BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE

Faculty of Engineering & Technology
B. Tech - Electronics & Communication Engineering
New Syllabus

BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY) Pune.

Faculty of Engineering & Technology
Programme : B. Tech (Electronics & Communication Engg) (2021 Course)
Course Structure & Syllabus
(Choice based credit systems-2021)
B.Tech (Branch name…)Semester I to VIII

Manual1.

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Executive summary

Students pursuing engineering studies need to be well equipped and state of art with the latest technological trends and industrial requirements. To produce the students with high caliber and technically sound, enrichment in the curriculum content and various quality initiatives are needed. This is possible only when the students undergo studies with an updated and evolving curriculum to match global scenario.

Curriculum Development History

- In ambits of Deemed University- 2000
- Curriculum of SPPU Accepted
- First Revision in 2004
- Second Revision in 2007
- Third Revision in 2011
- Fourth Revision in 2014
- Fifth Revision in 2018 was expected

The proposed curriculum is developed to inculcate the advanced engineering skills to cope up with upcoming industrial and societal needs. Students will be imparted with advanced contents from respective field and innovative delivery methods.

To inculcate the advanced engineering skills and knowledge, branch specific courses have been introduced from the Sem – I itself. There are total 38 theory courses, 4 vocational courses, 3 MOOCs, 2 projects, technical research paper writing, no. of application software courses, no. of practical based courses, 6 Industry taught courses along with 60 days exclusive internship have been incorporated in the curriculum with 230 credits and 6500 Marks.

There will be collaboration with the prominent industries to execute the vocational courses. These industries will deliver the content and execute the hands-on session to inculcate the required engineering skills of particular course. Also, one course per semester will be entirely delivered by the expert/s from the industry of respective field for which blended teaching learning will be adopted.

Students will apply the knowledge of respective courses and develop the prototype/ model as a part of project based learning.

To give the experience of technical writing and research article, students have to develop the two projects in pre final and final year respectively and shall submit the research article to reputed journal for publication. This will inculcate research aptitude among students and will enhance the research profile of institute also. Incorporation of various practical based courses in respective discipline, will give hands on experience to students to understand the engineering concept in better way. Nowadays all practices and process in the field are being computerized and automated. Hence, it was pertinent to increase software content in the curriculum. It was demand from the industry that every engineer should be conversant with Software/Programming/Data analysis and automation process. Hence, courses to such as C, C++, Python, Machine Learning, Artificial Intelligence are added in curriculum of all discipline. Students who wish to develop their career in the IT field, significant courses related to computational engineering and application software have been incorporated in the curriculum of each discipline.

National Education Policy is insisting the Online and Digital Education and Ensuring Equitable Use of Technology. To inculcate the self-learning approach amongst the students, proposed curriculum has introduced Massive Open Online Courses to all the students to provide an affordable and flexible way to learn new skills, advance the career and deliver quality educational experiences at scale.

2. Curriculum Content

- Curriculum derived from Latin word 'Currere', which means a race course or runway on which one runs to reach a goal.
- Curriculum is the instructional and educative programme by following students achieve their goals, ideals and aspirational life.
- Curriculum is a standards based sequence of planned experiences,

  which students practice and achieve proficiency in content and applied learning skills
- Its confidence building process
- Its total learning experience of the individuals
- Its interactive system of instructions and learning with specific goals , contents, strategies, measurements and resources.
- The desired outcome of curriculum is successful transfer / development of knowledge, skills, and attitude.
- Curriculum should lead to transformation of student to contributory member of the society

We tried to develop curriculum , which will meet these concepts.

Curriculum is the outline of concepts to be taught to students to help them meet the content standards. **Curriculum** is what is taught in a given course or subject. It refers to an interactive system of instruction and learning with specific goals, contents, strategies, measurement, and resources. It is a course of study that will enable the learner to acquire specific knowledge and skills. A **curriculum** consists of the "roadmap" or "guideline" of any given discipline. Both the philosophy of teaching of the instructors as well as of the educational institution serve as two of the principles upon which a curriculum is based.

In Engineering, a **curriculum** is the combination of instructional practices, learning experiences, and students' performance assessment that are designed to bring out and evaluate the target learning outcomes of a particular course. It is the goals, assessments, methods, and materials used to teach a particular skill or subject and includes thinking under "skill.". The curriculum needs to be planned and designed in such a way so as to sequentially improve students' knowledge and skills.

Placement is an important parameter and outcome of a good curriculum, which satisfy the need of good placement. The written curriculum is a plan of what is to be taught so that the student gets good placement. For this , a variety of technical and non-technical courses that are required to complete a specific degree so as to help the student for placement are included in the curriculum. In addition to technical knowledge , it should also include social behaviors as well as content and thinking skills.

Overall, the curriculum should be such that it should develop a student in a good job seeker, good entrepreneur and also a good human being.

All the above aspects are taken care in the curriculum of **B. Tech-2021** course. This will develop different abilities in a student.

3. Curriculum Preamble

The curriculum 2021 is formed such that it will develop different abilities in a student. It a combination of blended teaching learning process in which both online and offline teaching is a part of the curriculum. In order to develop affection towards the discipline a student has selected, core discipline courses are included right from first year. This will also help to give the overall idea about the branch / discipline to the student.

Interaction with the industry is increased in this curriculum by introducing two new concepts –

1. **Vocational Course** and 2. Industry Taught Course.

Vocational Course (VC), a student will able to develop a specific skill set from the relevant people/ agency from the industry. This will add in gaining new skill sets required by the industry. Such Vocational Courses are included from Semester III to Semester VI of the curriculum. Department also design vocational course relevant for the discipline, which add practical knowledge to students. The vocational courses should be discipline specific. 4 vocational courses and 8 credits are integrated with curriculum.

Industry Taught Courses (ITC) are the courses which will be taught by the people from industry who are experts in the relevant field, either partially or fully. This will provide a scope to students to gain the latest knowledge as used in industry and also to have direct one on one interaction with the industry. This will develop a confidence among the students. Such teaching by industry experts will be as per their availability, if required online and other than official college hours also. Thus, there is a blend of online and offline teaching, knowledge from academicians as well as from industry. Total six Industry Taught Courses are included in the curriculum.

Industry Internship of 60 days at the end of Semester VI integrated with curriculum, will also add to the interaction with the industry. A student will avail his training in industry or on site or in any design office or research organization as allotted to him/by the institute. A separate logbook will be maintained by the student during this period duly signed daily by the competent authority.

Project Based Learning is a part of almost each course of the curriculum. Small projects on relevant topics will be allotted to the students as a part of term-work of that course. This will inculcate the habit of applying the knowledge learnt to solve practical problems.

Two Projects are included in two stages, one in third year (Sem V and Sem VI) and the second in final year (Sem VII and Sem VIII). Improvement in Research, thinking ability and application of theoretical knowledge to develop practical ideas is the main purpose of these projects.

Publication of a research paper is the outcome expected from the Project work and as a motivation, separate credits are allotted for this. Students are expected to write research article based on Project-I in standard journals in final year. Guide for Project -I will help in writing the research article.

To develop the self studying, self-learning skills, each student has to join the **MOOC/NPTEL** courses and will get the certification of the respective course. This will also give him/her a chance to get the knowledge from teachers from well known institutes of national repute. Three such MOOC/NPTEL courses are included each in Semester III, Semester V and Semester VII and separate credits are allotted to it.

Various new courses are introduced in the curriculum thereby introducing the current and latest technology to students. Basic Science and Engineering Science course contents are designed to match the requirement of the specific disciplines.

Number of software related to that branch/ discipline are included as part of the curriculum. This will help the students to get good placement.

Few soft courses are introduced to non-circuit branches. This will give a soft feel to such branches and also to inculcate confidence among the students.

In addition to technical abilities, a student needs to be developed as a good human being. For this, he will complete social activities in Semester IV and Sem VIII.

Thus Curriculum-2021 satisfies the requirements of National Education Policy-2021.

"Knowledge, Skill, Behavior" are the three attributes that are inculcated in a student when he completes his B.Tech. course under Curriculum-2021.

Recommendations considered

- UGC- Quality mandate
- National Education Policy (NEP)

- AICTE model curriculum
- Curriculum of International Universities
- Curriculum of Indian Universities
- Feedback from HR of industries called for placements
- Market perception

Methodologies Adopted In Designing Curriculum (2021-22)

- 19 Basic Points for design of Curriculum
- Listing of common points (credits, marks, No. of courses, common courses, industry taught courses, vocational Programmes etc.)
- Conducted series of meetings
- Conducted in depth one on one discussions with HoDs
- Planned three workshops,
- Eminent experts from Industry, IITs, IISER, NIT, SPPU, Central Universities were invited for workshops
- First workshop - Course structure, Titles of courses, Industry taught courses, Vocational Courses.
- Second workshop - Content of first and second year courses
- Third workshop - Content of third and fourth year courses- (Planned)

4. Salient features

- Total 250 contact hours teaching are incorporated.
- Credit based 38 theory courses being offered to achieve global standards of quality.
- Curriculum offers practicals to more than 80 % (~ 30 theory courses) theory courses.
- Total 230 credits (6500 marks) are offered for the entire B. Tech. programme.
- Theory courses contains 60% of courses and 20% to practical courses.
- Tutorials (6 Credits), online courses (6 Credits), vocational courses (6 Credits), projects (18 Credits), internship (3 Credits), Research Publication (2 Credits) and social activities assigned (4 Credits) contains remaining 20% of credits
- Blended education policy is adopted considering its importance. 20% courses are taught in online mode.
- Incorporation of 6 industry taught courses is one of the important and strategic step.
- Adopting 4 vocational Programmes in cooperation with industries, renowned agencies, universities will improve skillsets of our students.
- 60 days industrial internship to meet the requirements of industry.
- Including of 2 projects to enhance technical skills & self learning.
- Research paper based on Project-I will inculcate research aptitude among students.
- Project based learning practically for all courses will enhance the ability of application of knowledge and problem solving aptitude.
- NPTEL/ MOOC courses in online mode are introduced as integrated part of the course structure.
- To understand social responsibility and social activities of weightage of 4 credits are integrated part of the course structure.
- Quantitative Techniques and communication courses are introduced to enhance the analytical ability of students and address employability.
- Wide range of elective courses have been offered to provide the choice, to explore the knowledge in their domain of interest.

Salient Features

Sr. No.	UGC (Quality mandate)/ NEP2020-Recommendations	Curriculum (2021-22)
1	Learning Outcome-based Curriculum Framework (LOCF)	a) Programme outcomes and course outcomes are being made ready
2	Imparting Life Skills to Students.	a) Quantitative techniques b) Communication skills c) Bridging gap with Industry by vocational courses d) Self learning by NPTEL/PBL/Two projects
3	Social and Industry Connect	a) 6 Industry taught courses b) 4 Vocational courses c) 60 days internship d) Time and credits for social activities
4	Promotion of Research and the Creation of New Knowledge.	a) Research publications based on projects b) Project based learning
5	Blended Education	a) 15% courses in online mode b) NPTEL/MOOC courses in online mode
6	Technology Enabled Learning/Self Learning	a) NPTEL/MOOCS
7	Software Applications	a) Programme specific softwares and Software application Courses

5. Curriculum Details

5.1. Courses-Theory/Practical's/Tutorials/Units/Co-mapping and Engagement

Courses-Theory/Practical's/Tutorials/Units/Co-mapping and Engagement, University exam and internal assessment

The B.Tech. 2021 offers Credit and Outcome based curriculum with total 230 credits, required for graduation with a Bachelors' degree (B.Tech). The Under-Graduate Programme (B.Tech) is of four years duration i.e of eight semesters (two semesters/year).

Engagement of Courses:

The courses in revised curriculum structure of B.Tech. program are categorized under Core courses, Elective courses, Engineering Science courses and Basic Science courses. These courses are taught to students by engaging them through lectures, practical or tutorials by respective course coordinators. From semester I to VI, there are five (lecture engaged and assessed) courses and in semester VII and VIII there are four (lecture engaged and assessed) courses which are mandatory. All the courses have varying hours of engagement and credits. Theory lecture engagement varies between 3 hours to 4 hours/week, practical engagement varies between 2 hours to 4 hours/week for the respective courses. The contents of every course is divided into six units. Each unit can be covered in 6 hours or 8 hours depending on the total allotted hours/week of lecture engagement for the respective course. Some courses are solely practical oriented. These courses will be only engaged through laboratory sessions.

Outcome Based Curriculum:

Planning and realization of teaching and learning related to outcome-based curricular model requires that initial element shall be an outcome. It serves as a basis for defining modes of evaluation and validation of outcomes. The curriculum defines the Course Outcomes (COs) and course objectives for every course. The outcomes are assessed through various activities and evaluation of learner's performance in various examination schemes i.e Theory/Practical/Oral/Term work.

Credit Calculation:

The course credits are computed based on the teaching hours per week for that course using the formula as mentioned below.

Credits earned by the Student = Credits earned in Theory (Th) + Credits earned in Practical (P) / Oral (O) + Credits earned in Tutorial (T)

Here, as mentioned above, the credit assignment for Th/P/O/T of any course is based on number of teaching hours of that course. It is as mentioned here:

Number of Credits for Theory (Th) courses = Number of classroom teaching hours per week for that course (1:1 correspondence)

Number of Credits for Practical (P) / Oral (O) courses = Number of laboratory hours per week for that course / 2 (0.5:1 correspondence)

Number of Credits for Tutorial (T) courses = Number of tutorial hours for that course (1:1 correspondence)

Example: If a course has 4 hours of classroom teaching, 2 hours of laboratory session and 1 hour of tutorial, then the credits assigned for that course will be 4(Th), 1(P/O) and 1(T) respectively.

Examination Pattern:

A) University Examination (UE)

The pattern for theory examination is of 60:40, where the learner can earn 60 Marks (maximum) through University Examination (UE) and 40 marks (maximum) are assigned for Internal Assessment (IA). For the UE of Practical/Oral assessment, the total marks allotted are 50. The laboratory assessment is divided into three assessment heads viz. Term work (TW), Practical (P) and Oral (O). The students will be assessed through TW or P or O or combination of any of these for the courses that have practical assessment. 25 Marks are assigned to TW/P/O each, so when a learner is assessed for practical through TW and P heads, he/she will be assessed for 50 marks.

B) Internal Assessment (IA)

The Internal Assessment (IA) for the respective courses will be performed through Unit Tests (UT) and Assignments. Total two UTs of 20 marks each will be conducted and the average marks of these two UTs will be considered. Similarly, course coordinators will design the class assignments in terms of exercises, case studies, real world problems or mini projects, which the learners have to submit from time-to-time, as mentioned by the deadline of each assignment. While designing the assignment, the course coordinators will provide the assessment criteria to the learners and maximum score (marks) for the assignment as well. If there are multiple assignments, then the average of score (from score attained in all assignments) will be calculated and considered as IA marks. This way, the learner will be assessed for 20 marks (maximum) for assignments.

Hence, total marks for UT and assignments are 20 each and so, IA will be of 40 marks. The score for IA is calculated as:

IA Score attained by learner (Max 40) = Average Score attained in UTs (Max 20) + Score attained in Assignments (Max 20)

5.2. Credit Concept: Equivalence

In CBCS 2021 Course structure, the allotment of credits are as follows:

Theory class of 1 hour: 1 Credit

Practical class of 2 hours: 1 Credit

Tutorial class of 1 hour: 1 Credit

Project, Research Paper & Social Activity: 1 Credit

5.3. Vocational course

Vocational learning opportunities play a important role in skill development and employability of student. Vocational courses are ways of implementation of theoretical knowledge in the practice.The importance of vocational development can largely be summed up as the difference between theoretical knowledge vs. practical skills. The vocational courses are based on the teaching of practical skills. These courses are designed to introduce the manual skills in the professional education in addition to the theory. These courses will serve as bridge courses for professional growth and career improvement.

Aims & objectives of vocational courses:

- To provide students with technical knowledge and skills necessary for progressive education in engineering profession.
- To give a better understanding of the emerging of technology.
- To train the student with necessary skills leading to skilled personnel who will be enterprising and self-reliant.
- To enhance the skill of students for becoming self-sustained engineer.
- To reduce the mismatch between the demand and supply of skill man-power.

In this curriculum at B.Tech Programme, there are four vocational courses introduced i.e. in Semester III, IV, V and VI. The courses offered at these semesters are as per the requirement of the programme.

Methodology:

The vocational courses shall be conducted in association with the companies through MoUs. The candidate shall be provided training in the industries in respective area. The training can also be given by the company experts in the college with appropriate infrastructure. Departments can design vocational programme/course as per employability skills for an engineer of respective discipline required. The student shall have to attend the training sessions for at least 4 hours per week. The training sessions shall be organized on weekends or on the extended hours of the college timing.

A faculty-in-charge will be appointed to monitor the functioning of the vocational course as well as monitor the performance of the student for the said course.

The student has to maintain proper record of the training attended throughout the semester and submit the report on the work carried out. The record has to be checked and signed by the faculty –in-charge.

Assessment:

The assessment of the performance of the candidate for the vocational courses shall be in the form of term work and oral. The term work and oral carry 50 marks. The candidate performance shall be evaluated based on the training undertaken by the candidate throughout the semester. Student shall give presentation of skills he learned through vocational courses followed by viva. External examiner for the same shall necessarily from relevant industry.

A total of 2 credits shall be allotted per vocational course per semester.

Certificate:

Every candidate shall be awarded a certificate after successful completion of the vocational course as per the rules & regulations.

The certificate shall be jointly signed by concerned authorities of college and the company.

5.4. Industry Taught Courses

PREAMBLE:

The concept of Industry Offered Courses enables bridging of technological gaps between students and state-of-the-art technologies used current in the industry.

OBJECTIVES: To

i. Impart the state-of-art technology course existing in the industry.

ii. Expose students to application of technologies adopted by industry.

iii. Train students for solving real-world projects in respective industries by applying technical knowledge gleaned from an industry expert

iv. Make students draw benefit from the experience of veterans from industry. Knowledge sharing by industry experts.

v. Align student's mind-set towards industrial environment through the instructor from industry. Provide industry instructor lead courses.

CREDIT/HRS.:

Percentage of Industry Taught Courses in the programme =……………. %

METHODOLOGY:

A) A faculty shall be appointed as course co-ordinator. Roles and responsibilities of Course coordinator are as follows:

(i) Act as a liaison between identified Industry expert and department.

(ii) Arrange schedule of lectures in consultation with identified Industry expert.

(iii) Keep record of students' attendance.

(iv) Collect feedback from students and suggest changes and modifications in lecture delivery method by industry subject expert.

(v) Keep record of Unit Test Performance and Practicals along with experts.

(vi) Organise visit to the industry relevant to the course.

B) Execution:

(i) The Identified industry expert can conduct theory classes on weekends or as per convenience of Industry experts either through offline or online mode. The courses which are to be taught by expert from industry are already identified and confirmed in workshop-I

(ii) Practical sessions will be conducted by course coordinator. Panel of experts from Industry shall be identified to teach the course before the commencement of the respective semester and submitted for the approval of the Head of the Institution with financial layout.

BHARATI VIDYAPEETH

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COLLEGE OF ENGINEERING, PUNE – 411043.

Approval format for Expenditure for Industry Taught Course

Date:

Name of the Department: ____

1. Budgetary allocation for industry expert (As per Budget 2021-22) Please mention total amount (in Rupees) and other bifurcations, if made---------------- (to be filled at college level)

2. No. of Lectures (Industry offered Course wise / Subject wise) required with specific subjects:

Sr.No.	Title of the course	Name of Department	Semester	Work Load per week	Details of Industry Expert(s)				Total Remuneration
					Name & Designation of Expert	Name of the company	Contact Details	Honorarium per lecture	
1									
2									
3									

Recommendation for Course Coordinator
Recommendation for HoD
Recommendation for Principal

3. Total financial Outlay for honorarium of Faculty: (Industry taught courses-Subject wise): with number of lectures (in Hours) in UG sections

Sr. No.	Name of industry Expert	Honorarium	Financial Outlay (in rupees)
1			
Total			

Signature of HoD **Signature of Principal**

Request format-To Industry Expert

To

……

Subject: Industry Taught Course (ITC) for B.Tech (…..) , Sem-____

Dear Sir,

Greetings from Dept. of _________, Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune

Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune, BV(DU)COEP an AICTE approved institution, was established in the year 1983 and is a constituent unit of Bharati Vidyapeeth (Deemed to be University), accredited (3rd Cycle) with 'A+' grade by NAAC and NBA.

In the national arena, BV(DU)COE Pune has been among top 100 Engineering Colleges of India, consecutively for five years (99th ranking in 2020) by MHRD in June 2020. It has also been ranked 20th at national level by AICTE Internshala for internships. Our reputation as India's premier engineering institution is further enhanced by being honored with the Platinum category by AICTE-CII survey. College is proud to be ranked 11th across India by the prestigious magazine India Today. DATAQUEST a leading journal, ranked BV(DU)COEP in 3rd position amongst the Top 50 Private T - Institutes of India. The college ranked 17th position in the survey conducted by Times of India in 2019.

----Brief about dept-----

The course curriculum has a multi-dimensional approach, it not only implements a dynamic, qualitative, and evolved structure and syllabus, but also incorporates a good and healthy mix of theoretical and practical exposure. In this regards the institute promotes and encourages courses in line with industry expectations and forthcoming challenges which should ease the students for undergoing industry offered courses for practical exposure of applications of Education system. This is much required to bridge the gap between Industry and Academia and by promoting industry orientation for creating a complete industry ready professional.

To fulfil these objectives, curriculum design, which will be implemented from the academic year 2021-22, B.Tech. program includes 6 courses taught by industry experts. With reference to the subject mentioned above, we request you to teach… ….. Total…… number of lectures (60 min each) are required to be delivered. A blended learning, to be offered for the students through combining online or offline teaching wherever and whichever is best possible. Therefore, I request you to send acceptance letter, mode of teaching, convenient day and time slot to teach the said course. Enclosed please find herewith standard format for reply.

With Thanks and Regards,

Sign and stamp of Head, Dept of ________

Enclose:- Course content

Reply

To

The Principal

BV(DU)

COE,

Pune.

Subject: - Acceptance for delivering/ conducting lecture of the course -------- of B.Tech(-----), Sem(----).

Ref.: - Your letter ------------------ dated-

Dear Sir,

This has a reference of your letter mentioned above. It gives me immense pleasure to accept your invitation to deliver lectures in the said course. Following will be the time-table for the lecture.

Sr. No.	Title of Course	Time	Days						
			Mon	Tue	Wed	Thu	Fri	Sat	Sun

Sincerely

<Signature >

< Name of Expert>

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COLLEGE OF ENGINEERING, PUNE – 411043.

Date:

AGREEMENT TIME-TABLE

Name of department:

Name of industry taught course:

Sr. No.	Day	Date	Time Slot

(Name & sign. of HOD with date & stamp) (Name & Sign. of Concerned Person)

Industry Taught Courses (Assessment- Theory/ Practical)

- One course coordinator should be appointed for the course. All documents related to assessment of the course will be maintained by the course coordinator.
- Total assessment of Industry Taught Course -Theory is of 100 Marks.
- Assessment of this course consists of Internal Assessment and End Semester Exam which carry 40 Marks and 60 Marks, respectively.
- Internal Assessment consists of assignments and mini projects.
- One real world project (mini project) is considered as part of Internal Assessment.
- Students should give presentation on given topic.
- Industry expert should set question papers.
- In case of practical exam, industry expert can take oral exam (may be online) and students will perform the experiments in the presence of course coordinator in the department.

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B.Tech (Brach Name) Sem __

Title of ITC: - _________

Record of Lecture Taken

Sr. No.	Lecture No.	Unit no.	Date of Conduction	Topic Covered	No. of Students Attended	Sign

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Bill format for remuneration for Industry Taught Courses

(The bill should be submitted directly to the concerned department on or before 5th of every month)

1. Name of industry expert: ______________________________

   Company/Industry name:

2. Name of the Department: ______________________________
3. Remuneration for the Month: ______________________________
4.

Name of the Bank	Branch	A/C No.	IFSC

5. Contact Details: -

Email	Cell Phone No.

6. Details of lectures delivered:

Sr. No.	Title of the Course	Class	Date	No. of lectures	Total Remuneration (Rs./lecture)
	Total				

Date: ______________

____

Signature of the Industry expert

Certified that has been appointed by the ----- dept as an industry expert for the course vide order No. ______________________

dated. __________________________ has delivered _____ lectures/taken classes during the month/ Sem ______________________

and is entitled to honorarium of Rs. ____________________(@Rs. ------ /- per lecture/per day)

Course Coordinator: ____________________________

____

Signature of the Head of the Department with Seal

Date:

Receipt: -

Received with thanks ₹-------- from BVDUCOE, Pune towards conduct of -------- lectures of the course ------------- of B.Tech(-------), Sem--- --.

Signature of Industry Expert

BHARATI VIDYAPEETH
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COLLEGE OF ENGINEERING, PUNE – 411043.

Payment Record
(Copy to be maintained in the Department)

Sr. No	Name of Department	Name of course	Name of Industry Expert	Name of company	Email	Mo. No	Address	Amount	Remark/ check number transaction id

Encl:
1) College voucher copy
2) NEFT/RTGS copy

5.5 MOOCs Implementation

To inculcate the self-learning approach amongst the students, proposed curriculum has introduced Massive Open Online Courses to all the students. It will provide an affordable and flexible way to learn new skills, advance the career and deliver quality educational experiences at scale.

Also, National Education Policy is insisting the Online and Digital Education and Ensuring Equitable Use of Technology.

A massive open online course (MOOC) is an online course aimed at large-scale interactive participation and open access via the web. In addition to traditional course materials such as videos, readings, and problem sets, MOOCs provide interactive user forums that help build a community for the students, professors, and teaching assistants (TAs).

BV(DU)COE Pune is having active NPTEL local chapter-partnership. Proposed curriculum has introduced three MOOCs at B.Tech Sem – III, Sem V and Sem VII with following objectives.

1. To provide e-learning through online web and video courses in Engineering by experts in the country in that subject.
2. To develop self-learning attitude in students.
3. To provide platform for knowledge enhancement of student's as per their area of interest.
4. To update students with advanced technologies.
5. To make the students more employable.
6. To prepare the students for competitive exams like GATE and also for higher studies.

Methodology of Assessment:

- Department shall publish list of NPTEL courses in every semester. Student can refer selected one of them in respective semester.
- Considering pre-requisite, proposed curriculum has provided with the various subject baskets as per the courses available.
- Students need to enroll for the course in each academic year as mentioned in the structure.

- Students need to attend all online lectures and complete all assignments as per schedule for registered course.
- Student will register and appear for exam conducted by NPTEL and shall submit the copy of course completion certificate received after passing the exam for registered course.
- Accordingly, the credits will be allotted to the student for respective MOOCs.
- Students have the flexibility to attempt the said course during the entire B.Tech Programme to earn the credits of respective MOOCs.
- NPTEL courses relevant to respective branch are only expected to select by students. Credits will not be awarded if general/ non engineering courses opted.

5.6 Project I and II

Project Stage I Objectives:

Provide help to the students

- In generating a new idea or modify existing system for solving societal, industrial and/or institutional problem.
- In review of literature that aligns with new idea and/or existing systems and clearly defining the problem
- In developing a workflow process/methodology for the desired system.
- In designing various components of the system assembly
- In developing a CAD model of the desired system.
- In writing the technical report based on the work completed

Project Stage II Objectives:

Provide help to the students

- In fabrication of the experimental setup/new system and/or purchase of standard components
- In pilot run and/or validation of new system for its performance
- In modifying the system if required to improve its performance.
- In detailed parametric studies of the modified system and analyzing the results
- In writing the technical report, research article and/or filing a patent.

Particular	Hours per week	Credits allotted
Project I stage I	2	4
Project I stage II	2	4
Project II stage I	4	4
Project II stage II	4	6

Assessment & Evaluation:

For Project-I Stage I & II		
Assessment Tools	**Assessed through**	**Marks**
	Presentation 1	10
	Presentation 2	10
	Presentation 3	10
	Continuous Assessment by guide	10
	Final Project demonstration, presentation & viva voce (University Examination)	60
	Total Marks	**100**

For Project-II Stage I & II		
Assessment Tools	**Assessed through**	**Marks**
	Presentation 1	20
	Presentation 2	20
	Presentation 3	20
	Continuous Assessment by guide	20
	Final Project demonstration, presentation & viva voce (University Examination)	120
	Total marks	**200**

Minimum number of in-sem. project presentations: 03

Parameters for evaluation of project in University examination

1. Idea of Project/Topic
2. Technical content
3. Innovation
4. Experimentation/Model development/Software development/Simulation development etc.
5. Participation as an Individual
6. Research Potential
7. Project Hardware/Software
8. Fabrication/Model/Equipment development
9. Data Analysis
10. Attendance
11. Timely completion
12. Report writing
13. Presentation

Prepare a format for report card of indicating progress, assessment and progressive evaluation of the project. This progressive evaluation record (PER) is prerequisite for university examination.

Progressive Evaluation Record (PER) shall be submitted in the department at the end of the semester and made available at time of university examination.

Format for Internal Examination for Project- I & II
B.Tech (------), Sem--------

Roll No.	PRN	Name of student	Term Work Marks			
			Presentation-I (10%)	Presentation-II (10%)	Presentation-II (10%)	Continuous Assessment by Guide (10%)

Format for University Examination for Project- I & II

Roll No.	PRN	Name of student	Parameter for assessment of project and marks for examination													Total out of 100	Any five parameters out of remaining
			Idea of Project/Topic	Technical content	Innovation	Experimentation/Model development/Software development/Simulation development etc	Participation as an Individual	Research Potential	Project Hardware/Software	Fabrication/Model/Equipment development	Data Analysis	Attendance	Timely completion	Report writing	Presentation		
			10	10	10	10	10	10	10	10	10	10	10	10	10		

Out of 13 parameters, parameters no. 1,3,4,6 & 8 are mandatory and may be considered for assessment of the project. Each parameter will carry 10 marks for Project-I & 20 marks for Project-II.

5.7 Social Activities for the Learners

A) Introduction

The prime objective of Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune is holistic development of students. The learner achieves the status as “whole” when he/she has not only achieved success in academics but also has succeeded in bringing the nation up by connecting with socially left-out elements and bringing ray of hopes into their lives. In this respect, the new curriculum encourages the learner on the social activities. In this case, student’s social activities are provided by the colleges, but not limited to them. Total of four credits assigned for these activities.

B) Objectives

a) To make people create balances, so they do not only focus on academic aspects, but there can also be other aspects to have in life.

b) To build better relationship with others.

c) To create great balance with the academic aspects.

d) To learn and understand society.

e) To develop the nature of help and enhance the ethical norms for behaviors.

f) Teamwork

C) Outcome of Social Activities:

The social activities make a good impact on learners. The learner:

a) Will be able to understand the needs of society.

It enables a learner to consider the perspective of other people and understand their needs by interacting with people from diverse backgrounds.

b) Will be able to understand different perspectives and engage other cultures.

Social events develop social skills and empathy—the outward-oriented dimensions of emotional intelligence (EQ). The interactions or conversations elicited by events helps students build relationships, understand different perspectives and engage other cultures. Social events provide an opportunity to expand one’s social circle.

c) Will be able to maintain positive outlook towards life.

With high adaptability to diverse situations and a good level of understanding of other's opinions, socially aware learners are less likely to indulge in negative behavior. They are also less vulnerable to stressful situations and have fewer chances of getting involved in undisciplined behavior. These students also have a more positive outlook on life.

d) Will be able to maintain good emotional health.

Social activities keep the learners sharp and mentally engaged, and this is important to prevent the onset of serious diseases like dementia or Alzheimer. Connecting with others helps keep you in a positive mood, which in turn wards off depression by improving physical health and maintaining good emotional health as well.

D) Sample list of Social Activities (not limited to them)

a) Organizing Educational Camps

Educational camps may be organized for the socially and economically week elements, especially in rural areas or even in the slum areas of the city, by making them aware of the importance of education and their own human rights.

b) Tree Plantation Drive

There are so many health benefits to having plants around – like fresher air, improved emotional state, and reduction of illness in and around the society. Tree plantation in this respect plays a crucial role. Just planting the tree is not enough but it should be made to grow to its extent.

c) Offer Helping Hand for Martyrs Family by Fundraisers

Soldiers fight for our country, securing our borders. They don't think of their family and sacrifice their lives for us, and what we do for them? Packages are announced every time after the death of our worriers but rarely reaches them. Families keep waiting for years. In this regard, few of these forgotten families can be visited and a small helping hand can be lend to them, to make them lead their further life peacefully. Fundraising in this respect, is a great student society social idea. It is incredible to see how people can bring positive change if they work together. The youth can make a team with an external organization to take part in a purposeful community event as mentioned above.

d) National Service Scheme

It will help in the overall personality development of a learner by participating in projects that benefit the community. This extra-curricular activity is sponsored by the Ministry of Youth Affairs and Sports.

e) Felicitations of People who have contributed to the society but now forgotten by the society

There are so many intellectuals in our society who have achieved great heights in their field, who are stalwarts in different field but never came into limelight, their contribution is not recognized. Few of these can be invited publicly or visited at individual level by making a team and felicitate to appreciate their contribution towards the society or nation. Some of these stalwarts may be like Anand Kumar who teaches underprivileged students for IIT-JEE without a penny, Shekhar Naik who is the Captain of Indian Blind Cricket Team, Ranjeet Singh Desale who even being a rural teacher, is awarded by UNESCO with Global Teacher Prize, Ritu Biyani who fought cancer, traveled across the country to spread awareness.

f) Street Play on Social Awareness

This is also typically known as "Nukkad Natak". This form has been used to propagate social and political messages and to create awareness amongst the people regarding social issues. What is important is that the plays make the people think. The play is seen by many people of different age groups who then question and discuss the contents of the play. There have been several plays exposing the mechanism of black marketing and hoarding. Some talk of the use of political power for pressurizing people. Others highlight caste conflicts or ideas about hygiene and health. Street plays are also used to encourage literacy amongst villagers. Street plays on some of the topics like degradation of Indian media, hypocrisy, responsibility towards environmental concerns, brain drain, dilapidated educational structure, safety issues and rights for women. child labor, organ/human trafficking etc., can be thought of. The learners can participate in street play festivals like Manthan Mahotsav, the largest street play festival in India.

g) Poster Exhibition on Contributions of Heroes of India

The learners can organize an exhibition to not only display but explain the contribution of Indian Heroes who have been forgotten and remained in the book of history. Some of these inspiring heroes may be Mihir Sen, Khashaba Dadasaheb Jadhav, Anandibai Joshi – First woman doctor from India, Bhikaji Cama, Khudiram Bose, Baba and Prakash Amte etc. Such exhibitions make inspired, the youth of today's generation.

h) Waste Clean Drive

i) Educating literacy-poor societies about disposal of nature-harming objects

j) Distributing needful items for living in economically backward societies

k) Organizing early completion on national issues.

l) Cleaning of Public Places/ Traffic Management/ Police Mitra.

m) Organizing activities under engagement of people with Science and Technology.

Report of social activities conducted each student shall be prepared in standard format. Appropriate documentary evidences shall be part of report of students correspondence with respective authorities for social activities, permissions, certificates from Institutes/Organization/Local Government are essential documents for award of credits under this head.

E) Summary

Thus the interactions or conversations elicited by such social events help students to build relationships, understand different perspectives and engage other cultures and these events not only will uplift the moral of the society but also ignite minds of generations ahead to provide their support and enthusiastically participate in such activities. Such interactions will certainly provide an opportunity to expand their own social circle.

5.8 Internship

Internship of 60 days is incorporated as an integrated part of curriculum structure-2021. The primary objective of internship is to make students familiar with industry environment and to take up on- site assignment as trainees or interns in order to bridge the gap between theory and industrial practices. It is mandatory for students to undergo in-plant training after completion of semester VI in reputed industrial organization. The student shall submit the "Intern Certificate" issued by the industry organization as well as a technical report not exceeding 30 pages within the stipulated time to be eligible for making a presentation before the committee constituted by the department. On the basis of daily work carried out in the industry, student shall prepare a record book. This record book shall be checked and signed by his/her supervisor from the industry where he/she is doing internship on daily basis.

University examination carries 50 marks and after successful completion, student may be awarded 3 credits for the internship work. Standard format for record book shall be as below. Marks will be awarded out of maximum 50 and three credits will be given upon completion of internship towards the degree requirements, as per the regulations. Internship will ultimately assist students to apply theory learned in classroom to industrial practices so as to understand engineering/technical solutions in a global, economic, environmental and societal context.

5.9 Research paper publication

Research paper publication is one of the innovative features of programme curriculum- 2021.

1. It has been & introduced in 7th semester. Two credits are awarded for the same subject to publish of research paper. Student shall publish a research paper in peer reviewed/ Standard journal(not in paid journals) based on research work carried out for Project-I. Guide for Project-I shall be responsible for Writing manuscript, Selection of journal for publication, Submission of manuscript to the journal. Progress report of publication of research paper shall be prepared in standard format and submitted for the award of credits. Students shall be first author of research papers. No name either of faculty members except guide or other students shall be added without any contribution in research/project work. Format for progress report of research paper published (To be maintained by Guide). A departmental committee comprising of head of department, project guide, and one senior professor will review the progress of this activity periodically (not exceeding three months). The suggestions/comments offered by committee will be incorporated in due course of time to accomplish the task within a predetermined period.

2. Research paper publication as a integrated part of the course structure, will inculcate research aptitude among students. This will help there in seeking admissions in reputed International Universities for higher studies. Further, this research aptitude developed may enhance his employability also.

3. This activity is expected to generate 15 to 20 publication per year, which will enhance research profile of department and institute too.

4. Hence, there should be team of maximum 3 to 4 students per project except very exceptional projects. Prior permission to increase team size is essential.

Weekly progress report of the research paper publication.

Title of the project -

Name of the Guide -

Weekly schedule of meeting- Day------- Time-----

Student Details - Name--------- PRN------ Roll No.---

Sr. No.	Week No.	Date	Work completed/done by students per week

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Vision and Mission of the Department

VISION of the Department

To create technical manpower to suit global needs in Electronics and allied Engineering.

Mission of the Department

M1-To empower students with state-of-the-art knowledge to meet the growing challenges in Electronics and allied field.

M2-Establish a unique learning environment for creativity, innovation & professional activities in Electronics field for student and faculty to inculcate moral& ethical values.

M3- To provide quality and value based education to excel in their profession to meet economic and social requirements of new era.

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGG.

Program Educational Objectives

PEO1- Solve real-life engineering problems exhibiting a solid foundation in mathematical, scientific & engineering fundamentals.

PEO2-To facilitate learning in the core field of Electronics and Communication Engineering to integrate technological progression & software & firmware skills to produce sustainable solutions.

PEO3-Apply knowledge of Electronics and Communication Engineering to provide real-life solutions to technical problems with societal, environmental, and ethical responsibility.

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGG.

Program Specific Outcomes

PSO1-

Demonstrate conceptual understanding of Electronics and Communication to solve the problems in the emerging areas of Communication, Networking, Embedded and VLSI, AI enabled technology, Signal processing.

PSO2-

Develop an ability to apply hardware and software tools for design and analysis of various real-world applications.

ELECTRONICS AND COMMUNICATION ENGINEERING

Program Outcomes

POS	STATEMENT
PO1	Apply basic knowledge of mathematics, science & engineering.
PO2	Identify, formulate, analyze and solve engineering problems.
PO3	Design and develop systems/ processes to meet the desired specifications.
PO4	Use of research based knowledge to design and conduct experiments, analysis and interpret data to provide valid conclusions.
PO5	Apply the techniques, resources and modern engineering tools required for Electronics Engineering applications.
PO6	Understand effect of engineering solutions in global, economic, health, safety & societal context.
PO7	Understand the impact of engineering solutions on society to be aware of contemporary issues.
PO8	Shoulder professional and ethical responsibilities for societal development.
PO9	Work as effective and efficient team member of the team or leader.
PO10	Communicate effectively.
PO11	Manage projects in Electronics and multi-disciplinary environment.
PO12	Engage in lifelong learning.

B. Tech. (Electronics & Communication)) Sem I

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1.		Linear Algebra, Calculus & SolidGeometry	4	0	1	60	40	0	0	0	100	4	0	1	5
2.		Chemistry & Economics ofMaterial Science	4	2	0	60	40	50	0	0	150	4	1	0	5
3.		Electronic Components & Devices	4	2	0	60	40	50	50	0	200	4	1	0	5
4.		Electrical Technology	4	2	0	60	40	25	0	0	125	4	1	0	5
5.		Computation &Programming Using C	4	2	0	60	40	50	25	0	175	4	1	0	5
	Total		**20**	**08**	**1**	**300**	**200**	**175**	**75**	**00**	**750**	**20**	**4**	**1**	**25**

Bharati Vidyapeeth
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College of Engineering, Pune

B. Tech. (Electronics & Communication Engineering) Sem I **LINEAR ALGEBRA, CALCULUS AND SOLID GEOMETRY**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination(UE): 60 Marks	Credits : 04
Practical:--	Internal Assessment(IA): 40 Marks	
Tutorial: 01		Credit :01
	Total:100 Marks	Total Credits:05

Course Pre-requisites:	
The students should have knowledge of	
1	Basic algebra.
2	Ordinary derivative.
3	Plane geometry.

Course Objectives:	
1	Rank, consistency of system of equations and concepts of solid geometry.
2	Partial derivative and maxima, minima for several variable
3	Methods of curve tracing and multiple integrals

Course Outcomes: After learning this course students will be able to	
1	Apply & test rank of matrix for consistency of linear system.
2	Understand the partial derivative and apply to find errors and approximate values.
3	Test the functionality using Jacobian.
4	Trace curves of various types of mathematical functions.
5	Compute the coordinate system and apply it to locus problems.
6	Evaluate multiple integrals and apply it evaluate area and volume.

UNIT – I	**Linear Algebra: Matrices**	**(08 Hours)**
	Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – HamiltonTheorem. Application to problems in Engineering.	
UNIT – II	**Partial Differentiation and its applications**	**(08 Hours)**
	Functions of two or more variables, Partial derivatives,	

	Homogeneous functions, Euler's theorem, Total derivative, Change of variables, Errors and Approximations.	
UNIT -III	**Jacobian and Maxima and Minima Multivariable Calculus**	**(08Hours)**
	Partial derivative, Jacobians and their applications, Chain Rule, Functional Dependence. Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.	
UNIT - IV	**Fourier series, Integral Calculus and Curve Tracing**	**(08 Hours)**
	Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis, Differentiation Under the Integral Sign, Error functions. Tracing of Curves, Cartesian, Pola and Parametric Curves. Rectification of Curves.	
UNIT -V	**Solid Geometry**	**(08Hours)**
	Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder.	
UNIT - VI	**Multiple Integrals and their Application**	**(08 Hours)**
	Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values	

Text Books:

1. .P. N. Wartikar and J. N. Wartikar, "Applied Mathematics" (Volumes I and II), 7th Ed., Pune Vidyarthi GrihaPrakashan, Pune, 2013.

References Books:

1. B. S. Grewal, "Higher Engineering Mathematics", 42th Ed., Khanna Publication, Delhi
2. B.V. Ramana, "Higher Engineering Mathematics", 6th Ed., Tata McGraw-Hill, New Delhi, 2008.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Ed., John Wiley & Sons, Inc., 2015.
4. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Ed., Cengage Learning, 2012.
5. Michael Greenberg,"Advanced Engineering Mathematics", 2nd Ed., Pearson Education, 1998.

Project based learning:

1. Find the eigen values and eigen vectors of any random matrix
2. Check the linear dependence / independence of vectors
3. Check the consistency and solve the linear equations
4. Solve the partial differential equations
5. Find the error using the concept of total derivative
6. Check the Functional Dependence using the concept of Jacobian

7. Find the derivatives of error functions
8. Find Maxima and Minima of functions of two variables
9. Use differentiation under the integral Sign to solve integrals
10. Trace the Cartesian curves
11. Trace the polar curves
12. Find the equation of sphere, cone and cylinder using the concept of solid geometry
13. Find root mean square values using integrals
14. Find the volume using triple integrals
15. Find the area using double integral

Students in a group of 3 to 4 shall complete any one project from the above list.

Bharati Vidyapeeth
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B. Tech. (Electronics & Communication Engineering) Sem I CHEMISTRY AND ECONOMICS OF MATERIAL SCIENCE		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination(UE): 60 Marks	Credits : 04
Practical:02	Internal Assessment(IA): 40 Marks	
Tutorial: --	TW:50 Marks	Credit: 01
	Total:150 Marks	Total Credits:05

Course Pre-requisites:	
The students should have knowledge of	
1	Structure property relationship, types of crystals, Capacitor, insulator, classification and properties of polymers, super capacitors , Green solvents
Course Objectives:	
1	To develop the interest among the students regarding chemistry and their applications in engineering.
2	To develop confidence among students about chemistry, how the knowledge of
3	The student should understand the concepts of chemistry to lay the groundwork for subsequent studies in the field such as E&C Engineering.
Course Outcomes: After learning this course students will be able to	
1	Describe the properties of materials and application of semiconductor electronics
2	The student will able to understand various structure of polymers and their effect on different properties of polymers.
3	Apply constitutive equations of composite materials and understand mechanical behavior at micro and macro levels.
4	To explain students the importance of economics and environmental issues in material science.
5	Design and develop sensors using optical methods with desired properties.
6	Identify the grand challenges of green chemistry and consider what it will take to resolve them.

UNIT – I	**Semi conductors, insulators and Superconductors**	**(08 Hours)**
	Semi conductivity in non-elemental materials, Preparations of semiconductors, Chalcogen photoconductors, photocopying process Introduction to Superconductors, types of Superconductors, Properties of superconductors, Applications of Superconductors, Electrical insulators or Dielectrics.	

UNIT – II	**Polymers for the Electronics Industry**	**(08 Hours)**
	Definition, Classification, Chain Architecture (Linear/Branched, Tacticity, Isomerism), homopolymers, copolymers, graft copolymers and their characteristic properties in reference to their applications. Conduction mechanism, Preparation of conductive polymers, Polyacetylene, Poly (p- phenlylene), Polyhetrocyclic systems, Polyaniline, Poly (Phenylene sulphide), Poly (1,6-heptadiyne), Applications, Photonic applications	
UNIT -III	**COMPOSITES**	**(08Hours)**
	Introduction of Composites, Classification of Composites, Organic Matrix Composites, Metal Matrix Composites (MMC), Ceramic Matrix Materials (CMM), Classification Based on Reinforcements, Fiber Reinforced Composites/Fibre Reinforced Polymer (FRP) Composites, Laminar Composites, Particulate Reinforced Composites (PRC), Classification Based on Reinforcements and Matrices, Classification Based On Matrices, Metal Matrix Composites (MMC), Advantages and Limitations of Composites Materials, Limitations of Composites	
UNIT -IV	**ECONOMICS OF ENGINEERING MATERIALS**	**(08 Hours)**
	Introduction, economic considerations, green design, environmental and societal considerations of materials recycling of metals and non-metals recycling issues, limits of recycling, life cycle analysis and its use in design.	
UNIT -V	**SENSORS**	**(08Hours)**
	MEMS, NEMS, Actuators, Biosensors, construction and working of Biosensors and classification of Biosensors, Advantages of Biosensors, Biochips or Biological computers.	
UNIT -VI	**GREEN CHEMISTRY**	**(08 Hours)**
	Introduction, Twelve Principles of Green chemistry, numericals on atom economy,synthesis, adipic acid and indigo. Green solvents (ionic liquid supercritical CO2), and products from natural materials.	

Term Work:
The term work shall consist of record of minimum eight experiments.
1. To determine strength of strong acid using pH meter
2. Titration of a mixture of weak acid and strong acid with strong base using

conductometer
3. Preparation of polystyrene
4. To determine molecular weight of a polymer by viscosity measurement
5. To determine radius of macromolecule polystyrene/ polyvinyl alcohol by viscosity measurement.
6. Study of corrosion of metals in medium of different pH.
7. To determine pH of soil
8. To determine Acidity of soil
9. Determine the surface concentration of 1-butanol in aqueous solution.
10. Preparation of a conducting polymer.
11. Preparation of Urea-formaldehyde resins
12. To determine strength of strong acid using pH meter
Text Books
1. Bhal & Tuli, "Text book of Physical Chemistry (1995)", S. Chand & Company, New Delhi.
2. S. S. Dara , "A textbook of Engineering Chemistry", McGraw-Hill Publication, New Delhi.
Reference Books:
1. Jain P.C & Jain Monica , " Engineering Chemistry", Dhanpat Rai & Sons, Delhi, 1992.
2. O. G. Palanna , "Engineering Chemistry", Tata McGraw-Hill Publication, New Delhi..
3. F. A. Cotton and G. Wilkinson, "Advanced Inorganic Chemistry (6th edition)", John Wiley
4. P. Ghosh, " Polymer Science and technology (2nd Edition)" , Tata McGRAW Hill, 2008.
5. J.M.G.Cowie , "Polymers: Chemistry & Physics of Modern Materials (2nd edition)", Blackie Academic & Professional, 1994.
6. Shikha Agarwal , "Engineering Chemistry- Fundamentals and applications", Cambridge Publishers - 2015.
Project based learning:
1. To Prepare and for synthesis of the following polymers, a. Bakelite b. Polystyrene c. Epoxy Resin
2. Synthesis properties and applications of polymer.
3.To Prepare Glass Hybrid Fibres, Epoxy Composite material using Hand Layup Method
4 To Prepare Fibre Reinforced Composites.
5. To study - Bio diesel and Bio petrol & extraction process of Bio desial. 6. Effect of fertilizers in water
7. Preparation of Gold Nanoparticles Using Tea:
8. Determination of Mercury in Milk by Cold Vapor Atomic Fluorescence:
9. Nitration of Phenols Using $Cu(NO_3)_2$
10 Solvent less and One-Pot Synthesis of Cu(II) Phthalocyanine Complex:
11. Density Based Traffic Signal System using Microcontroller and IR Sensors
12 Solar Energy Measurement System using Microcontroller
13 To develop diagnostic biosensor.
14 Electrochemical 3D printing
15. Investigating cell mechanics with Fluid FM force spectroscopy.

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem I **ELECTRONIC COMPONENTS AND DEVICES**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination (UE): 60 Marks	Credits : 04
Practical:02	Internal Assessment(IA):40 Marks	
	TW : 50 Marks & Practical:50 Marks	Credits : 01
	Total Marks:200	Total Credits:05

Course Pre-requisites:	
The students should have knowledge of	
1	Class XII level Physics & Mathematics.

Course Objectives:	
1	To make the students gain the knowledge of basic electronic passive components.
2	To provide detailed description of PN junction behavior at the circuit level and its role in the operation of diodes as rectifiers, clippers and clampers
3	To provide a comprehensive study of bipolar junction transistor.
4	To learn and analyze transistor biasing circuits.
5	To observe characteristics and working of FET and MOSFET
6	To get familiarized with various optoelectronic devices.

Course Outcomes: After learning this course students will be able to	
1	Identify various Passive components.
2	Demonstrate knowledge of working of diode with applications such as rectifier, clipper and clamper.
3	Analyze the characteristics of BJTs in various configurations (CB, CE, and CC).
4	Design the biasing circuits like fixed bias and voltage divider bias.
5	Describe the operation of FET and MOSFET.
6	Demonstrate knowledge of working of optoelectronic devices.

UNIT – I	**Passive Components**	**(08 Hours)**
	Introduction to the concept of active and passive electronic components, Resistors: types of resistors, construction and applications, Capacitor: types of capacitors, construction and applications, Inductor: types of inductors, construction and applications.	
UNIT –II	**Diode and applications**	**(08 Hours)**
	Classification of material based on band gap theory, types of	

	semiconductors (p-type and n-type), PN junction Diode: basic structure and operating principle, current-voltage characteristic, Zener breakdown, Avalanche breakdown. Diode Applications: Rectifier circuits: Half-wave and full-wave rectifiers. Full wave Rectifier with capacitor filter. Diode as clipper: series and parallel forms of clipper circuits, biased clipper, Diode as a clamper.	
UNIT -III	**Bipolar Junction Transistor**	**(08 Hours)**
	Introduction to Bipolar Junction Transistors, it's construction and working mechanism, configuration of BJT in Common Base, Common Emitter and Common Collector configuration. Input–output characteristics in all three configurations with relevant V-I expressions and definitions of DC gains.	
UNIT -IV	**Transistor biasing and applications**	**(08 Hours)**
	Need of biasing, DC load line analysis, operating point, Thermal runaway. Requirements of a biasing circuit, Different biasing circuits: fixed bias, collector to base bias & voltage divider bias. Stability factor, General expression for stability factor, stability factor for biasing circuits, Transistor as an amplifier.	
UNIT -V	**FET & MOSFET**	**(08 Hours)**
	FET: Types of FET, JFET Structure, Construction and working mechanism of JFET, V-I characteristics and transfer characteristics, Parameters of JFET. MOSFET: Types of MOSFET, MOSFET Structure,Working of Depletion and Enhancement type MOSFETs, Drain and Transfer Characteristics of D-MOS and E-MOS.	
UNIT-VI	**Optoelectronic devices**	**(08 Hours)**
	Construction, V-I characteristics and applications of LED, LDR, Photodiode, Phototransistor, Photoconductive cell, Photovoltaic cell, optocoupler.	

Term Work:

The term work shall consist of record of minimum eight experiments.

1. To plot V-I characteristics of PN junction diode
2. To plot V-I characteristics of half wave rectifier
3. To plot V-I characteristics of Full wave rectifier using Capacitor filter.
4. To plot input-output characteristics of CE configuration of BJT.
5. To analyze biasing techniques of BJT: Fixed bias and voltage divider bias
6. To plot frequency response of single stage CE amplifier and find its bandwidth
7. To plot frequency response of single stage FET amplifier and find its bandwidth

8.To plot optical characteristics of LED and LDR
9.To plot optical characteristics of Photodiode and phototransistor
10.To plot transfer characteristics of Optocoupler
Text Books:
1.Robert Boylestad, Electronic Devices and Circuit Theory, Pearson Publication.
2. V.K.Mehta, Principles of Electronics, S Chand & Company Ltd. New Delhi.
3. Millman,Halkies, Electronic Devices and Circuits, TMH publication
Reference Books:
1. Thomas L. Floyd , "Electronic Devices", Pearson
2. Ben G. Streetman and Sanjay Banerjee, "Solid State Electronic Devices", Pearson Education India
3. Malvino, "Electronic Principle", McGraw Hill Education
4. Sedra& Smith, "Microelectronics Engineering", Oxford University Press
Project Based Learning:
Build the following circuits -
1. PN junction diode in forward and reverse biasing mode.
2. Conversion of AC to pulsating DC using half wave rectifier.
3. AC to DC converter using Full wave rectifier (Center tap Transformer)
4. AC to DC converter using Bridge Rectifier with capacitor filter
5. BJT in CE configuration.
6. Check stability of operating point using fixed bias method.
7. Check stability of operating point using Voltage divider bias method.
8. BJT Amplifier circuit.
9. FET Amplifier Circuit.
10. Optical characteristics of LED and LDR.
11. Optical characteristics of Photodiode and Phototransistor.
12. Characteristics of optocoupler.
13. Zener diode in forward and reverse biasing mode.
14. BJTs as a digital switch
15. Automatic Street Light controller

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem I ELECTRICAL TECHNOLOGY		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination(UE): 60 Marks	Credits : 04
Practical: 02	Internal Assessment(IA): 40 Marks	
Tutorial:--	TW: 25 Marks	Credit: 01
	Total Marks:125	Total credits:05

Course Pre-requisites:	
The Students should have knowledge of	
1	Basic physics.
2	Basic mathematics

Course Objectives:	
1	To study electrical circuit basics, network theorems, AC fundamentals, electrical machines, transformers, batteries, two port networks.

Course Outcomes: After learning this course students will be able to	
1	To find voltages and currents in a given network using various network reduction techniques and network theorems
2	To find parameters relating to a given series or a parallel resonant circuit.
3	Outline magnetic circuits and types of transformer.
4	Demonstrate AC and DC electrical machines.
5	Classify types of batteries.
6	To find any of the two port parameters of a given two port networks.

UNIT – I	**Introduction to Electrical Circuits and Network Theorems**	**(08 Hours)**
	Circuit concepts, Voltage and Current Sources, Independent and Dependent sources, Voltage-Current relationship for passive elements, Source Transformation and Source shifting techniques, Network Reduction techniques-Series, Parallel, Series-Parallel, Star-to-Delta, Delta-to-Star Transformations, Kirchhoff's Laws, Node and Mesh Analysis, Super node and Super mesh. Thevenin's Theorem, Norton's Theorem, Superposition Theorem, Maximum Power Transfer Theorem	
UNIT –II	**AC Fundamentals and circuits:**	**(08Hours)**

	AC Fundamentals: Sinusoidal, square and triangular waveforms – average and effective values, form and peak factors, concept of phasors, phasor representation of sinusoidally varying voltage and current. Analysis of series, parallel and series-parallel RLC Circuits: apparent, active & reactive powers, power factor, causes and problems of low power factor, power factor improvement; resonance in series and parallel circuits, bandwidth and quality factor (simple numerical problems)	
UNIT -III	**Magnetic circuits and Types of Transformer:**	
	Magnetic Circuit: Kirchhoff's laws for magnetic circuits. Magnetic circuit concepts, analogy between electric & magnetic circuits, magnetic circuits with DC and AC excitations, magnetic leakage, B-H curve, hysteresis and eddy current losses, magnetic circuit calculations, mutual coupling. Faradays law of electromagnetic induction, statically and dynamically induced emf, self inductance, mutual inductance, coefficient of coupling. Single Phase Transformer: Principle of operation, construction, e .m. f. equation, voltage ratio, current ratio, KVA rating ,determination of efficiency and regulation by direct load test, equivalent circuit, power losses,(simple numerical problems), introduction to auto transformer, Three phase transformer and its different winding connections..	**(08 Hours)**
UNIT -IV	**Electrical Machines: DC & AC:**	**(08 Hours)**
	Principles of electro mechanical energy conversion, DC machines: types, e. m. f. equation of generator and torque equation of motor, characteristics and applications of dc motors (simple numerical problems).Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications. Three Phase Induction Motor: types, Principle of operation, slip-torque characteristics, applications (numerical problems related to slip only).	
UNIT -V	**Batteries**	**(08 Hours)**
	Basic idea of primary and secondary cells, Construction, working principle and applications of Lead-Acid, Nickel Cadmium and Silver-Oxide batteries, Charging methods used for lead-acid battery (accumulator), Care and maintenance of lead-acid battery, Series and parallel connections of batteries, General idea of solar cells, solar panels and their applications, Introduction to maintenance free batteries, Safe disposal of Batteries; Fuel cell: Principle & Types of fuel cell.	
UNIT -VI	**Two Port Networks**	**(08 Hours)**

	Two port parameters: Z, Y, ABCD and H-parameters, Conditions for Reciprocity and Symmetry, Inter-relationship between two-port parameters, Interconnections between two port parameters.	

Term Work:

The term work shall consist of record of minimum eight experiments.

1. To verify Thevenin's, Norton's and Superposition Theorem.
2. To find Steady State response of RL,RC and RLC circuits
3. To find resonant frequencies of series and parallel circuit.
4. Load test on single phase transformer.
5. OS & SC test on single phase transformer to find efficiency and regulation
6. Load test on DC machine.
7. Speed control of DC motor
8. Study of different types of starters for DC & AC Machine
9. Testing and maintenance of batteries
10. To find Z and Y parameters of given two port networks.
11. To find H and ABCD parameters of given two port networks.

Text Books:

1. B. L. Theraja, 'A Textbook of Electrical Technology', Vol.1, S. Chand & Company Ltd. New Delhi.
2. V. K. Mehta, 'Basic Electrical Engineering', S Chand & Company Ltd. New Delhi.
3. I. J. Nagarath and Kothari, 'Theory and applications of Basic Electrical Engineering', Prentice Hall of India Pvt. Ltd.
4. D. Roy Choudhury, 'Network and Systems', New Age International Publishers, Second Edition.
5. Ravish Singh, "Network analysis and Synthesis, M. Graw Hill Education (India) Private Limited.

Reference Books:

1. Edward Huges, 'Electrical Technology' Pearson
2. D. P. Kothari, J Nagarath, 'Basic Electrical Engineering'. TMC
3. M. E. Van Valkenburg, 'Network Analysis', PHI, 3rd Edition

Project based learning:

1. Design a small circuit to study superposition theorem.
2. Design small circuit to study Thevenin's Theorem.
3. Design Small circuit to study Norton's Theorem.
4. Design small circuit to study R-C series circuit.
5. Design small circuit to study R-L series circuit.
6. Design small circuit to study R-L-C series circuit.
7. Design of small R-L parallel circuit for study.
8. Design of small R-C parallel circuit for study.
9. Design of small R-L-C parallel circuit for study.
10. Design small two winding transformer.
11. Design small electromagnet.
12. Design of small chemical battery.
13. Design of small two port network for study of ABCD parameters.
14. Design of small electric circuit to study Kirchhoff's voltage laws.
15. Design of small electric circuit to study Kirchhoff's current laws

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem I **COMPUTATION AND PROGRAMMING USING C**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination(UE): 60 Marks	Credits: 04
Practical: 02	Internal Assessment(IA): 40 Marks	
Tutorial:--	TW : 50 Marks & Oral: 25 Marks	Credit: 01
	Total Marks:175 Marks	Total Credits:05

Course Pre-requisites:	
1	Students must possess knowledge about basic fundamentals of computer and professional Microsoft office development tools.

Course Objectives:	
The students should have knowledge of	
1	This course will introduce the concepts of C language software development and compiling tool. By the end of the course, student will be familiar with various fundamentals of C- language.

Course Outcomes:	**After learning this course students will be able to**
1	Understand the basic concept of C programming**.**
2	Write basic programs using conditional statement.
3	Use Array in programming.
4	Use Functions in programming.
5	Write basic programs using Pointers.
6	Write basic programs using structures.

UNIT – I	**Introduction:**	**(08 Hours)**
	Basic of C**:** Structure of a C program, identifiers, basic data types and sizes. Constants, variables, arithmetic, relational and logical operators Managing input and output operations, Sample programs.	
UNIT – II	**Conditional Statements and Loops:**	**(08 Hours)**
	Decision making within a program, conditions, if statement, if-else statement, loops: while loop, do while, for loop. Nested loops, infinite loops, switch statement, sample programs.	

UNIT -III	**Arrays & Strings**	**(08 Hours)**
	Arrays - concepts, declaration, definition, accessing elements, storing elements, Strings and string manipulations, 1-D arrays, 2-D arrays and character arrays, string manipulations, Array applications: Matrix Operations.	
UNIT -IV	**Functions:**	**(08 Hours)**
	Basics, parameter passing, storage classes- extern, auto, register, static, scope rules, user defined functions, recursive functions, Recursive solutions for Fibonacci series, example c programs. Passing arrays & strings to functions.	
UNIT -V	**Pointers:**	**(08 Hours)**
	concepts, initialization of pointer variables, pointers and function arguments, passing by address, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays.	
UNIT -VI	**Structures and Linked list**	**(08 Hours)**
	Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typedef, bit-fields, program applications. Concept of linked lists, Types & Advantages linked list, creating a linked list, Inserting and deleting linked list, Applications of linked list	

<u>Term Work:</u>

The term work shall consist of record of minimum eight experiments.

1. Write a C program to take user Input and print it on the screen.
   a. Perform a C program to perform various mathematical and logical operations.
   b. Perform a C program to find whether the entered input number is Odd or Even.
2. Perform a C program to find out Prime numbers.
3. Write and perform C program to find out Fibonacci series.
4. Perform and write a C program to find out Armstrong number.
5. Perform a C programs to print different patterns.
6. Perform and write a C program to do factorial using recursion.
7. Perform a C program to sort the given array in Ascending & Descending order.
8. Perform C programs to perform various operations on 2-D arrays

9. Perform a C program to perform different operations on strings.
10. Use of Pointers a. Write a C program to swap numbers using pointers b. Write a C program to show the use of pointers in arrays. c. Write a C program to use functions using pointers.
11. Perform a C program to show the use of structure and linked list
12. Perform a C program to create student mark sheet using structures and linked list.
Text Books:
1. E Balagurusamy, “Programming in ANSI C”,5th Edition-TMH
Reference Books:
1. Yashwant Kanitkar , “Let Us C”,PBP
Project based learning:
1. Bank Management System
2. Diary management System
3. Calendar using C
4. Contact Management System
5. Library Management System
6. Snake Game
7. Bus Reservation system
8. Customer Billing system
9. Hospital Management system
10. Cyber management
11. Cricket score display
12. Employee management system
13. Pacman Game
14. Quiz game
15. Phone-book application
16. Election System
17. Flight ticket booking
18. Tourism Management system
19. Simple Result system
20. Stock Management system

Students in a group of 3 to 4 shall complete any one project from the above list.

B. Tech. (Electronics & Communication) Sem II

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
6		Integral Transforms & Vector Calculus	4	0	1	60	40	0	0	0	100	4	0	1	5
7		Wave Theory & Photonics	4	2	0	60	40	50	0	0	150	4	1	0	5
8		Electronic Communication	4	2	0	60	40	50	50	0	200	4	1	0	5
9		Computer Aided Graphics	4	2	0	60	40	25	0	0	125	4	1	0	5
10		Python Programming	4	2	0	60	40	50	25	0	175	4	1	0	5
	Total		**20**	**08**	**1**	**300**	**200**	**175**	**75**	**00**	**750**	**20**	**4**	**1**	**25**

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B. Tech. (Electronics & Communication Engineering) Sem II INTEGRAL TRANSFORMS AND VECTOR CALCULUS		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination(UE): 60 Marks	Credits : 04
Practical:--	Internal Assessment(IA): 40 Marks	
Tutorial: 01		Credit : 01
	Total Marks: 100 Marks	Total Credits: 05

Course Pre-requisites:	
The students should have knowledge of	
1	Integrals.
2	Fourier series.
3	Vector algebra.
Course Objectives:	
1	Methods to solve differential equations
2	Various techniques of integral transform.
3	line, surface and volume integrals.
Course Outcomes: After learning this course students will be able to	
1	Implement the methods for first order first degree differential equation.
2	Understand the modeling of physical systems and find the solutions.
3	Solve the nth order linear differential equation.
4	Compute the integral transform for various functions.
5	Apply the Laplace transform for solving differential equations
6	Understand vector calculus and apply it to evaluate line, surface and volume integrals.

UNIT – I	**Differential Equation**	**(08 Hours)**
	Formation of the ordinary differential equations(ODEs), Solution of an ordinary differential equation, Equations of the first order and first degree, Linear differential equation, Bernoulli's equation, Exact differential equations, Equations reducible to exact equations,	
UNIT – II	**Applications of Differential Equation**	**(08 Hours)**
	Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under	

	Gravity, Rectilinear Motion, Simple Harmonic Motion, One–Dimensional Conduction of Heat.	
UNIT - III	**Linear Differential Equations**	**(08 Hours)**
	Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's &Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE, Modeling of Electrical Circuits.	
UNIT - IV	**Z-transform**	**(08 Hours)**
	Fourier Transform (FT): Complex Exponential Form of Fourier series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory **Z-Transform (ZT)**: Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.	
UNIT -V	**Laplace Transform**	**(08**
	Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz., Periodic, Unit Step, Unit Impulse, ramp, jump, . Problems on finding LT & inverse LT. Applications of LT and Inverse LT for solving ordinary differential equations.	
UNIT - VI	**Vector Calculus**	**(08 Hours)**
	Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities. Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem, Applications to Problems in Electro-Magnetic Fields.	

Text Books:

2. P. N. Wartikar and J. N. Wartikar, "Applied Mathematics (Volumes I and II)", 7th Ed., Pune Vidyarthi Griha Prakashan, Pune, 2013.

References Books:

1. B. S. Grewal, "Higher Engineering Mathematics", 42th Ed., Khanna Publication, Delhi
2. B.V. Ramana, "Higher Engineering Mathematics", 6th Ed., Tata McGraw-Hill, New Delhi, 2008.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Ed., John Wiley & Sons, Inc., 2015.

4. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Ed., Cengage Learning, 2012.
5. Michael Greenberg, "Advanced Engineering Mathematics", 2nd Ed., Pearson Education, 1998.
Project based learning:
1. Formation of differential equations
2. Evaluate the electric circuit problem using differential equations
3. Evaluate the heat conduction in 1-D using differential equations
4. Evaluate the rectilinear motion problem using differential equations
5. Evaluate the simple harmonic problem using differential equations
6. Obtain the solution of Simultaneous & Symmetric Simultaneous DE
7. Obtain the solution of Simple Difference Equations using Z-transforms
8. Find the Directional Derivatives
9. Find work done using Green's theorem
10. Find scalar potential using vectors
11. Evaluating integrals using Green's theorem, Gauss's and stoke's theorem
12. Use Laplace transform to solve differential equations
13. Use Laplace transform to solve integrals equations
14. Use Fourier transform to solve integrals
15. Applications of vector integration to solve problems in Electro-Magnetic Fields.
16. Find the conditions for Solenoidal and irrotational vector fields

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem II WAVE THEORY AND PHOTONICS		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination(UE): 60 Marks	Credits : 04
Practical:02	Internal Assessment(IA): 40 Marks	
Tutorial: --	TW:50 Marks	Credit: 01
	Total:150 Marks	Total Credits:05

Course Pre-requisites:

The students should have knowledge of

1	Students are expected to have a basic understanding of physics and calculus.

Course Objectives:

1	To impart knowledge of basic concepts in physics relevant to engineering applications in a broader sense with a view to lay foundation for the Electronics and Communication Engineering.

Course Outcomes: After learning this course students will be able to

1	Connect the problems associated with architectural acoustics and give their remedies. and use ultrasonic as a tool in industry for non-destructive testing.
2	Summarize and solve the engineering problems on Electromagnetism
3	Develop competency and understanding of the principles and applications of lasers and fiber optics.
4	Solve quantum physics problems to electronic phenomena and solid-state physics
5	Apply the properties of photon in communication engineering
6	Interpret the need, importance and scope of non-conventional and alternate energy resources.

UNIT – I	**Acoustics and Ultrasonics**	**(08 Hours)**
	Acoustics: Intensity, Loudness, Absorption coefficient and its determination, Reverberation and Reverberation time, Factors affecting acoustics of buildings and their remedies, Sources and impacts of noise, Sound level meter, Strategies on controlling noise pollution. Ultrasonic waves and properties, Methods of Ultrasonic production (Magnetostriction and Piezoelectric), Applications of Ultrasonics in Engineering and medicine.	

UNIT – II	**Electromagnetic Wave**	**(08 Hours)**
	Displacement current, Maxwell's equations (derivation), Wave equation for electromagnetic waves, Propagation in free space, Poynting theorem, Characteristic of Transverse electric and magnetic waves, Skin depth, Rectangular and circular waveguides.	
UNIT - III	**Lasers and Fibre Optics**	**(08 Hours)**
	Lasers introduction, Characteristics of Lasers, Einstein's coefficients and their relations, Lasing action, Working principle and components of CO_2 Laser, Nd -YAG Laser, Semiconductor diode Laser, Excimer Laser and Free electron Laser, Applications in remote sensing. Principle of Optical fiber, Acceptance angle and acceptance cone, Numerical aperture, V-number, Types of optical fibers (Material, Refractive index and mode), Photonic crystal fibers, Fiber optic communication, Fiber optic sensors.	
UNIT - IV	**Quantum Mechanics and Crystal Physics**	**(08 Hours)**
	Quantum mechanics: Inadequacies of Classical Mechanics, De Broglie hypothesis for matter waves, Heisenberg's uncertainty principle, Schrödinger's wave equation, Particle confinement in 1D box (Infinite Square well potential). Crystal Physics: Crystal directions, Planes and Miller indices, Symmetry elements, Quasi crystals, Diamond and HCP crystal structure, Packing factor, Reciprocal lattice, Diffraction of X-rays by crystal planes, Laue method and powder method	
UNIT -V	**Photonics**	**(08Hours)**
	Quantum properties of radiation and matter, Photon properties, Duality nature of electromagnetic radiation, Group/phase velocity and dispersion, matter and its interaction, light modulation, Coherence-different types, Two-beam interference and interferometry, multi-wave interference, Fabry-Perot interferometer, Fraunhofer diffraction, Fresnel diffraction, semiconductor junction characteristics, semiconductor light sources, semiconductor light detectors.	
UNIT - VI	**Green Energy Physics**	**(08 Hours)**
	Introduction to Green energy, Solar energy: Energy conversion by photovoltaic principle, Solar cells, Wind energy: Basic components and principle of wind energy conversion systems, Ocean energy: Wave energy, Wave energy conversion devices, Tidal energy, single and double basin tidal power plants, Ocean Thermal Electric	

	Conversion (OTEC), Geothermal energy: Geothermal sources (hydrothermal, geo-pressurized hot dry rocks, magma), Biomass: Biomass and biofuels, bio-energies from wastages, Fuel cells: H_2O_2, Futuristic Energy: Hydrogen, Methane Hydrates, Carbon capture and storage (CCS).	

Term Work:
The term work shall consist of record of minimum eight experiments.
1. To determine the velocity of sound
2. Measurement of average SPL across spherical wavefront and behavior with the distance
3. Expansion chamber muffler: investigation of muffler response as a filter in the low frequency approximation by determining insertion loss
4. Interference of sound using PC speakers
5. Determination of velocity of sound in liquid by ultrasonic interferometer
6. Ultrasonic probe - a study
7. Determination of divergence of a laser beam
8. Particle size by semiconductor laser
9. Determination of wavelength of laser by diffraction grating
10. Determination of Planck's Constant by photoelectric effect
11. To study Hall effect and determine the Hall voltage
12. Calculation of conductivity by four probe method
Text Books:
1. M N Avadhanulu, P G Kshirsagar and TVS Arun Murthy, "A Textbook of Engineering Physics" , S. Chand Publishing (2018)
2. R K Gaur and S L Gupta, " Engineering Physics" , Dhanpat Rai Publishing Co Pvt Ltd (2015)
3. Arthur Beiser**,** Shobhit Mahajan and S. Rai Choudhury**, "**Concepts of Modern Physics" , McGraw Hill Education (2017)
Reference Books:
1. Jearl Walker, David Halliday and Robert Resnick, "Fundamentals of Physics", John Wiley and Sons (2013)
2. Francis Jenkins and Harvey White, "Optics" , Tata Mcgraw Hill (2017)
3. John W. Jewett, "Principles of Physics" , Cengage publishing (2013)
4. C. Kittel , "Introduction to Solid State Physics", Wiley and Sons (2004)
5. H. V. Keer , "Principles of Solid State Physics", New Age International (1993)
6. B. B. Laud, "Laser and Non-Linear Optics" , New Age International Private Limited (2011)
7. Dr. S. K. Kulkarni , "Nanotechnology: Principles and Practice" , Capital Publishing Company (2014)
8. C.M. Srivastava and C. Srinivasan, "Science of Engineering Materials", New Age International Pvt. Ltd. (1997)
9. David R. Griffiths, "Introduction to Electrodynamics", Pearson (2013)
10. Boyle, "Renewable Energy: Power for a Sustainable Future", Oxford University Press (2012)
Project based learning:
1. Measurement and effect of environmental noise in the college
2. Construction and application of heat sensor in process control
3. Design and simulation of automatic solar powered time regulated water pumping
4. Solar technology: an alternative source of energy for national development

5.	The study on the effect of length on the resistance of a copper wire (verification of ohms law r directly proportional to l)
6.	Possible effects of electromagnetic fields (emf) on human health
7.	The design and construction of the hearing aid device
8.	Design and construction of digital distance measuring instrument
9.	Design and construction of automatic bell ringer
10.	Design and construction of sound or clap activated alarm
11.	Electronic eye (Laser Security) as auto switch/security system
12.	Determination of velocity of O-ray and E-ray in different double refracting materials
13.	Quantum confinement effect in wide band semiconductors
14.	Small wind turbines as a source of electricity
15.	LiFi- wireless data transfer system using light

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem II
ELECTRONIC COMMUNICATION

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04	End Semester Examination (UE): 60 Marks	Credits : 04
Practical:02	Internal Assessment (IA): 40 Marks	
	TW: 50 Marks & Oral: 50 Marks	Credits : 01
	Total Marks:200 Marks	Total Credits:05

Course Pre-requisites:

The students should have knowledge of

1	Solid State Devices
2	Basic Physics
3	Basic Mathematics

Course Objectives:

1	To introduce the concepts of analogue communication systems.
2	To equip students with various techniques related to analogue communication such as modulation, demodulation.
3	To study noise, transmission media etc.

Course Outcomes: After learning this course students will be able to

1	Outline the basic concept of communication system, need of modulation, some Terminologies in communication systems.
2	Classify the transmission media used in communication system.
3	Outline the different modern communication systems.
4	Classify the different sources of noise.
5	Classify& compare the amplitude modulation & demodulation techniques.
6	Classify & compare the Angle modulation & demodulation techniques.

UNIT – I	Fundamentals of Communication Engineering	(08 Hours)
	Signals: Basics of signal representation & its analysis, Bandwidth of Signals, Signal Shapes in Communication, Electromagnetic spectrum & typical applications, System: Baseband Systems, Pass band Systems, Communication System: Block diagram of communication systems, Analog Versus Digital Communication System, Modulation and Demodulation in Communication System, Need of Modulation, Classification of modulation techniques, Terminologies in Communication Systems.	

UNIT – II	**Transmission Media and Propagation Mechanisms**	**(08 Hours)**
	Wired Media: Twisted Pair, Optical fiber: Structure of a Fiber Optic Cable, Propagation Modes of Fiber Optic Cable, Calculation of Number of Modes in a Fiber, Optical Fiber Index Profile, Optical Fiber's Numerical Aperture (NA), Wireless Media, Wireless Propagation: Ground Wave Propagation, Sky Wave Propagation, Propagation Mechanism.	
UNIT - III	**Modern Communication System** Introduction to modern communication system: Operation of communication system, need of modern communications. Communication Technologies: The Internet, Basics of Networks, Optical communication: Introduction to optical communication, Development in optical communication, Wireless communications: Introduction to wireless communication, Wireless communication technologies, Mobile cellular communications, Satellite Communications: Basic principle of operation of satellite communication, Satellite orbits, Introduction to Underwater Communication, Radar.	**(08 Hours)**
UNIT -IV	**Noise**	**(08 Hours)**
	Introduction, Sources of noise: External Noise, Internal Noise, Noise calculations(thermal noise),Noise figure: Signal to Noise ratio, definition of noise figure, Classification of noise figure, noise Figure from equivalent noise resistance, Noise Temperature.	
UNIT -V	**Amplitude Modulation & Demodulation**	**(08 Hours)**
	Amplitude Modulation: Introduction, Mathematical expression for AM, Modulation index, Frequency spectrum and bandwidth of AM, Time domain representation of AM Power relation in AM, Generation of AM signal: Double sideband full carrier (DSBFC), Double sideband suppressed carrier (DSBSC), SSB, Generation of SSB: Filter method, phase shift method, Third method, Block diagram & working principle of AM Transmitters, AM Receivers: Performance's characteristic of receivers, Tuned radio frequency (TRF) receiver, Super heterodyne receiver, Demodulation of AM Signal.	
UNIT -VI	**Angle Modulation& Demodulation**	**(08 Hours)**
	Introduction, Types of angle modulation techniques, Mathematical expression of FM, Modulation index for FM, Frequency spectrum and bandwidth of FM, Narrow band and wide band FM, Pre emphasis and de-emphasis, Generation of frequency modulation techniques: Direct method and indirect method, Pulse analog modulation techniques: Pulse Amplitude Modulation (PAM), Pulse	

	Width Modulation, Pulse Position Modulation, Demodulation of Pulse analog modulated signal, Comparison of AM, FM and PM, Block diagram & working principle of FM Transmitters, Block Diagram & working principle of FM receiver.	

Term Work:

The term work shall consist of record of minimum eight experiments.

12. Generate AM signals, study their time- and frequency-domain characteristics, and measure their modulation indices (Under modulation, Perfect modulation & Over modulation)
13. Demonstrate the modulation &demodulation process of DSB-SC.
14. Demonstrate the modulation &demodulation process of SSB-SC.
15. Generate &analyze frequency modulated signal &demodulate using FM demodulator.
16. Analysis of standard signals (square and triangular)and Modulated signals(all types of AM, FM) using spectrum analyzer.
17. Demonstrate the Pulse Amplitude Modulation & demodulation & their waveforms.
18. Demonstrate the Pulse Width Modulation & demodulation & their waveforms.
19. Demonstrate the Pulse Position Modulation & demodulation & their waveforms.
20. Examine the operation of PAM-TDM.
21. Study of Super heterodyne (AM) Receiver.

Textbooks:

1. S.Haykin , "Communication System" (IV Edition), John Wiley & Sons.
2. A.B. Carlson, " Communication Systems", McGraw-Hill.
3. B.Lathi , "Modern Analog And Digital Communication Systems", Oxford Univ.Press.
4. Taub & Schilling , "Communication Systems", TMH.
5. Kennedy, Davis , "Electronic Communication Systems", (4/e), McGraw Hill, Reprint 2008.
6. Djafar K. Mynbaev, Lowell L. Scheiner, "Essentials of modern communications" , Wiley.

Reference Books:

1. Matin, Mohammad Abdul , "Communication Systems for Electrical Engineers" , springer.

Project Based Learning:

1. Testing the connectivity of circuit using DMM.
2. Testing of devices using DMM.
3. Construct a circuit for sound amplifier.
4. Design of regulated power supply.
5. Construct a circuit for Analog signal multiplier using Op-amp.
6. Construct a circuit for Analog signal divider using Op-amp.
7. Construct a circuit for Walkie-talkie.
8. Construct a circuit for Wireless power transfer.
9. Construct a circuit for Crystal oscillator tester.
10. Construct a circuit for Mobile incoming call indicator.
11. Construct a circuit for FM transmitter.
12. Construct a circuit for AM Modulator.
13. Construct a circuit for PAM Modulator.
14. Construct a circuit for single transistor FM transmitter.

15. Construct a circuit for solar energy operated mobile charger.

Students in a group of 3 to 4 shall complete any one project from the above list.

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College of Engineering, Pune

B. Tech. (Electronics & Communication Engineering) Sem II **COMPUTER AIDED GRAPHICS**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination(UE): 60 Marks	Credits : 04
Practical:02	Internal Assessment(IA): 40 Marks	
Tutorial: --	TW: 25 Marks	Credit: 01
	Total Marks:125 Marks	Total Credits:05

Course Pre-requisites:	
The students should have knowledge of	
1	Mathematics

Course Objectives:	
1	To understand the basic principles of engineering drawing and highlight the importance of Computer Aided Graphics in engineering.
2	To develop the graphical skills for communication of concepts & idea through technical drawings.

Course Outcomes: After learning this course students will be able to	
1	Understand the fundamental concepts of Drawing, different types of lines, curves and dimension technique with practical application.
2	Understand the concept of Orthographic projections and apply it to draw detail views by using 1^{st} angle projection method.
3	Understand the concept of isometric projection and apply it to construct 3D view of a component.
4	Understand the concept of projections of Point, Line and plane; and apply to draw its projection by using 1^{st} angle projection method and to locate its traces
5	Understand the concept of projections of different types of solids and apply to draw its projection by using 1^{st} angle projection method.
6	Understand the concept of Development of Lateral surfaces; and apply to development of simple Solids.

UNIT – I	**Lines and Dimensioning in Engineering Drawing and Engineering Curves**	**(08 Hours)**
	Introduction to Engineering Drawing, Types of lines and Dimensioning, Layout and size of drawing sheets, Scales Engineering Curves-Ellipse drawing by Focus-Directrix Circle Method and Concentric Circle Method, Involutes of a circle, Cycloid, Archimedean Spiral, Helix on cone and Cylinder. Introduction to Auto CAD commands.	

UNIT – II	**Orthographic Projection**	**(08 Hours)**
	Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections. (Also using AutoCAD commands)	
UNIT - III	**Isometric Projections**	**(08 Hours)**
	Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view. (Also using AutoCAD commands)	
UNIT - IV	**Projections of Points, Lines and Planes**	**(08 Hours)**
	Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only), Traces of lines. **Projections of Planes-** projection of perpendicular and oblique planes (polygonal and circular surfaces), Obtaining true shape of plane surface. (Also using AutoCAD commands)	
UNIT -V	**Projection of Solids**	**(08 Hours)**
	Introduction of solids- Types of solids, Projection of solid inclined both references plane, Projection of common solids such as prism, pyramid, cylinder and cone. (Also using AutoCAD commands)	
UNIT - VI	**Development of Lateral Surfaces of Solids**	**(08 Hours)**
	Introduction to development of lateral surfaces and its Industrial application, draw the development of lateral surfaces of cone, pyramid and prism. (Also using AutoCAD commands)	

<u>Term Work:</u>

The term work shall consist of record of minimum eight experiments.

1. Types of lines, Dimensioning practice, free-hand lettering, 1st and 3rd angle methods symbol
2. Engineering curves.

3. Orthographic Projections.
4. Isometric views.
5. Projections of Points, Lines and planes.
6. Projection of Solids.
7. Development of lateral surfaces
Text Books:
1. N. D. Bhatt , “Elementary Engineering Drawing”, Charotar Publishing house, Anand India,
2. Munir Hamad ,“AutoCAD 2020 Beginning and Intermediate” , Mercury Learning & Information Publication, 2019.
3. Venugopal K ,“Engineering Drawing and Graphics”,., New Age International publishers.
Reference Books:
1. K.L.Narayana & P. Kannaiah ,“Text Book on Engineering Drawing” , Scitech Publications, Chennai.
2. WarrenJ. Luzzader, “Fundamentals of Engineering Drawing”, Prentice Hall of India, New Delhi,
3. M. B. Shah and B.C. Rana,"Engineering Drawing", 1st Ed, Pearson Education, 2005
4. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1stEdition,1988
5. P.S.Gill ,"Engineering Drawing(GeometricalDrawing)",10thEdition,S.K.KatariaandSons,2005
Project Based Learning
Following is the list topic for project based learning (Not Limited to) based on the syllabus contents:
To obtain industrial drawings to identify the types of lines, dimensioning methods and method of projection.
2. To develop the model/charts based on engineering curves.
3. To prepare model/chart for identification of engineering curves in nature for industrial, societal, etc application.
4. To demonstrate different methods of orthographic projection.
5. To demonstrate projection of Points.
6. To demonstrate projection of Lines.
7. To demonstrate projection of Planes.
8. To demonstrate projection of Solids.
9. To demonstrate developments of surfaces for solids.
10. To demonstrate industrial application of development of surfaces such as steam carrying pipes, Ducts of air conditioning systems, etc.
11. To demonstrate Isometric projection method through model of a cube.

Students in a group of 3 to 4 shall complete any one project from the above list

Bharati Vidyapeeth
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B. Tech. (Electronics & Communication Engineering) Sem II PYTHON PROGRAMMING		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination: 60 Marks	Credits : 04
Practical:02	Internal Assessment: 40 Marks	
Tutorial: --	TW: 50 Marks & Oral: 25 Marks	Credits: 01
	Total Marks:175 Marks	Total Credits:05

Course Pre-requisites:	
The students should have knowledge of	
1	Students should have basic knowledge of programming.

Course Objectives:	
1	This course will introduce the concepts of Python language software development tool. By the end of the course, student will be familiar with various fundamentals of Python language.

Course Outcomes: After learning this course students will be able to	
1	Understand the basic concept of Python programming.
2	Write basic programs using control statement.
3	Use exception handling.
4	Learn object oriented programming.
5	Write basic programs using arrays.
6	Use Python for simple applications.

UNIT – I	**Python Basics:**	**(08 Hours)**
	Python Introduction, Python Installation, Relational operators, Bitwise operators, Logical operators Python Data Types - Numbers (Integer, Floating Point, Complex Numbers), Strings,Lists, Tuples, Dictionaries, List comprehensions, Python Control Statements	
UNIT – II	**Python Core:**	**(08 Hours)**
	Python Modules & Functions, Lambda, Scope, Python File Handling, Python Regular Expressions, Sequence Types, Input and output, Recursion, Flow Control, Immutable and Mutable Objects	
UNIT -	**Python Exception Handling:**	**(08**

III		Hours)
	Meaning of Exception, Exception Hierarchy Diagram, Types of Exception- Checked Exception, Unchecked Exception, Exception Handling -TRY, CATCH, FINALLY, Raising an Exception, User Defined Exceptions	
UNIT - IV	**OOPS, UML & OOAD:**	**(08 Hours)**
	Object Oriented Programming (OOPs) - Class & Object, Abstraction, Inheritance, Polymorphism, Encapsulation, Object Oriented (OO) Modelling, Object Oriented Analysis & Design (OOAD)	
UNIT -V	**PYTHON MULTI-THREADING:**	**(08 Hours)**
	Threads in Python (a) Kernel Threads(b) User Space Threads or User Threads, Advantages ofThreading, Thread States: Life Cycle of a Thread, Thread & Threading Modules, Forking & Synchronizing Threads, Networking	
UNIT - VI	**Python Packages and Graphics:**	**(08 Hours)**
	Numpy: Introduction, datatypes, arrays, arrays manuplation, ploting , testing anddebugging, Sharing Data using Sockets , pycharm in python ,Simple applications of python	

Term Work:

The term work shall consist of record of minimum eight experiments.

1. Evaluate any given expression involving arithmetic operators
2. Evaluate any given expression involving logical operators
3. Develop python functions to produce given patterns such as diamond, pyramid, triangles.
4. Usage of different functions present in “math” module
5. Write a function that takes two numbers as input parameters and returns their least common multiple.
6. Write a function that takes two numbers as input parameters and returns their greatestcommon divisor.
7. Write a function that returns the sum of the digits of a number, passed to it as an argument.
8. Write a program that takes a sentence as an input and displays the numbers of words inthe sentence.
9. Program to interchange first and last elements in a list
10. program to print even numbers in a list
11. Ways to sort list of dictionaries by values in Python – Using lambda function
12. Example using “matplotlib” module
13. Example using “NUMPY” module
14. Evaluate any given expression involving arithmetic operators

Text Books:

2. Sheetal Taneja,Naveen Kumar, “Python Programming,A modular approach”, Pearson publication
Reference Books:
1. Learning Python 5th Edition, Oreilly Publication.
2. Magnus Lie Hetland, “Beginning Python: From Novice to Professional”, Third Edition,Appress Publication
3. Allen Downey , Jeffrey Elkner , Chris Meyers, “Learning with Python”, DreamtechPublication.
4. Paul Berry , “Head-First Python: A Brain-Friendly Guide” (2nd Edition), O'Reilly Media
5. Magnus LieHetland , “Python Algorithms: Mastering Basic Algorithms in the Python Language”, Apress Pub.
Project Based Learning
1. Design and development of Mad Libs generator.
2. Design and development of electronic mail system (Read, write, send and delete operations).
3. Design and development of store billing system.
4. Design and development of typing speed check web application.
5. Design and development of windows application for music player.
6. Design and development of windows Quiz Application.
7. Design and development of web application for daily expense tracker.
8. Design and development of student portfolio management & CV generator system.
9. Design and development of windows based to do list or sticky notes.
10. Design and development of assignment plagiarism checker.

Students in a group of 3 to 4 shall complete any one project from the above list

B. Tech. (Electronics & Communication)) Sem III

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
11		Probability & Statistics	4	0	1	60	40	0	0	0	100	4	0	1	5
12		Switching Theory & LogicDesign	4	2	0	60	40	25	0	25	150	4	1	0	5
13		Analog Circuits & Applications	3	2	0	60	40	25	0	25	150	3	1	0	4
14		Signals & Systems	4	2	0	60	40	25	25	0	150	4	1	0	5
15		Process & Control System*	3	0	0	60	40	0	0	0	100	3	0	0	3
16		Vocational Course-I PCB Design & Assembly	0	2	0	0	0	25	25	0	50	0	1	0	1
17		Data Structures	0	2	0	0	0	25	0	0	25	0	1	0	1
18		Database Management System	0	2	0	0	0	25	0	0	25	0	1	0	1
	Total		**18**	**12**	**1**	**300**	**200**	**150**	**50**	**50**	**750**	**18**	**06**	**1**	**25**
	Social Activity- I **		-	-	-	-	-	-	-		-	-	-	-	2

*Industry Taught Course – I
** Add on course

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B. Tech. (Electronics & Communication Engineering) Sem III **PROBABILITY AND STATISTICS**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination(UE): 60 Marks	Credits : 04
Practical: --	Internal Assessment(IA): 40 Marks	
Tutorial: 01		Credit : 01
	Total: 100 Marks	Total Credits: 05

Course Pre-requisites:	
The students should have knowledge of	
1	Measures of central tendency, dispersion, skewness and kurtosis.

Course Objectives:	
1	To study probability distributions and testing of hypothesis.

Course Outcomes:	**After learning this course students will be able to**
1	Understand discrete and continuous probability distributions.
2	Identify standard probability distributions.
3	Apply bivariate distributions.
4	Apply sampling distributions.
5	Understand concept of point estimation and interval estimation.
6	Apply ANOVA for one way and two way distribution.

UNIT – I	**Probability and random variables**	**(08 Hours)**
	Concept of probability, Random Variables, Probability Distributions and Expectation: Concept of a random variable, discrete probability distributions, continuous probability distributions, joint probability distributions, mean, variance, covariance.	
UNIT -II	**Standard distributions**	**(08 Hours)**
	Gaussian, exponential, Rayleigh, uniform, Bernoulli, binominal, Poisson, Normal, hyper geometric, discrete uniform and conditional distributions, . Functions of a random variable.	
UNIT -III	**Joint Distributions**	**(08 Hours)**

	Joint, marginal and conditional distributions, product moments, independent of random variables, bivariate normal distribution.	
UNIT -IV	**Sampling Distributions**	**(08 Hours)**
	The central limit theorem, distributions of the sample mean and the sample variance for a normal population, Chi-square, t and F distributions.	
UNIT -V	**Estimation**	**(08Hours)**
	The methods of moments and the of maximum likelihood estimation, confidence intervals for the mean(s) and variance(s) of Normal populations.	
UNIT-VI	**Testing of Hypothesis**	**(08 Hours)**
	Null and Alternative hypotheses, the critical and acceptance regions, types of errors, power of the test, the most powerful test and Neyman-Pearson Fundamental Lemma, tests for one sample problems for normal populations, ANOVA I & ANOVA II.	

Text Books

1. Rohatgi, V K. and Saleh , A. K. Md. Ehsanes, "An Introduction to Probability and Statistics", (John Wiley and Sons) , (2nd edition)
2. J.S. Milton & J.C. Arnold, “Introduction to Probability and Statistics” Tata McGrawHill Publication

References Books

1. H.J. Larson , “Introduction to Probability Theory and Statistical Inference” Wiley Publication.
2. S.M. Ross , “Introduction to Probability and Statistics for Engineers and Scientists” Academic Press.

Project Based Learning:

Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code/proof for it, wherever applicable.

1) Find the stability of the data using coefficient of variation
2) Use concept of correlation to find coefficient of correlation between different observations
3) Use Rank correlation to find correlation for qualitative data
4) Derive Spearman’s Rank correlation
5) Find the chance of happening particular event using Baye’s theorem
6) Use probability theory to estimate the life of electric equipments
7) Find the height, weight of the population using the example of normal distribution
8) Check the goodness of fit using chi-square distribution
9) Perform ANOVA for single way classification data
10) Perform ANOVA for two way classification data
11) simple regression model

12)	Multiple regression model
13)	Coefficient of variation
14)	Joint and marginal probability distribution
15)	Standard probability distributions

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem III
SWITCHING THEORY AND LOGIC DESIGN

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04	End Semester Examination(UE): 60 Marks	Credits : 04
Practical: 02	Internal Assessment (IA): 40 Marks	
Tutorial: --	TW:25 Marks & Practical:25 Marks	Credit : 01
	Total: 150 Marks	Total Credits:05

Course Pre-requisites:

The Students should have knowledge of

1	Fundamentals of Number Systems
2	Knowledge of Boolean algebra laws.

Course Objectives:

1	To familiarize with various number representations and conversion between different representation in digital electronic circuits.
2	To introduce the students to various logic gates, SOP, POS and their minimization techniques
3	To analyze logic processes and implementation of logical operations using combinational logic circuits.
4	To describe, analyze and design sequential circuits.

Course Outcomes: After learning this course students will be able to

1	Represent numerical values in various number systems and perform number conversions between different number systems.
2	Apply knowledge of Boolean algebra and other minimization techniques for digital circuit design.
3	To differentiate between logic families TTL and CMOS.
4	Identify, formulate and solve a problem based on combinational circuits.
5	Analyze and design a simple sequential logic circuit.
6	Implement Digital circuits using VHDL systems

UNIT – I	**Number system & Codes:**	**(08 Hours)**
	Binary number base conversion decimal, octal, hexadecimal numbers,1’s 2’s Complement, signed binary numbers binary codes-BCD codes, Gray codes,Excess-3 code, ASCII code & codes for serial data transmission & storage	

	Logic Gates: Positive and Negative Logic, Various Logics Gates with IEEE/ANSI symbols, Boolean equations, truth table and IC Details. Universal Gates & Derived gates	
UNIT – II	**Boolean Algebra and Simplification Techniques:**	**(08 Hours)**
	De-Morgan's theorem – switching functions Introduction, Postulates and Theorems, Various types of Boolean expressions, Simplification Techniques-K-map up to 4 variables, Product of Sum simplification & Sum of product simplification, Don't care conditions, Quine Mc-Cluskey method	
UNIT - III	**Combinational Logic Circuits:**	**(08 Hours)**
	Combinational Circuits and its implementations, Arithmetic Circuits – Adders and Subtractors, BCD Adder, Look-Ahead Carry Generator, ALU, Multiplier, Magnitude comparator. Multiplexer, Encoders, Demultiplexers and Decoders, Parity Generation and Checking.	
UNIT - IV	**Sequential Logic Circuits:**	**(08 Hours)**
	R-S and D Flip-flop, Level Triggered and Edge-Triggered Flip-flops, J-K and T Flip-flop, Synchronous and Asynchronous Input, Flip-flop Timing Parameters, Application of Flip-flop. Ripple Counter, Synchronous Counter, Modulus Counter, Binary Ripple Counter, Synchronous Counters, UP/Down Counters, Decade and BCD Counters, Presettable Counters, Decoding Counter, Cascading Counter, Designing Counter with Arbitrary Sequences, Shift Register, Shift Register, Counters	
UNIT -V	**Programmable Logic Devices, Memory & Logic Families:**	**(08**
	Memories: ROM,PROM,EPROM Programmable Logic Devices(PLD):Programmable Logic Array(PLA),Programmable Array Logic(PAL) CPLD-FPGA Logic Families: Significance of families, Characteristic parameters, Types of Logic Families: TTL,ECL Comparison between various logic families Interfacing. between CMOS and TTL logic families	
UNIT - VI	**Introduction to VHDL:**	**(08 Hours)**
	Introduction to VLSI design flow (with reference to an EDA tool),sequential, data flow and structural modeling, functions, procedures, , data objects types, attributes, packages and configurations	
Term Work:		

The term work shall consist of record of minimum eight experiments.
1. Implementation of Boolean functions using logic gates.
2. Study of characteristics of typical 74 TTL / 74 CMOS family like: fan in, fan out standard load , noise margin & interfacing with other families
3. Half, Full Adder and subtractor using gates and IC's
4. Code conversion using digital IC's
5. Function implementation using Multiplexer and Demultiplexer
6. BCD Adder/Subtractor using IC7483.
7. Study of counters : Ripple , Synchronous , Ring , Johnson , Up-down counter and its application
8. Study of shift registers : Shift left , Shift right , parallel loading
9. To model 8:1 mux, 1:8 demux using VHDL.
10.Sequence generator using MS-JK flip flop IC's
Text Books:
1. R.P. Jain , "Modern digital electronics" , 3rdedition , 12th reprint TMH Publication, 2007
2. Anand Kumar 'Fundamentals of Digital Circuits'--. PHI
3. J. Bhaskar, "VHDL Primer", PHI, Third Edition (2009).
Reference Books:
1. J.F.Wakerly "Digital Design: Principles and Practices", 3rd edition, 4th reprint, Pearson Education, 2004.
2. A.P. Malvino, D.P. Leach 'Digital Principles & Applications'' –Vith Edition-Tata Mc Graw Hill, Publication
3. Morris Mano 'Digital Design'-- (Third Edition),.PHI
4. Thomas L Floyd & R.P Jain, "Digital Fundamentals" (Eight editions), Pearson
5. Stephen Brown & Zvonko Vranesic, "Fundamentals of Digital Logic Design with VHDL", Second Edition, TMH (2009).
Project based learning:
1. To demonstrate the use of NAND as Universal Gate
2. Electronic Eye using basic gates.
3. Light sensor switch circuit using JK-Flip-Flop
4. Morning sun alarm circuit using IC-4011(quad NAND gate)
5. To demonstrate the use of IC 555 as a Pulse Generator Circuit
6. Automatic switch off battery charger using IC 555
7. Fluid Level Control Using IC 4093
8. A pseudo-random number generator
9. 2-Bit-Parallel-or-Flash-Analog-to-Digital-Converter
10. Digital Bank Token Number Display
11. Digital Object Counter
12. Asynchronous-Modulo-16-Down-Counter
13. Analog-Signals-Multiplier
14. 4-line to 16-line decoder Circuit using 7442
15. Simple Electronic Toggle Switch Flip Flop Circuit Using IC 4017

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem III **ANALOG CIRCUITS AND APPLICATIONS**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03	End Semester Examination(UE): 60 Marks	Credits : 03
Practical: 02	Internal Assessment(IA): 40 Marks	
Tutorial: --	TW:25 Marks & Practical: 25 Marks	Credit: 01
	Total: 150 Marks	Total Credits:04

Course Pre-requisites:

The Students should have knowledge of

1	Electronic components and devices.

Course Objectives:

1	To understand analysis of single stage and multistage transistor amplifier.
2	To give a practical approach of analysis of feedback amplifiers ,power amplifiers and oscillators
3	To understand analysis and design of voltage regulators.

Course Outcomes: After learning this course students will be able to

1	Describe and demonstrate BJT single stage amplifier, its hybrid equivalent and hybrid models.
2	Analyze multistage amplifiers using BJT.
3	Analyze the importance of negative feedback in amplifiers.
4	Demonstrate and analyze power amplifier circuits in different modes of operation.
5	Design various oscillator circuits using BJT.
6	Design and analyze transistorized series and shunt voltage regulators.

UNIT – I	**Single stage Amplifiers**	**(06 Hours)**
	Classification of Amplifiers – Distortion in Amplifiers, Analysis of CE, CC, and CB Configurations with simplified Hybrid Model, Analysis of CE amplifier with Emitter Resistance and Emitter follower, Miller'sTheorem and its dual, Design of Single Stage RC Coupled Amplifier using BJT.	

UNIT – II	**Multi Stage Amplifiers**	**(06 Hours)**
	Need of Multistage amplifiers, Parameter evaluation such as Ri, Ro, Av, Ai & Bandwidth for general multi stage amplifier, Analysis & design at low frequency & mid frequency of direct coupled, RC coupled, transformer coupled (Two stage) amplifier, Darlington amplifier, cascode amplifier	
UNIT - III	**Feedback Amplifiers**	**(06 Hours)**
	Concept of feedback, classification of amplifiers, Negative feedback topologies with their block diagram representation, Effect of negative feedback on Input impedance, Output impedance, Gain and Bandwidth with derivation, method of analysis of feedback amplifier, analysis of all feedback topologies.	
UNIT -IV	**Power Amplifiers**	**(06 Hours)**
	classification of power amplifiers - Class A, Class B, Class C, and Class AB. Operation of - Class A with resistive load; Transformer coupled class A Amplifier; Class B Push – pull amplifier ; Class B Complementary symmetry amplifier. Efficiency analysis for Class A transformer coupled amplifier and Class B push – pull amplifier, cross over distortion in power amplifiers, harmonic analysis	
UNIT -V	**Oscillators**	**(06 Hours)**
	Positive feedback, Barkhausen criterion, Classification of oscillators, derivation and analysis of RC oscillators, Wien bridge Oscillators, LC Oscillators for frequency of oscillation, Tuned collector oscillator, Piezo-electric effect in crystals and Crystal Oscillator	
UNIT -VI	**Regulator**	**(06 Hours)**
	Block schematic of linear regulators, Performance parameters – Load and Line regulations, Ripple rejection, Output resistance Emitter follower regulator, Transistor series regulator, shunt regulator Study and design of regulators using IC's:78XX, 79XX, 723, LM317, Method of boosting output current using external series pass transistor. Protection circuits – Reverse polarity protection, over circuit, fold back current limiting, over voltage protection.	
<u>Term Work:</u>		
The term work shall consist of record of minimum eight experiments.		
1. Analysis of multistage LF amplifier, verification with theoretical values of A_{is}, A_{vs},		

R_i, R_o (overall) with square wave testing.
2. Input impedance improvement techniques for emitter follower.
3. Analysis of LF amplifier with negative feedback in Voltage series and current series topology.
4. Analysis of LF amplifier with negative feedback in Voltage shunt and current shunt topology.
5. Measurement of frequency of oscillations of RC Oscillators - phase shift and wien bridge
6. Measurement of frequency of oscillations of LC oscillators – Hartley, Colpitt
7. Biasing analysis of BJT power amplifier in class A, B, C.
8. Regulation characteristic of series and shunt regulators and calculation of S_v and R_o.
Text Books:
1. S. Salivahanan, Suresh Kumar Vallavaraj, “Electronic devices and circuits”, Mc Graw Hill Publication
2. Robert Boylestad, “Electronic Devices and Circuit Theory”, Pearson Publication
Reference Books:
1. Allen Mottershed , “Electronic Devices and Circuits”, PHI Publication
2. J.B. Gupta , “Electronic Devices and Circuits”, Kaison Educational Series
3. Raghbir Singh Khandpur, “Printed circuit boards: Design, fabrication, assembly and testing”, 2006, ISBN 10:0071464204,McGraw Hill
Project Based Learning:
Build the following circuits -
1. A single stage common emitter amplifier.
2. RC coupled multistage amplifier.
3. Darlington amplifier.
4. Voltage shunt negative feedback amplifier.
5. Current shunt negative feedback amplifier.
6. Voltage series negative feedback amplifier.
7. Current series negative feedback amplifier.
8. Class A, B, C power amplifier.
9. RC phase shift oscillator using BJT.
10. Colpitt’s oscillator using BJT.
11. Hartley oscillator using BJT.
12. Shunt voltage regulator using zener diode.
13. Series voltage regulator.
14. IC 723 as basic high/low voltage regulator with fold back current limiting.
15. Flashing LED using astable multi vibrator.

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem III SIGNALS AND SYSTEMS		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination(UE): 60 Marks	Credits : 04
Practical: 02	Internal Assessment(IA): 40 Marks	
	TW:25 Marks & Oral:25 Marks	Credit : 01
	Total:150 Marks	Total Credits: 05

Course Pre-requisites:

The students should have knowledge of

1	Differential and Integral calculus
2	Vector algebra and algebra of complex numbers

Course Objectives:

1	To understand the behavior of signals in time and frequency domain
2	To understand the characteristics of LTI systems
3	To analyze continuous and discrete time systems using different transform techniques.

Course Outcomes: After learning this course students will be able to

1	Classify signals and perform operations on signals.
2	Analyze LTI systems using convolution.
3	Apply Fourier series and Fourier Transform for analysis of signals.
4	Analyze CT signals and systems using Laplace transform.
5	Apply Z-transform for the analysis of DT signals and systems.
6	Sample and reconstruct the signals using sampling technique.

UNIT –I	**Introduction and Classification of signals:**	**(08 Hours)**
	Signals and Systems definition, Types of signals, continuous time and Discrete time signal operations, Amplitude scaling, Time shifting, Time reversal, Time scaling, Mathematical operations additions, subtraction, multiplication of signals, Classification of signals according to their property, Periodic/Aperiodic, Even/Odd, Energy/Power/Causal/Non causal, Deterministic/Random signals	
UNIT –	**Time domain representation of LTI System:**	**(08**

II		**Hours)**
	Introduction to systems, Classification of systems according to their properties, Linear/Nonlinear, Static /Dynamic, Time Invariant/Time-variant, Causal/non causal, Stable/Unstable, Invertible/Non Invertible systems, LTI system: Causality, stability, step response, impulse response, Convolution Integral, convolution sum using graphical method properties and applications.	
UNIT-III	**Fourier Analysis of Signals:** Fourier Series: - Review of Fourier series of CT and DT signals and its properties (No derivation), Exponential and Trigonometric Fourier series of periodic signals, amplitude and phase spectra of periodic signals,Fourier Transform and its properties.	**(08 Hours)**
UNIT-IV	**Application of Laplace Transform in Signal processing:**	**(08 Hours)**
	Review of Bilateral and Unilateral Laplace Transform of signals, ROC and its properties. Laplace transforms of standard signals, Inverse Laplace Transform, Solution to differential equation, System transfer function and Response calculations, Poles and Zeros representation	
UNIT -V	**Z-transform**	**(08 Hours)**
	Z-transform, Region of convergence and its properties, Inverse z-transform, properties of z transform, relation between Z and Laplace Transform, Analysis and characterization of discrete time LTI systems using z-transform.	
UNIT-VI	**Sampling and Correlation:**	**(08 Hours)**
	Sampling theorem, sampling and reconstruction of signal from its samples using interpolation, Effect of under sampling, Correlation, Autocorrelation and cross-correlation of energy and power signals, properties of correlation functions, applications of Correlation, Energy Density Spectrum, Parsevals Theorem, Power Density Spectrum,	

Termwork:

1. Introduction to MATLAB and its basic functions.
2. Generate Continuous and discrete time signals.
3. Perform signal operations on Continuous and discrete time signals.
4. Find even and odd part of the signal and sequence and find real and imaginary parts of signal.
5. Compute linear convolution and convolution integral of sequences/signals.
6. Compute Fourier Transform and Inverse Fourier Transform of a given signal

/sequence and plot its Magnitude and Phase Spectra.
7. To compute and plot the impulse response and pole-zero diagram of transfer function using Laplace transform.
8. To compute and plot the impulse response and pole-zero diagram of transfer function using Z-transform.
9. Compute auto correlation and cross correlation between signals and sequences and verify its properties.
10. Verify sampling theorem and reconstruct the signal.
Text Books:
1. Oppenheim, Willsky, S.Hamid Nawab, "Signals and Systems", PHI, 2nd edition, 2002.
2. M.J. Roberts, "Signals and Systems", McGraw-Hill, 1st edition,2003.
3. B.P Lathi, "Principles of linear systems and signals", Oxford, 2nd edition,2009.
Reference Books:
1. Simon Haykin and Bary Van Veen, "Signals and Systems", Wiley- India Publications
2. Michal J. Roberts and Govind Sharma, "Signals and Systems", Tata Mc-Graw Hill Publications
Project Based Learning:
1. Generate basic signals using C / Python programming.
2. Perform multiple operations on signal using C or MATLAB.
3. Visualize signal/data in time and frequency domain using MATLAB.
4. Find the Trigonometric Fourier Series of a given Signal using C/Python/MATLAB.
5. Create Frame-Based Signals using MATLAB Simulink.
6. Create Multichannel Signals by combining single channel signals using Simulink.
7. Create Multichannel Signals by combining multichannel signals using Simulink.
8. Inspect sample and frame rate using Simulink.
9. Perform Linear Convolution of two sequences using SCILAB.
10. Represent, Play and plot audio signals with different sampling frequencies using MATLAB.
11. Study of Signal Processing Sound Effects: Introducing a delay, creating an echo effect by repeating the signal, time scaling, time reversal, volume scaling.
12. Create acoustic environment in Simulink.
13. Develop a Python application to generate digital signals.
14. Perform measurement using spectrum analyzer using MATLAB Simulink.
15. Filter the frames of noisy wave using MATLAB.

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem III ITC-I: PROCESS AND CONTROL SYSTEM		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03	End Semester Examination(UE): 60 Marks	Credits : 03
Practical: --	Internal Assessment(IA): 40 Marks	
Tutorial: --		
	Total:100 Marks	Total Credits: 03

Course Pre-requisites:	
The Students should have knowledge of	
1	Basic knowledge of signals.
2	Basic mathematical tools like Laplace Transform.

Course Objectives:	
1	This course provide in depth knowledge of various control system.
2	It introduces the stability of system , transducers, DAS etc.

Course Outcomes:	**After learning this course students will be able to**
1	Identify various control systems and determine the 'transfer function' of System using block diagram reduction and Signal flow graph.
2	Determine the error in various control systems.
3	Evaluate the stability of a system using Routh's stability criteria, root locus, bode plot etc.
4	Illustrate different specifications of the system in frequency domain.
5	Measure non-electrical quantities such as displacement, temperature, angular speed etc using suitable transducer.
6	Compare various control actions such as Proportional (P), Integral (I), Derivative (D), PI, PID.

UNIT – I	**Control System Classification**	**(06 Hours)**
	Open loop, closed loop, Feedback and Non-feedback Systems, continuous, discrete, linear and non-linear control systems. Transfer Function, Analysis of T.F. using Block diagram and signal flow graph.	
UNIT– II	**Time Domain Analysis**	**(06 Hours)**
	Transient and steady state responses of first and second order	

	systems, steady state errors, control of transient response, Basic control actions and their effects on transient and steady state responses.	
UNIT-III	**Stability**	**(06Hours)**
	Stability concepts, Routh Hurwitz criterion, Root loci, properties and construction of root loci, effects of adding of poles and zeros, root locus of conditionally stable systems.	
UNIT-IV	**Frequency Domain Analysis**	**(06Hours)**
	Bode plot, gain, magnitude and phase shift plots, frequency domain specifications, peak resonance and resonant frequency of a second order system, gain margin and phase margin, conditionally stable system.	
UNIT -V	**Transducers**	**(06Hours)**
	Classification of Transducers and its Characteristics. RTD, Thermocouple, Thermister, capacitive transducer, LVDT, strain gauge, Electromagnetic flow-meter, Piezoelectric Accelerometer, tacho-generators. Internet Things (IoT) for wireless sensor networks.	
UNIT -VI	**Controllers**	**(06Hours)**
	Control actions – On/Off Controller, Proportional Controller, Integral Controller, Derivative Controller, Proportional- Integral(PI) Controller, Proportional-Derivative(PD) Controller, PID Controller.	

Assignments:

It shall consist of record of minimum six assignments.

1. Transfer function of closed loop system.
2. Transient response specifications of second order system.
3. To draw Root Locus theoretically and verify it.
4. To draw Bode plot theoretically and verify it.
5. To study characteristics of temperature transducer.
6. To Study characteristics of LVDT for displacement measurement.
7. Study of Strain Guage.
8. Internet Things (IoT) for wireless sensor networks.
9. Study of Various Controllers.

Text Books:

1. A. K. Sawhney, “Electrical and Electronic Measurements and Instrumentation”, Dhanpt Rai and Co. Ltd

Reference Books:

1. J. Nagrath & M. Gopal, “Modern Control Engineering”, New Age International, New Delhi (Fifth Ediion) 2007

2. H S Kalsi, “Electronic Instrumentation”, Tata McGraw-Hill.
3. Ogata, K., “Modern Control Engineering”, Prentice Hall, second edition, 1991
Project Based Learning:
1. Design of a Lead Compensator.
2. Design of a Lag Compensator.
3. Displacement measurement using “Linear Variable Differential Transformer”.
4. Design of Temperature control system using RTD.
5. Design of Temperature measurement system using thermocouple.
6. Design of Temperature control system Using Thermistor.
7. Design of Load Cell using Strain Guage.
8. Application Internet Things (IoT) using wireless sensor.
9. Transient response analysis for second order system.
10. Design and Simulation of Root Locus for given system.
11. Design and Simulation of Bode plot for given system.
12. Design of on-off controller.
13. Design of Proportional controller.
14. Design of Integral controller.
15. Design of Proportional-Integral controller.
16. Design of Proportional-Integral-Derivative controller.

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem III VOCATIONAL COURSE-I PCB DESIGN & ASSEMBLY		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: --	End Semester Examination(UE): --	
Practical: 02	Internal Assessment(IA): --	
Tutorial: --	TW:25 Marks & Oral: 25 Marks	Credits : 01
	Total:50 Marks	Total Credits: 01

Course Pre-requisites:	
The Students should have knowledge of	
1	Basic knowledge of Electronic components.

Course Objectives:	
1	Become familiar with the simulation software.
2	This course provide in depth knowledge of PCB design.
3	It also introduces the PCB manufacturing.

Course Outcomes:	**After learning this course students will be able to**
1	Design electronic circuits, create a schematic, PCB layout.
2	Become proficient with software skills using EDA tool, for drawing electronic circuit Schematic and PCB Layout.
3	Fabricate a Prototype PCB using EDA tool.
4	Demonstrate the knowledge of selecting proper PCB primitives.
5	Use PCB design software for simple single sided PCB artwork design.
6	Identify and select appropriate soldering tools for the soldering job.

Unit-I	**Component Selection**	
	Principles and Process of Electronic Component Selection: **Electrical parameters, Mechanical parameters** . Performance, Quality**, Availability and price, PCB footprint with Dual -in-Line Package (DIP) and surface mount Packages.(SMP)/ SMD.**	
Unit-II	**Schematic design**	
	Electrical connection between different active and passive electrical components like resistors, capacitors, Integrated circuits IC. Connectivity and functionality between different components. Physical representation of all the electrical connections between active and passive components used in the schematic.	

Unit-III	**Circuit Design**	
	Design specification, Circuit Design theoretically and implementing on Breadboard, verification and testing.	
Unit-IV	**PCB Design**	
	Introduction to PCB Design using EDA tool. Design of single sided PCB, Design of Double sided PCB. Verification and testing. PCB Design Implementation with print-out or Gerber file.	
Unit-V	**PCB fabrication**	
	PCB Manufacturing Process Steps: Design and Output From File to Prototype machine/Film, Printing the Inner layers, Removing the Unwanted Copper, Layer Alignment and Optical Inspection, Layer-up and Bond, Drill, Plating and Copper Deposition, Outer Layer Imaging, Final Etching, Solder Mask Application, Surface Finishing, Electrical Test. PCB fabrication using Prototype machine/Chemical method.	
Unit-VI	**Soldering of Component**	
	Materials and Equipment: soldering iron, Rosin core solder, Sponge, Solder braid etc. PCB Protection Chemicals. Soldering and de-soldering of Components.	

PCB Plant Visit: At the end of course students should visit to PCB manufacturing company.

Text Books:

1. R.S. Khandpur **,** “Printed Circuit Boards: Design, Fabrication, and Assembly” ,McGraw-Hill Electronic Engineering
2. Coombs Clyde, “ Printed Circuits Handbook”, McGraw-Hill Education

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B. Tech. (Electronics & Communication Engineering) Sem III **DATA STRUCTURES**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory:--	End Semester Examination(UE): --	
Practical: 02	Internal Assessment(IA): --	
Tutorial: --	TW:25 Marks	Credits:01
	Total:25 Marks	Total Credits: 01

Course Pre-requisites:	
The Students should have knowledge of	
1	Knowledge of C programming

Course Objectives:	
1	This course provides in depth knowledge of the various types of data structures and various algorithms. Also it introduces the programming for linked list, stack, queues, graph and tree.

Course Outcomes: After learning this course students will be able to	
1	Write a program using data structure and its types.
2	Define various operations on linked and double linked lists.
3	Implement stacks and queues involving linked list.
4	Perform operations on a tree using linked lists.
5	Create a graph using adjacency list & traverse it using BFS & DPS methods.
6	Find the shortest path in each graph using algorithm.

Term Work:

The term work shall consist of record of minimum eight experiments.

1. Program to search for record from a given list of records stored in array using
   i) Linear search
   ii) Binary search
2. Program to sort an array of names using
   i) Bubble sort
   ii) Insertion sort
   iii) Quick sort
3. Program to implement following operation on singly linked list:
   i) Create
   ii) Delete
   iii) Insert
   iv) Display
   v) Search

4. Program to add two polynomials using linked list.
5. Program to implement stack using: i) Array ii) Linked list
6. Program to convert an infix expression to postfix expression & evaluate the resultant expression.
7. Program to Implement Queue using: (i) Array (ii) linked list
8. Program to create a Binary search tree & Perform following primitive operation on it: i) Search ii) Delete iii) Traversals (inorder, pre-order, post-order -recursive) iv) Non-recursive in order traversal
9. Program to create a graph using adjacency list & traverse it using BFS & DPS methods
Text Books:
1. ISRD group ,"Data structure using C",TMH.
2. Yashwant kanetkar "Data Structure through C" ,BPB Puplication.
Reference Books:
1. AM Tanenbaum, Y Langsam and MJ Augustein "Data structure using C", Prentice Hall India.
2. Weiss, Mark Allen, "Data structure and Algorithm Analysis in C", Addison Wesley.
3. Richard F Gilberg Behrouz A. Forouzan, Thomson ,"Data structure – A Pseudocode Approach with C", Cengage Learning India
4. Yashwant Kanetkar ,"Let us C" ,BPB Publication

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B. Tech. (Electronics & Communication Engineering) Sem III DATABASE MANAGEMENT SYSTEM		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory:--	End Semester Examination(UE): --	
Practical: 02	Internal Assessment(IA): --	
Tutorial: --	TW:25Marks	Credits:01
	Total:25 Marks	Total Credits: 01

Course Pre-requisites:	
The Students should have knowledge of	
1	Computational C.

Course Objectives:	
1	To explain basic database concepts, applications, data models, schemas and instances.
2	To demonstrate the use of constraints and relational algebra operations.
3	Describe the basics of SQL and construct queries using SQL.
4	To emphasize the importance of normalization in databases.
5	To facilitate students in Database design
6	To familiarize issues of concurrency control and transaction management

Course Outcomes: After learning this course students will be able to	
1	Apply the basic concepts of Database Systems and Applications.
2	Use the basics of SQL and construct queries using SQL in database creation and interaction
3	Design a commercial relational database system (Oracle, MySQL) by writing SQL using the system
4	Analyze and Select storage and recovery techniques of database system.
5	Use Algorithms to solve scheduling conflict.
6	Apply Algorithms in distributed database.

Experiment List

1. Conceptual Designing using ER Diagrams (Identifying entities, attributes, keys and relationships between entities, cardinalities, generalization, specialization etc.) Note: Student is required to submit a document by drawing ER Diagram to the Lab teacher.
2. Converting ER Model to Relational Model (Represent entities and relationships in Tabular form, Represent attributes as columns, identifying keys) Note: Student is required to submit a document showing the database tables created from ER Model.
3. Normalization -To remove the redundancies and anomalies in the above relational tables, Normalize up to Third Normal Form

4. Creation of Tables using SQL- Overview of using SQL tool, Data types in SQL, Creating Tables (along with Primary and Foreign keys), Altering Tables and Dropping Tables
5. Practicing DML commands- Insert, Select, Update, Delete
6. Practicing Queries using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION,
7. Practicing Sub queries (Nested, Correlated) and Joins (Inner, Outer and Equi)..
8. Practice Queries using COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING, VIEWS Creation and Dropping.
9. Practicing on Triggers - creation of trigger, Insertion using trigger, Deletion using trigger, Updating using trigger
10. Procedures- Creation of Stored Procedures, Execution of Procedure, and Modification of Procedure.
11. Cursors- Declaring Cursor, Opening Cursor, Fetching the data, closing the cursor.
Text/Reference Books:
1.Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", McGraw Hill Publishers, ISBN 0
2. Connally T, Begg C., "Database Systems", Pearson Education, ISBN 81
3. Pramod J. Sadalage and Martin Fowler, “NoSQL Distilled”, Addison Wesley, ISBN10: 0321826620, ISBN

Bharati Vidyapeeth (Deemed to be University), Pune
Faculty of Engineering and Technology
Programme: B. Tech. (Electronics & Communication) –CBCS 2021 Course

B. Tech. (Electronics & Communication) Sem IV

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
19		Digital Communication	3	2	0	60	40	25	25	0	150	3	1	0	4
20		Microcontroller & Applications	4	2	0	60	40	25	0	25	150	4	1	0	5
21		EM Waves & Propagation	4	0	1	60	40	0	0	0	100	4	0	1	5
22		Integrated Circuits& Amplifier Design	4	2	0	60	40	25	0	25	150	4	1	0	5
23		Essentials of Data Science*	3	0	0	60	40	0	0	0	100	3	0	0	3
24		Vocational Course-II Domestic Appliances &Maintenance	0	2	0	0	0	25	25	0	50	0	1	0	1
25		Java Programming	0	2	0	0	0	0	25	0	25	0	1	0	1
26		Linux Programming	0	2	0	0	0	25	0	0	25	0	1	0	1
		Total	**18**	**12**	**1**	**300**	**200**	**125**	**75**	**50**	**750**	**18**	**6**	**1**	**25**
		MOOC-I**	--	--	--	-	-	--		--	--	-	-	-	2

*Industry Taught Course – II
** Add on course

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B. Tech. (Electronics & Communication Engineering) Sem IV **DIGITAL COMMUNICATION**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03	End Semester Examination(UE): 60 Marks	Credits : 03
Practical: 02	Internal Assessment (IA) :40Marks	
Tutorial: --	TW:25 Marks & Oral: 25 Marks	Credit: 01
	Total:150 Marks	Total Credits: 04

Course Pre-requisites:

The Students should have knowledge of

1	Electronic communication
2	Signals & Systems
3	Probability and Statistics

Course Objectives:

1	To understand the building blocks of digital communication system.
2	To prepare mathematical background for communication signal analysis.
3	To understand the basics of baseband and pass band digital communication systems.
4	To acquire the knowledge of spread spectrum communication systems.

Course Outcomes: After learning this course students will be able to

1	Apply different sampling techniques to convert analog signal into discrete sequence
2	Describe various CW modulation schemes
3	Learn the generation and detection of band pass modulation techniques
4	Identify the need of Multiplexing and Synchronization in digital communication and design Scrambler and Un-scrambler. Characterize, sketch various Line Codes
5	Evaluate probability of error in various digital modulation techniques
6	Describe the digital communication system with spread spectrum modulation

UNIT – I	**Pulse Modulation**	**(06 Hours)**
	Introduction to Digital Communication System, digital representation of analog signal, advantages of digital communication. Pulse Modulation, Sampling Theorem (time domain analysis) ideal sampling, Natural sampling, Flat top sampling, aliasing effect and aperture effect. Nyquist criteria, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation, Their generation and Demodulation.	

UNIT – II	**Digital transmission of analog signals**	**(06 Hours)**
	Quantization–Uniform, Non-Uniform, Companding, A-Law, µ Law, Pulse code modulation Delta Modulation, Adaptive Delta Modulation, Differential Pulse Code Modulation.	
UNIT -III	**Band pass Modulation Techniques**	**(06 Hours)**
	ASK, PSK, FSK, Binary Phase shift keying, Differential Phase shift keying, Differential encoded PSK, Quadrature PSK, M-ary PSK, Quadrature Amplitude shift keying (QASK), Binary frequency shift keying, Minimum shift keying (MSK), signal space representation and constellation diagram	
UNIT -IV	**Baseband Digital Transmission**	**(06 Hours)**
	Digital Multiplexing: Multiplexers and hierarchies, Data Multiplexers. Data formats and their spectra, synchronization: Bit Synchronization, Scramblers, Frame Synchronization. Inter-symbol Interference, Equalization.	
UNIT -V	**Baseband Receivers**	**(06 Hours)**
	Base band signal receiver, Probability of error, Optimum filter, White noise-Matched filter, probability of error of matched filter, correlation, FSK, PSK, non-coherent detection of FSK, DPSK, QPSK, Calculation of error probability for BPSK &BFSK, Signal space to calculate Pe.	
UNIT -VI	**Spread Spectrum Techniques**	**(06 Hours)**
	Introduction, Generation of PN Sequences and its properties, Direct Sequence Spread Spectrum Signals, Frequency Hopped Spread Spectrum Signals, Introduction to Multiple Access Techniques: CDMA, TDMA, FDMA.	

Term Work:

The term work shall consist of record of minimum eight experiments.

1. To verify the sampling theorem
2. To perform Pulse Code Modulation System (PCM) System
3. To analyze a Delta modulation system and interpret the modulated and demodulated waveforms
4. To analyze Adaptive Delta modulation system and interpret the modulated and demodulated waveforms
5. To analyze ASK (Amplitude Shift Keying) System with waveforms
6. To analyze PSK (Phase Shift Keying) System with waveforms
7. To analyze FSK (Frequency Shift Keying) System with waveforms

8. To analyze of Quadrature Phase Shift Keying (QPSK) with waveforms

9. To simulate any digital modulation scheme using MATLAB
10. To analyze waveforms of different Data Formats
Text Books :
1. Sklar, Bernard, "Digital Communications, Fundamentals & Applications," Second Edition, Prentice-Hall Inc., 2001.
2. Lathi B P, and Ding Z “Modern Digital and Analog Communication Systems,” Fourth Edition, Oxford University Press.
3. Leon W. Couch, “Digital and Analog Communication Systems”, Sixth Edition, Pearson Education, 2001.
Reference Books:
1. Haykin Simon, “Digital Communication Systems,” Forth Edition, John Wiley and Sons, New Delhi.
2. Taub, D. Schlling, and G. Saha, “Principles of Communication Systems,” Third Edition, Tata McGraw Hill.
3. John G. Proakis, “Digital Communication” ,Fifth Edition, Pearson Education.
Project Based Learning:
Implement following systems using matlab and simulink
1. Sampling of the given signal
2. Pulse Width Modulation generator
3. Pulse Position Modulation generator
4. Pulse Amplitude Modulation generator
5. Delta modulation system
6. Quantization of an audio signal
7. Pulse code modulation system
8. Frequency Shift Keying modulator
9. Amplitude Shift Keying modulator
10. Phase Shift Keying modulator
11. Quadrature Phase Shift Keying modulator
12. Unipolar RZ Line coding scheme
13. Bipolar RZ and NRZ line coding scheme
14. Random binary sequence generator
15. Generate the sound

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem IV **MICROCONTROLLER & APPLICATIONS**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination(UE): 60 Marks	Credits: 04
Practical: 02	Internal Assessment(IA): 40 Marks	
Tutorial: --	TW:25 Marks & Practical:25 Marks	Credit: 01
	Total:150 Marks	Total Credits: 05

Course Pre-requisites:

The students should have knowledge of

1	Basics of Digital Logic Design.
2	Basics of C programming
3	Basic of Microprocessor architecture.

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Course Objectives:

1	To introduce the operation of micro-controllers.
2	To familiarize with the fundamentals of embedded system architecture, its basic hardware and software elements.
3	To understand the concept of AVR Controller
4	To introduce the AVR micro-controller with architecture and programming

Course Outcomes: After learning this course students will be able to

1	Classify the memory devices, microcontrollers and their architecture.
2	Write the programs for 8051 microcontroller using mathematical, logical, data flow instructions.
3	Interface the external devices to 8051 microcontroller
4	Understand the architecture of AVR microcontroller
5	Implement the programs in C using AVR microcontroller
6	Distinguish different types of serial communication protocols

UNIT – I	**Review of Processor and Memory:**	**(08 Hours)**
	General-purpose processors, single-purpose processors, application specific processors, CISC and RISC processor architecture, memory devices, processor and memory selection for an embedded system, interfacing processor, memory and I/O devices, 8/16-bit microcontrollers.	
UNIT – II	**8 Bit Micro Controller 8051:**	**(08 Hours)**

	MCS 51 family architecture: Registers in MCS-51, Parallel I/O ports, Timers & Counters, Memory Organization, Pin Description, Instruction set, Addressing modes, Interrupts in MCS-51, Programming.	
UNIT- III	**8051 Serial Communication &Interfacing of 8051**	**(08 Hours)**
	Serial Communication of 8051: Basics, SBUF register, SCON and PCON registers, Modes of operation Simple program of serial communication. Interfacing of 8051 with devices: LED, LCD, keyboard, LM35 temperature sensor & A/D converter	
UNIT- IV	**Introduction to AVR microcontroller**	**(08 Hours)**
	Overview of AVR family, AVR Microcontroller architecture, status register, Special function registers, RAM, ROM & EEPROM space, On-Chip peripherals, ATmega32 pin configuration & function of each pin, Fuse bits of AVR**.**	
UNIT -V	**AVR programming in C**	**(08 Hours)**
	AVR Data types, AVR I/O port programming, Timer programming, Input capture and Wave Generator, PWM programming External Interrupt programming, ADC programming, EEPROM programming.	
UNIT- VI	**Serial communication protocols**	**(08 Hours)**
	UART protocol, I2C protocol, SPI protocol, Serial Port programming using polling and interrupt, I2C Programming, SPI Programming	

Term Work:

1.Addition / subtraction / multiplication / division of 8/16 bit data using 8051
2. Largest/smallest from a series using 8051.
3.Generate different waveforms: Sine, Square, Triangular, Ramp using DAC interface.
4.To write a C program to demonstrate LED using 8051 Micro-controller development kit.
5.To write a C program to demonstrate Seven Segment using 8051 Micro-controller development kit
6.To write a program to demonstrate Stepper Motor using 8051 Micro-controller development kit.
7.To write a program to demonstrate LCD using 8051 Micro-controller development kit.
8.Installation of AVR STUDIO and familiarization of ATMega32 AVR Development Board.
9.Stepper motor interfacing with ATMega32 in C with ATMega32.
10.Timer to generate accurate delay using Interrupt in C with ATMega32

11.Seven Segment Display interfacing with ATMega32 in C.
12.Timer to generate accurate delay using polling in C with ATMega32
13.16x2 LCD interfacing with ATMega32 in C.
15.Interfacing with ATMega32 in C using I2C protocol
16.On-chip ADC for interfacing analog sensors in C with ATMega32.
Textbooks:
1. Muhammad Ali Mazidi, Janice Gillespie Mazidi, “The 8051 Microcontroller and Embedded System” Pearson Education.
2. Dhananjay Gadre, “Programming and Customizing the AVR Microcontroller”, McGraw Hill Education
Reference Books:
1. Kenneth J. Ayala, “The 8051 Micro-controller – Architecture, Programming & Applications”, Second Edition Penram International & Thomson Asia
2. Rajkamal, “Embedded System-Architecture, Programming and Design”, TMH Publications, Edition 2003
3. Muhammad Ali Mazidi, Sarmad Naimi and Sepehr Naimi, “ The AVR Microcontroller and Embedded Systems Using Assembly and C”, Pearson Education
Project Based Learning:
Build the following circuits -
1. 8 Channel Quiz Buzzer Circuit using Microcontroller 8051/AVR
2. 8 Channel Quiz Buzzer Circuit using Microcontroller 8051/AVR
3. Automatic Railway Gate Controller with High Speed Alerting System using Micro-controller 8051/AVR
4. Bidirectional Visitor Counter using Microcontroller 8051/AVR
5. Celsius Scale Thermometer using Microcontroller 8051/AVR
6. Digital Tachometer using Microcontroller 8051/AVR
7. Density Based Traffic Signal System using Microcontroller 8051/AVR
8. Digital Temperature Sensor using Micro-controller 8051/AVR
9. Digital Voltmeter using Microcontroller 8051/AVR
10. Line Following Robotic Circuit using Microcontroller 8051/AVR
11. Password Based Door Lock System using Microcontroller 8051/AVR
12. RFID based Attendance System using Micro-controller 8051/AVR
13. Remote Control Circuit through RF using Microcontroller 8051/AVR
14. Street Lights that Glow on Detecting Vehicle Movement using Micro-controller 8051/AVR
15. Sun Tracking Solar Panel using Micro-controller 8051/AVR
16. Temperature Controlled DC Fan using Microcontroller 8051/AVR
17. Ultrasonic Rangefinder using Microcontroller 8051/AVR
18. Water Level Controller using Microcontroller 8051/AVR
19. Water Level Indicator using Micro-controller 8051/AVR
20. Temperature based Ceiling Fan Speed Control System (230V AC Motor) using Micro-controller 8051/AVR

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem IV EM WAVES AND PROPAGATION		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination(UE): 60 Marks	Credits : 04
Practical: --	Internal Assessment(IA): 40 Marks	
Tutorial: 01		Credits : 01
	Total: 100 Marks	Total Credits: 05

Course Pre-requisites:

The Students should have knowledge of

1	Vector calculus and coordinate systems.
2	Curl, Divergence and Gradient.
3	Partial differential equations.

Course Objectives:

1	Provide fundamentals of Static Electromagnetic Fields.
2	Explain basics of the vector Differential, Integral operators to Electromagnetic theory &
3	Electrostatic & Electromagnetic fields.
4	Define and derive different laws in Electrostatic & Electromagnetic fields.
5	Explain Maxwell’s equations and concepts of transmission lines.
6	Analyze techniques for formulating and solving problems in Electrostatic &

Course Outcomes: After learning this course students will be able to

1	Comprehend the fundamentals of Electrostatic and Electromagnetic fields..
2	Apply Gauss’ law, Ampere’s Law, Biot-Savart law, Faraday’s law and laws related with steady magnetic field while solving problems in Electrostatic and Electromagnetic fields.
3	Develop field equations from understanding of Maxwell’s Equations.
4	Extend the knowledge of basic properties of transmission lines to analyze Electromagnetic wave propagation in generic transmission line geometries
5	Demonstrate mathematical skills related with differential, integral and vector calculus.
6	Apply radiation principles and concept of Antennas

UNIT – I	**Static Electric Fields**	**(08 Hours)**
	Review of Co-ordinate systems, Coulomb’s law, line, Surface & Volume Charge distribution. Electric Field Intensity, Electric Field	

	due to infinite line and surface charges, Electric Flux Density, Gauss law (differential and integral form) and its applications, Divergence Theorem, Electric Potential and gradient, Poisson's and Laplace Equations, Work done, Energy Density, Electric Dipole and moment. Polarization in Dielectrics, Boundary conditions for Dielectric and Dielectric, boundary conditions for Conductor and Dielectric, boundary conditions for Conductor and free space	
UNIT –II	**Static Magnetic Fields**	**(08 Hours)**
	Biot – Savart's law, Magnetic Field Intensity due to infinite and finite line. Ampere's Circuital Law in integral and differential form, Applications of Amperes Circuital law, Magnetic flux density, Stokes Theorem, vector magnetic potential, Magnetic Torque, moment and dipole, nature of magnetic material, magnetization, Magnetic boundary conditions.	
UNIT - III	**Time Varying Fields & Maxwell's Equations**	
	Faradays law of induced Emf, displacement current, Maxwell's Equations in point form & Integral form for various fields.	**(08 Hours)**
UNIT - IV	**Wave Propagation and Uniform Plane waves**	**(08 Hours)**
	Wave equations, wave propagation through different medium, wave propagation through free space , wave propagation through dielectric, wave propagation through conductors- skin depth, Poynting theorem, wave polarization, Reflection of plane wave from conducting medium, perfect dielectric., reflection of plane waves at normal incidence, reflection of plane waves at oblique incidence angles.	
UNIT -V	**Transmission Lines**	**(08 Hours)**
	Physical Description of Transmission line propagation, Transmission Line equations, Characteristic equation of infinite Transmission Line, Complex analysis of sinusoidal waves, Transmission lines equations & their solutions in phasor form, Uniform terminated 2 coefficient VSWR, smith chart (Numerical expected) and applications, transient analysis of transmission lines.	
UNIT -VI	**Waveguides & Antenna Fundamentals**	**(08 Hours)**
	Plane wave analysis of parallel-plate waveguide, rectangular waveguides, TE and TM modes, wave impedance, wave velocities, attenuation in waveguide, EMI/EMC concepts, basic radiation principles, Hertzian dipole, magnetic dipole, thin wire antennas, antenna specifications, antenna arrays.	

List of Tutorials:

1. Find the Electric field intensity and electric flux density at a given point due to following charge distributions. (In all coordinate systems)
   - Point charges
   - Line charges (finite and infinite)
   - Surface charges (finite and infinite)
   - Mixed charges (Point charge, Line charge, Surface charge)
2. Application of Gauss's law
   - Given ρv (volume charge density) in a particular region, find $\bar{D}$ (electric flux density) using Law at the given location.
   - Given ρS(surface charge density), find $\bar{D}$(electric flux density) using Gauss's Law at the given location.
   - Given $\bar{D}$(electric flux density), find total charge enclosed by the surface (Q), ρv (volume charge density) using Gauss's Law.(In all coordinate systems)
3. Find the electrostatic fields (Tangential and Normal) at the boundary between,
   - Free space and dielectric medium
   - Free space and conductor
   - Dielectric medium and conductor
   - Two dielectric media.
4. Find $\bar{H}$(Magnetic field intensity) and $\bar{B}$(Magnetic flux density) at a given point due to,
   - Infinitely long current carrying conductor
   - Finite current carrying conductor
   - Infinite conducting surface
   - Finite conducting surface
   - Different current carrying configurations (i.e. thin conductor, surface all together)
5. For the following current carrying configurations, find the $\bar{H}$(Magnetic field intensity) in a given region (or point) using Ampere's circuital law.
   - Infinitely long current carrying conductor
   - Infinite cylindrical surfaces of different radii all centered at the same axis.
   - Spherical surfaces of different radii all centered at a given point.
6. Given $\bar{H}$ (or $\bar{E}$) and the region properties (like ε, μ, σ etc.), find $\bar{B}$, $\bar{D}$ and $\bar{E}$ (or $\bar{H}$) using Maxwell's equations. (In all coordinate systems).
7. Find attenuation constant, propagation constant, intrinsic impedance, values of E/H for different mediums like free space, conductors, and dielectrics.
8. Given the primary constants (R, L, G, C) along with the generator specifications and termination, find secondary constants (α, β, γ, Z0) and other parameters like Velocity, wavelength, received voltage, received power, reflection coefficient etc.
9. Problems on Impedance matching and design of stub matching using Smith Chart.
10. Find cut-off frequency or waveguide dimensions or phase velocity for rectangular waveguides.

Text Books:

1. A. Murthi," Electromagnetic fields", S. Chand.
2. Edminister J.A, "Electromagnetics", Tata McGraw-Hill.

Reference Books:

1. Hayt& Buck, “Engineering Electromagnetics”, 7th Edition, Tata McGraw-Hill
2. Kraus,Fleisch, “Electromagnetics with applications”, 5th Edition, McGraw Hill.
3. Jordan &Balmain, “Electromagnetic waves & radiating systems”, 2nd edition, PHI.
4. Matthew N.O. Sadiku, ”Principles of Electromagnetics”,6th edition, Oxford
Project Based Learning:
1. Plot Magnitude of a Vector & its Unit Vector MATLAB.
2. Simulate Coulomb Law on MATLAB & Scilab.
3. Plot different charge distributions viz. line charge, volume charge, surface charge in MATLAB.
4. Find & simulate Electric filed intensity & flux density for given charge distributions.
5. Verify & plot Divergence theorem with Gauss law in SCILAB & MATLAB.
6. Design a code in SCILAB for relation between E & V, Electric Dipole visualization and verify Poisson’s & Laplace’s Equations.
7. Design & Verify boundary conditions between Free space- conductor-Dielectric in SCILAB.
8. Simulate Biot-Savart’s Law, Magnetic field intensity for different current distributions in SCILAB & MATLAB.
9. Design & Verify Magnetic boundary conditions in SCILAB
10. Visualize & Simulate Maxwell’s Equations for Time varying Fields in MATLAB & SCILAB
11. Visualize EM waves & Uniform Plane waves formation in MATLAB
12. Visualize & Simulate behavior of EM waves in good conductors Lossy-Lossless dielectrics in MATLB & SCILAB.
13. Find out Transmission line parameters for given frequency in SCILAB, Visualize how standing waves generated & reflected on Transmission line in MATLAB
14. Visualize & plot SWR Circle, Impedance Matching, and reflection coefficient input impedance on SMITH CHART in MATLAB.
15. Visualize & plot Stub Matching problem of Transmission lines SMITH CHART in MATLAB.

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem IV **INTEGRATED CIRCUITS AND AMPLIFIER DESIGN**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination(UE): 60 Marks	Credits: 04
Practical: 02	Internal Assessment(IA): 40 Marks	
Tutorial: --	TW:25 Marks & Practical :25Marks	Credit: 01
	Total: 150 Marks	Total Credits: 05

Course Pre-requisites:	
The Students should have knowledge of	
1	Knowledge of KCL and KVL Law
2	Basic knowledge of Op-Amp and its configurations

Course Objectives:	
1	Familiar in the operational amplifier principle- analysis- design and application.
2	Gain knowledge on the linear and nonlinear applications of operational amplifiers.
3	Understand the theory and applications of Active filters and PLL.
4	Familiar in the ADC- DAC and its classifications.
5	Understand the few applications of specific ICs.

Course Outcomes: After learning this course students will be able to	
1	Differentiate IC and Discrete components, understand manufacturing process of IC and analyze how monolithic components are being developed.
2	Identify different configurations of op-amp analyze the parameters of op-amp and observe the frequency response of operational-amplifier
3	Understand & demonstrate different applications based on operational-amplifier.
4	Understand analog multiplier and PLL & demonstrate different applications based on it
5	Differentiate A/D and D/A converter, understand their types and analyze their applications
6	Demonstrate the applications of waveform generators, timers and voltage regulators

UNIT – I	**Basics of operational Amplifier**	**(08 Hours)**
	Block diagram representation of a typical op-amp, Differential amplifier, Schematic symbol for op-amp, Definition of integrated	

	circuits, Types of Integrated Circuits, Manufacturers, Designation for IC, IC package types, PIN identification & temp ranges, Ordering information, Characteristics of an op-amp, Internal &external offset voltage compensation, Frequency Response of an op-amp.	
UNIT –II	**Operational Amplifier – Linear circuits**	**(08 Hours)**
	Inverting amplifier, non-inverting amplifier, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Integrator, Differentiator, peak detector, clipper and clamper, Instrumentation amplifier using 1, 2 and 3 op-amps, Instrumentation amplifier using transducer bridge.	
UNIT -III	**Operational Amplifier - Non-linear circuits**	**(08 Hours)**
	Precision half wave rectifier & full wave rectifier, comparator, Schmitt trigger, window detector, log-antilog amplifier and its temperature compensation techniques, log ratio, sample and hold circuit.	
UNIT -IV	**Active filters and waveform generators**	**(08 Hours)**
	First and second order low pass Butterworth filters, first and second order high pass Butterworth filter, Band pass filter, Band reject filter, All-pass filter, notch filter, Square wave, Triangular wave, Saw tooth wave generator and study of function generator IC 8038	
UNIT -V	**Special function ICS**	**(08 Hours)**
	IC 555- as Monostable and Astable Multivibrators and its applications. IC 565- operating principle of Phase Locked Loop IC 565, Applications like Frequency multiplier, FSK and FM detector.	
UNIT -VI	**Interfacing circuits**	**(08 Hours)**
	V to I & I to V converter, D to A converter- Binary weighted resistors and R & 2R resistors, A to D Converter- Counter-ramp type, Successive approximation and Dual Slope.	
Term Work:		
The term work shall consist of record of minimum eight experiments.		
1. To design and setup an inverting amplifier circuit with OP AMP 741C for a gain of 10, plot the waveforms, observe the phase reversal, measure the gain.		
2. To demonstrate the use of op-amp as Integrator and Differentiator and draw frequency response.		
3. To demonstrate the use of op-amp as precision rectifier.		
4. To design and setup a Schmitt trigger, plot the input output waveforms and measure		

VUT and VLT.

5. Design and obtain the frequency response of second order Low Pass Filter (LPF) at a high frequency of 1KHz.
6. Design and obtain the frequency response of High Pass Filter (HPF) at a cut off frequency of 1KHz with pass band gain of 2.
7. To design and setup astable multivibrator using Op-amp 555, plot the waveforms and measure the frequency of oscillation
8. To obtain the output of voltage comparator and zero crossing detector.
9. Design instrumentation amplifier the with the help of three Op-amps inverting amplifier and also implement Wheatstone bridge and balance for null condition. (usingVLabs)
10. To design and study the frequency response of Summing Inverting Amplifier circuit.(usingVLabs)
11. Design and simulate triangular/square waveform generator using IC 741.(usingVabs)
12. To construct and study the voltage to current convertor.
13. To construct and study digital to analog converter circuit.

Text Books:

1. Ramakant A. Gayakwad, OP-AMP and Linear ICs, Prentice Hall of India, 4^{th} Edition,2010.
2. K. R. Botkar, Integrated Circuits, khanna Publishers, 10^{th} edition, 2010

Reference Books:

1. David A. Bell, “Operational Amplifiers and Linear ICs”, Oxford publication,3^{rd}edition,2011
2. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, Tata McGraw Hill, 3^{rd} edition, 2008
3. D.Roy Choudhry, Shail Jain, Linear Integrated Circuits, New Age International Pvt.Ltd., 4^{th} edition, 2010

Project Based Learning:

1. To design and setup a non-inverting amplifier circuit with OP AMP 741C for a gain of 10, plot the waveforms, observe the phase reversal, measure the gain.
2. To demonstrate the use of op-amp as clipper circuit.
3. Designoperational amplifier 741 tester which test op-amp 741 either is good or fault
4. Design and simulate Temperature to Voltage Converter Circuit.
5. To demonstrate the use of op-amp 741 as an Electronics Thermometer
6. IC 741 based circuit for dark Switch.
7. Hartley and Colpitts oscillator using op-amp
8. Notch filters using op-amp.
9. Water Level based Alarm Circuit (using IC 555- AstableMultivibrator).
10. Digital Stop Watch
11. FM Radio using PLL.
12. ICL7107 (A/D converter) based Digital Voltmeter.
13. Dimmer circuit for LED Lamp (using IC 555)
14. Electronic Letter Box.
15. 4-line to 16-line decoder Circuit using 7442

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem IV **ITC-II:ESSENTIALS OF DATA SCIENCE**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03	End Semester Examination(UE): 60 Marks	Credits : 03
Practical: --	Internal Assessment(IA): 40 Marks	
Tutorial: --		
	Total:100 Marks	Total Credits: 03

Course Pre-requisites:	
The Students should have knowledge of	
1	Python programming
2	Probability & Statistics

Course Objectives:	
1	Introduce R as a programming language
2	Introduce the mathematical foundations required for data science
3	Introduce the first level data science algorithms
4	Introduce a data analytics problem solving framework
5	Introduce a practical capstone case study

Course Outcomes:	**After learning this course students will be able to**
1	Describe a flow process for data science problems (Remembering)
2	Classify data science problems into standard typology (Comprehension)
3	Develop R codes for data science solutions (Application)
4	Correlate results to the solution approach followed (Analysis)
5	Assess the solution approach (Evaluation)
6	Construct use cases to validate approach and identify modifications required (Creating)

UNIT – I	**Introduction to Data Science**	**(06 Hours)**
	Data Science Fundamentals: Data, Data Science Process, Components of Data Science, Data Scientist roles and responsibilities, Introduction to R and R Studio, Variables and Data types in R, Data frames, Recasting and Joining of Data frames, Arithmetic, Logical and Matrix Operations in R, Advanced Programming in R : Functions, Data Visualization in R Basic Graphics.	

UNIT - II	**Linear Algebra & Statistical Modeling for Data Science**	**(06 Hours)**
	Linear Algebra for Data science, Solving Linear Equations, Linear Algebra - Distance, hyperplanes and half spaces, Eigen values, Eigenvectors, Statistical Modeling, Random Variables and Probability Mass/Density Functions, Sample Statistics, descriptive statistics, notion of probability, distributions, mean, variance, covariance, Hypotheses Testing, Type 1 and Type 2 errors. Testing for parameters of a normal distribution and for percentages based on a single sample and based on two samples. Introduction to the chi-squared test. The concept of p-value. Mean-square estimation and Kalman filtering.	
UNIT - III	**Optimization for Data Science**	**(06 Hours)**
	Optimization for Data Science, Unconstrained Multivariate Optimization Gradient (Steepest) Descent (OR) Learning Rule, Multivariate Optimization With Equality Constraints, Solving Data Analysis Problems.	
UNIT - IV	**Regression and Classification**	**(06 Hours)**
	Predictive Modeling, Linear Regression, Model Assessment, Diagnostics to Improve Linear Model Fit, Simple Linear Regression Model Building and assessment, Multiple Linear Regression, The least squares error criterion. Relation to maximum likelihood, Analysis of Variance (ANOVA), Logistic Regression, Logistic Regression Implementation in R, Classification , Classification using logistic regression, K - Nearest Neighbors, K-Means Clustering, K - means Implementation in R , Dimension Reduction Techniques.	
UNIT – V	**Data Analysis and Visualization**	**(06 Hours)**
	Pandas and Numpy, Operating on Data in Pandas, Data modeling and transforming, dealing with null values, different data types, preparing data for the model, Visualization with Matplotlib, Seaborn, Data visualization using Power BI.	
UNIT - VI	**Machine Learning**	
	Introduction to Supervised and Unsupervised Learning, Clustering, Decision Trees, Random Forest, Time Series Forecasting: Introduction to Time Series, Correlation, Forecasting, Autoregressive models; Model Validation, Handling Unstructured Data, Neural networks, Support vector machine.	**(06 Hours)**
Text Books:		

1. Practical Statistics for Data Scientists by Peter Bruce, Andrew Bruce, O′Reilly Publication.
2. Introduction to Machine Learning with Python: A Guide for Data Scientists by Andreas C. Mueller, Sarah Guido, O′Reilly Publication.
Reference Books:
1. Mohammed J. Zaki , Wagner Meira, "Data Mining and Machine Learning: Fundamental Concepts and Algorithms", Jr,1st Edition. Cambridge University Press
2. Trevor Hastie Robert Tibshirani, " The Elements of Statistical Learning: Data Mining, Inference, and Prediction", Second Edition Springer Series in Statistics
3. Garrett Grolemund and Hadley Wickham, " R for Data Science", O'Reilly Pub.
Project Based Learning:
1. Detecting Fake News with Python Dataset/Package: news.csv
2. Real-time Lane Line Detection in Python
3. Sentiment Analysis Project in Rwith Dataset/Package: janeaustenR
4. Build an application to detect colors with Beginner Data Science Project – Color Detection with OpenCV
5. Build a chatbot using Python– Chatbot with NLTK &Keras
6. Design Gender and Age Detection with Data Sciencewith OpenCV
7. Design & buildMovie Recommendation System Project in R
8. Build an application for Customer Segmentation with Machine Learning(K-means Clustering) using R
9. Create a Spotify Music Analysis visualization using Python pandas
10. Create a Crypto currency Analysis visualization using Python pandas.
11. Build a Song recommendation model using Machine Learning.
12. Build a Book recommendation model using Machine Learning.
13. Uber Dataset Time Series Analysis / Uber Data Analysis in R
14. Implement an Email automation system using SQL & Python
15. Practically implement the Deep Learning Project with Source Code Handwritten Digit Recognition with CNN

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem IV **VOCATIONAL COURSE-II** **DOMESTIC APPLIANCES AND MAINTENANCE**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: --	End Semester Examination(UE): --	
Practical: 02	Internal Assessment(IA): --	
Tutorial: --	TW:25 Marks & Oral :25 Marks	Credits: 01
	Total: 50 Marks	Total Credits: 01

Course Pre-requisites:	
The Students should have knowledge of	
1	Basic Electronics
Course Objectives:	
1	To identify and rectify the faults in domestic appliances like Washing machine,Microwave oven, Mixer,Grinder and Electric kettle.
Course Outcomes: After learning this course students will be able to	
1	Identify and test passive and active electronics components & study of Multimeter
2	Troubleshoot the faults in power supply circuits.
3	Identify and test various mechanical and electrical modules of the washing machine.
4	Identify electronic parts/components/modules of the Microwave oven.
5	Identify and rectify the faults in mixer and grinder.
6	Identify and rectify the faults in electric kettle.

UNIT – I	**Basic Electronic components & Multi meter**	
	Different types of resistors, capacitors and inductors, Measurement of resistor using Color code, Measurement using LCR meter. Identify the power rating of components, Dismantle and identify the different parts of a relay, basics of Transformer, Multimeter.	
UNIT – II	**Power supply**	
	Testing of active components, Practice soldering and de-soldering techniques Assemble and test– half wave, full wave & bridge rectifier circuits with and without filter, different types of fixed positive and negative regulator ICs(78/79 series), Construct a fixed voltage regulator using 78xx/79xx series ICs, Variable voltage regulator using LM 723.	

UNIT - III	**Washing Machine**	
	Installation of front load washing machine Installation of top load washing machine, Identify the internal and external parts of semi-auto washing machine, Identify the internal and external parts of fully automatic washing machine, Operate semi–automatic washing machine, Operate fully–automatic washing machine, Rectify the fault leading to not working of control panel switches. Rectify the fault leading to not working of pulsator / agitator, Rectify the fault leading to spin drier not working, Rectify the fault leading to one side, rotation of motor. Rectify the fault leading to water inlet.	
UNIT - IV	**Microwave oven**	
	Internal and external parts of microwave oven. Identify the different touch pad controls their functions, Testing of high voltage diode. Identify the HV capacitor and discharge it. Rectify the fault leading to fuse blows off when cooking is initiated, Rectify the fault leading to not responding of touch switches(front panel). Rectify the fault leading to dead set. Rectify the fault leading to long cooking time. Precautions – importance of interlocking switch in performing maintenance.	
UNIT -V	**Mixer and Grinder**	
	Dismantle and identification of various parts, wiring, tracing of various controls, Electronic circuits in various types of Mixers/grinders, faults in various types of Mixers/grinders & rectification.	
UNIT - VI	**Electric Kettle**	
	Identify various components of Electric kettle, controls and trace the circuit and rectify the simulated faults	

List of Practicals:

Practical based on maintenance of appliances should be conducted

Text Books:

1. Shashi Bhushan Sinha, “Handbook of Repair and Maintenance of Domestic Electronics Appliances”,January 2016, BPB Publications.

Reference Books:

1. Michael Jay Geier, “How to Diagnose and Fix Everything Electronic”, Second Edition, Mc Graw Hill education.

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B. Tech. (Electronics & Communication Engineering) Sem IV **JAVA PROGRAMMING**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: --	End Semester Examination(UE): --	
Practical: 02	Internal Assessment(IA): --	
Tutorial: --	Oral: 25 Marks	Credits: 01
	Total: 25 Marks	Total Credits: 01

Course Pre-requisites:	
The Students should have knowledge of	
1	Fundamentals of computing

Course Objectives:	
1	To introduce object oriented programming concepts.
2	To develop programming ability by learning advanced coding techniques.

Course Outcomes:	**After learning this course students will be able to**
1	Demonstrate basic knowledge of object oriented programming concepts.
2	Write simple programs in Java.
3	Get the knowledge of interfaces, packages and different file handing operations.
4	Familiarize the concept of exception handling.
5	Conceptualize the technique of multithreading programming.
6	Apply Java for HTML and Applet applications.

Term Work:

The term work shall consist of record of minimum eight experiments.

1. Write a Java Program to demonstrate the use of OOP features.
2. Write a Java Program to display pattern (Triangle, Pyramid) using different loops.
3. Write a Java program to differentiate between method overloading and method overriding.
4. Implementation of different string functions by using switch case.
5. Write a Java program to understand the use of String buffer class.
6. Write a Java Program implement multiple inheritances by using Interface.
7. Write a Java program to implement the concept of package.
8. Write a Java program to implement concept of Exception Handling.
9. Write a Java Program to perform different file operations.

10. Write a program to implement multithreading.
11. Write a program to implement Frame and different graphics objects.
12. Write a program to implement Java Applet.
Text Books:
1. E Balagurusamy, “ Programming with Java: A Primer, 3E”, Tata McGraw Hill Publishing Company.
2. Herbert Schildt , “Java Complete Reference” , McGraw Hill Publishing Company
3. Deitel and Deitel , “Java: How to Program” , Deitel pub.
Reference Books:
1. Ivan Bayross, “Web Enabled Commercial Applications Development Using HTML, DHTML, JavaScript, Perl – CGI”, BPB Publication.

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B. Tech. (Electronics & Communication Engineering) Sem IV **LINUX PROGRAMMING**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: --	End Semester Examination(UE): --	
Practical: 02	Internal Assessment(IA): --	
Tutorial: --	TW:25 Marks	Credits:01
	Total: 25 Marks	Total Credits: 01

Course Pre-requisites:	
The Students should have knowledge of	
1	Computational C.
Course Objectives:	
1	Make a Shell script executable. To demonstrate the use of constraints and relational algebra operations.
2	Execute programs written in C under UNIX environment
3	To use the following Bourne Shell commands: cat, grep, ls, more, ps, chmod, finger, ftp, etc. To facilitate students in Database design
4	Learn tracing mechanisms (for debugging), user variables, Bourne Shell variables, read-only variables, positional parameters, reading input to a Bourne Shell script, command substitution, comments..
Course Outcomes: After learning this course students will be able to	
1	To demonstrate the basic knowledge of Linux commands and file handling utilities by using Linux shell environment
2	To evaluate the concept of shell scripting programs by using an AWK and SED commands.
3	To create the directory, how to change and remove the directory.
4	To analyze the process of how the parent and child relationships
5	To understand the concept of client-server communication by using sockets.
6	Discuss shell programming in Linux operating system

Experiment List

1.
a) Study of Unix/Linux general purpose utility command listman, who, cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown.
b) Study of vi editor.
c) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system.
d) Study of Unix/Linux file system (tree structure).

e) Study of .bashrc, /etc/bashrc and Environment variables.
2. Write a C program that makes a copy of a file using standard I/O, and system calls
3. Write a C program to emulate the UNIX ls –l command.
4. Write a C program that illustrates how to execute two commands concurrently with a command pipe. 5. Ex: - ls –l | sort
6. Write a C program that illustrates two processes communicating using shared memory
7. Write C program to create a thread using pthreads library and let it run its function.
8. Write a C program to illustrate concurrent execution of threads using pthreads library.
9. Write a shell script that accept a file name starting and ending line numbers as arguments and display all the lines between given line no: Write a shell script that delete all lines containing a specified word
10. Write a shell script that displays a list of all the files in the current directory ; Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. whenever the argument is a file or directory.
11. Write a java script to find the number of characters, words and lines in a file? linked list respectively. Write a C Program that makes a copy of a file using standard I/O and system calls? Implement in C the following Unix commands using system calls A) cat B)mv
12. Write a C program that illustrates how an orphan is created; Write a program that illustrates how to execute two commands concurrently with a command pipe.? Write C programs that illustrate communication between two unrelated processes using named pipe.
13. Write a client and server programs (using c)for interaction between server and client processes using Internet Domain sockets? Write a program to implement the shared memory . Write a client and server programs (using c)for interaction between server and client processes using Internet Domain sockets? . Write a C program that illustrates two processes.
Text Books:
1. Cristopher Negus, “Red Hat Linux Bibl”e, Wiley Dreamtech India 2005 edition.
2. Yeswant Kanethkar, “UNIX Shell Programming”, First edition, BPB.
Reference Books:
1. Robert Love,” Linux System Programming”, O’Reilly, SPD.
2. W.R.Stevens,” Advanced Programming in the Unix environment”, 2nd Edition, Pearson Education.
3. W.R.Stevens , “Unix Network Programming” ,PHI.
4. Graham Glass, King Ables, “Unix for programmers and users”, 3rd Edition, Pearson Education.

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B. Tech. (Electronics & Communication Engineering) Sem II **INTEGRAL TRANSFORMS AND VECTOR CALCULUS**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination(UE): 60 Marks	Credits : 04
Practical:--	Internal Assessment(IA): 40 Marks	
Tutorial: 01		Credit : 01
	Total Marks: 100 Marks	Total Credits: 05

Course Pre-requisites:	
The students should have knowledge of	
1	Integrals.
2	Fourier series.
3	Vector algebra.

Course Objectives:	
1	Methods to solve differential equations
2	Various techniques of integral transform.
3	line, surface and volume integrals.

Course Outcomes: After learning this course students will be able to	
1	Implement the methods for first order first degree differential equation.
2	Understand the modeling of physical systems and find the solutions.
3	Solve the nth order linear differential equation.
4	Compute the integral transform for various functions.
5	Apply the Laplace transform for solving differential equations
6	Understand vector calculus and apply it to evaluate line, surface and volume integrals.

UNIT – I	**Differential Equation**	**(08 Hours)**
	Formation of the ordinary differential equations(ODEs), Solution of an ordinary differential equation, Equations of the first order and first degree, Linear differential equation, Bernoulli's equation, Exact differential equations, Equations reducible to exact equations,	
UNIT – II	**Applications of Differential Equation**	**(08 Hours)**
	Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under	

	Gravity, Rectilinear Motion, Simple Harmonic Motion, One–Dimensional Conduction of Heat.	
UNIT - III	**Linear Differential Equations**	**(08 Hours)**
	Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's &Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE, Modeling of Electrical Circuits.	
UNIT - IV	**Z-transform**	**(08 Hours)**
	Fourier Transform (FT): Complex Exponential Form of Fourier series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory **Z-Transform (ZT)**: Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.	
UNIT -V	**Laplace Transform**	**(08**
	Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz., Periodic, Unit Step, Unit Impulse, ramp, jump, . Problems on finding LT & inverse LT. Applications of LT and Inverse LT for solving ordinary differential equations.	
UNIT - VI	**Vector Calculus**	**(08 Hours)**
	Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities. Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem, Applications to Problems in Electro-Magnetic Fields.	

Text Books:

2. P. N. Wartikar and J. N. Wartikar, "Applied Mathematics (Volumes I and II)", 7th Ed., Pune Vidyarthi Griha Prakashan, Pune, 2013.

References Books:

1. B. S. Grewal, "Higher Engineering Mathematics", 42th Ed., Khanna Publication, Delhi
2. B.V. Ramana, "Higher Engineering Mathematics", 6th Ed., Tata McGraw-Hill, New Delhi, 2008.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Ed., John Wiley & Sons, Inc., 2015.

4. Peter V. O'Neil, “Advanced Engineering Mathematics”, 7th Ed., Cengage Learning, 2012.
5. Michael Greenberg, “Advanced Engineering Mathematics”, 2nd Ed., Pearson Education, 1998.
Project based learning:
1. Formation of differential equations
2. Evaluate the electric circuit problem using differential equations
3. Evaluate the heat conduction in 1-D using differential equations
4. Evaluate the rectilinear motion problem using differential equations
5. Evaluate the simple harmonic problem using differential equations
6. Obtain the solution of Simultaneous & Symmetric Simultaneous DE
7. Obtain the solution of Simple Difference Equations using Z-transforms
8. Find the Directional Derivatives
9. Find work done using Green’s theorem
10. Find scalar potential using vectors
11. Evaluating integrals using Green’s theorem, Gauss’s and stoke’s theorem
12. Use Laplace transform to solve differential equations
13. Use Laplace transform to solve integrals equations
14. Use Fourier transform to solve integrals
15. Applications of vector integration to solve problems in Electro-Magnetic Fields.
16. Find the conditions for Solenoidal and irrotational vector fields

Students in a group of 3 to 4 shall complete any one project from the above list.

B.Tech.(Electronics & Communication)Sem V

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./ Week)			Examination Scheme(Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
27		Information Theory& Coding	4	2	0	60	40	25	0	0	125	4	1	0	5
28		Digital Signal Processing	4	2	0	60	40	25	25	0	150	4	1	0	5
29		Embedded System Design	4	2	0	60	40	25	0	25	150	4	1	0	5
30		Fuzzy Logic, Neural Networks&Genetic Algorithms	4	2	0	60	40	25	25	0	150	4	1	0	5
31		Telecom Switching Techniques*	3	0	0	60	40	0	0	0	100	3	0	0	3
32		Vocational Course-III Calibration & Measuring Instruments	0	2	0	0	0	25	25	0	50	0	1	0	1
33		Web Development	0	2	0	0	0	25	0	0	25	0	1	0	1
	Total		**19**	**12**	**0**	**300**	**200**	**150**	**75**	**25**	**750**	**19**	**6**	**0**	**25**
	Environmental Studies**		2	-	-	50	-	-	-	-	-	-	-	-	-
	Social Activity-II ***		-	-	-	-	-	-	-	-	-	-	-	-	2

*Industry Taught Course–III
**Mandatory audit course
***Add on course

Bharati Vidyapeeth
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B. Tech. (Electronics & Communication Engineering) Sem V
INFORMATION THEORY AND CODING

Teaching Scheme:	**Examination Scheme:**	**Credits Allotted:**
Theory: 04	End Semester Examination (ESE): 60 Marks	Credits: 04
Practical: 02	Internal Assessment (IA): 40 Marks	Credit: 01
	TW:25 Marks	
	Total:125 Marks	Total Credits: 05

Course Pre-requisites:

The students should have knowledge of

1	Digital Communication

Course Objectives:

1	To understand the concept of Entropy, the Rate of information and order of the source regarding dependent and independent sources.
2	To study various source encoding algorithms.
3	To model discrete & continuous communication channels.
4	To make students aware of various error control coding algorithms.
5	To have a detailed knowledge of compression and decompression techniques.
6	To introduce the concepts of multimedia communication.

Course Outcomes: After learning this course students will be able to

1	Differentiate between Dependent & Independent Sources, Entropy & Rate of Information.
2	Encode the information using Shannon, Shannon Fano, Prefix, and Huffman coding Algorithms.
3	Model the continuous and discrete communication channels using input, output, and joint probabilities.
4	Determine a codeword comprising of the check bits computed using Linear Block codes, cyclic codes & convolutional codes, BCH, and Golay codes.
5	Develop the encoding and decoding using various compression coding techniques.
6	Design a multimedia communication system using compression and decompression techniques.

UNIT – I	**Unit-1 Information Theory**	**(07 Hours)**
	Introduction, Measure of a information, Information content of message, Average Information content of symbols in Long Independent sequences, Average Information content of symbols in Long dependent sequences, Markov Statistical Model of Information Sources, Entropy and Information rate of Markoff Sources	

UNIT – II	**Source Coding**	**(07 Hours)**
	Source coding theorem, Prefix Codes, Kraft McMillan Inequality property – KMI, Encoding of the Source Output, Shannon's Encoding Algorithm. Shannon Fano Encoding Algorithm, Huffman codes, Extended Huffman coding, Arithmetic Coding, Lempel – Ziv Algorithm	
UNIT – III	**Information Channels**	**(08 Hours)**
	Communication, Channel Models, Channel Matrix, Joint probability Matrix, Binary Symmetric Channel, System Entropies, Mutual Information, Channel Capacity, Channel Capacity of: Binary Symmetric Channel, Binary Erasure Channel, Muroga's Theorem, Continuous Channels	
UNIT – IV	**Error Control Coding**	**(10 Hours)**
	methods of Controlling Errors, Types of Errors, types of Codes, Linear Block codes – Syndrome Decoding – Minimum distance consideration – cyclic codes – Generator Polynomial – Parity check polynomial – Encoder for cyclic codes – calculation of syndrome – Convolutional codes. Binary Cyclic Codes, BCH Codes, Convolution Codes: Convolution Encoder, Code Tree, Trellis and State Diagram, Viterbi Algorithm	
UNIT – V	**Compression Techniques**	**(08 Hours)**
	Principles – Text compression – Static Huffman Coding – Dynamic Huffman coding – Arithmetic coding – Image Compression – Graphics Interchange format – Tagged Image File Format – Digitized documents – Introduction to JPEG standards.	
UNIT – VI	**Audio And Video Coding**	**(08 Hours)**
	Linear Predictive coding – code excited LPC – Perceptual coding, MPEG audio coders – Dolby audio coders – Video compression – Principles – Introduction to H.26x & MPEG Video standards.	

Term Work:

The term work shall consist of record of minimum eight experiments using MATLAB

1. Write a program for determination of various entropies and mutual information of a given channel. Test various types of channels such as
   a) Noise free channel.
   b) Error free channel

Compare channel capacity of above channels

2. Write a program for generation and evaluation of variable length source coding using Shannon – Fano coding and decoding
3. Write a program for generation and evaluation of variable length source coding using Huffman Coding and decoding

4. Write a program for generation and evaluation of variable length source Lempel Ziv Coding and decoding
5. Write a Program for coding & decoding of Linear block codes.
6. Write a Program for coding & decoding of Cyclic codes.
7. Write a program for coding and decoding of convolutional codes.
8. Write a simulation program to implement source coding and channel coding for transmitting a text file
9. Write a simulation program to implement video compression using H.261
10. Implementation of any compression algorithm for audio data
11. Implementation of any compression algorithm for image or video data
Text Book/ Reference Books:
1. Digital and analog communication systems, K. Sam Shanmugam, John Wiley India Pvt. Ltd, 1996.
2. Digital communication, Simon Haykin, John Wiley India Pvt. Ltd, 2008. 3. Information Theory and Coding, Muralidhar Kulkarni, K.S. Shivaprakasha, Wiley India Pvt. Ltd, 2015, ISBN:978-81-265-5305-1.
3. Fred Halsall, Multimedia Communications, Applications Networks Protocols and Standards, Pearson Education, Asia 2002; Chapters: 3,4,5.
4. Digital Image Processing, Rafael C. Gonzalez and Richard E. Woods ,4rd edition
5. ITC and Cryptography, Ranjan Bose, TMH, II edition, 2007
6. Principles of digital communication, J. Das, S. K. Mullick, P. K. Chatterjee, Wiley, 1986 - Technology & Engineering
7. Digital Communications – Fundamentals and Applications, Bernard Sklar, Second Edition, Pearson Education, 2016, ISBN: 9780134724058.
8. Information Theory and Coding, K. N. Haribhat, D. Ganesh Rao, Cengage Learning, 2017.
9. Mark Nelson, “Data Compression Book”, BPB Publication 1992.
10. Watkinson J, “Compression in Video and Audio”, Focal Press, London, 1995.
Project Based Learning:
Students are expected to perform a project (in a group) based on the course and prepare a report for the same. The report should be as per the standard guidelines.

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B. Tech. (Electronics & Communication Engineering) Sem V
DIGITAL SIGNAL PROCESSING

Teaching Scheme	Examination Scheme	Credits Allotted
Theory: 04	End Semester Examination (ESE): 60 Marks	Credits: 04
Practical:02	Internal Assessment (IA): 40 Marks	Credit:01
	TW: 25 Marks & OR: 25 Marks	
	Total:150 Marks	Total Credits:05

Course Pre-requisites:

The students should have the knowledge of

1	Mathematical Preliminaries
2	Signals and Systems

Course Objectives:

1	To introduce the concept of Discrete Fourier Transform.
2	To learn the algorithm of fast computation
3	To design the finite impulse response filter & infinite impulse response filter
4	To examine the finite word-length effect of a filter
5	To understand the architecture & programming of a DSP processor

Course Outcomes: After learning this course students will be able to

1	Compute the Discrete Fourier transform & Fast Fourier transform
2	Design and realize appropriate linear FIR filters based on frequency domain specifications
3	Design and realize appropriate digital IIR filters through the classical approach of analog filter design
4	Evaluate the finite word length effect in digital filters
5	Implement the various applications on the DSP processor
6	Experiment with speech processing applications

UNIT – I	**Discrete Fourier Transform**	**(07 Hours)**
	Overview of signals and systems, Definition of DFT, Matrix representation and its inverse, Properties; duality, linearity, Complex Conjugation, time reversal, Circulation shifting, circular convolution and its graphical interpretation, circular correlation, filtering with block convolution. Introduction to Discrete Cosine Transform	
UNIT – II	**Fast Fourier Transform**	**(09 Hours)**
	Direct computation of D.F.T., its computational complexity, FFT algorithms, their classification, radix 2 FFT algorithms, Decimation-in-Time – FFT, Decimation-in-Frequency –FFT, Inverse radix 2	

	algorithms, FFT algorithms for composite value of N, Goertzel's algorithm, Chirp Z transform algorithm, Quantization effects, applications. Relation between DFT and FFT.	
UNIT – III	**Finite Impulse Response Filter**	**(08 Hours)**
	FIR Filter Design Ideal filter requirements, Gibbs phenomenon, windowing techniques, characteristics and comparison of different window functions, Design of linear phase FIR filter using windows and frequency sampling method. FIR filters realization using direct form, cascade form and lattice form	
UNIT – IV	**Infinite Impulse Response Filters**	**(08 Hours)**
	IIR filter design from analog filters using approximation of derivatives, impulse invariance, Bilinear transform, warping effect. Characteristics of Butterworth filters, Chebyshev filters and elliptic filters, Butterworth filter design, IIR filter realization using direct form, cascade form and parallel form, Finite word length effect in IIR filter design, IIR filters design from pole zero plots.	
UNIT – V	**Finite Word Length Effects in Digital Filters**	**(08 Hours)**
	Fixed- and floating-point number representation, sign-magnitude, 1's & 2's complement, Quantization noise in signal representation, effects due to truncation and rounding, SQNR computation and limit cycle, Quantization in Floating Point realization IIR, finite word length effects in FIR	
UNIT – VI	**Introduction to DSP Processors and Application**	**(08 Hours)**
	Introduction to DSP Processor, Sampling rate conversion by a non-integer factor, Design of two stage sampling rate converter, General Architecture of DSP, Introduction to Code composer studio. Application of DSP to Voice Processing, Music processing, Image processing and Radar processing	

Term Work:
Minimum 10 experiments should be conducted using MATLAB & at least one using hardware.
1. Preform DTFS and DTFT on periodic and non-periodic signals.
2. Perform DFT and IDFT on DT signal.
3. Find the frequency response and stability of DT system using convolution.
4. Perform convolution using overlap and add method.
5. Perform circular convolution.
6. To plot pole-zero plot of Z-domain using transfer function.
7. To solve the difference equation and find the system response using Z transform.
8. To find the impulse invariance IIR digital filter to realize the first order analog Butterworth filter.

9. To design IIR filter for first order analog Butterworth approximation using bilinear transformation.
10. Plot the frequency response for the rectangular and Hamming window.
11. To design FIR filter using frequency sampling method.
12. To plot spectrogram of speech signal.
13. To implement convolution sum using DSP processor.
14. To implement Speech processing applications using DSP processors.
Text Book/ Reference Books:
1. Essentials of Digital Signal Processing, B P Lathi, Cambridge University Press, 2014
2. Digital Signal Processing: Principles Algorithms and Applications, Proakis John and Manolakis, D. G. Prentice Hall 2012
3. Discrete Time Signal Processing, Oppenheim, Schafer & Buck, Pearson, 3e, 2008.
4. Real-Time Digital Signal Processing from MATLAB to C with the TMS320C6x DSPs, Welch, Wright and Morrow, Second Edition, CRC Press
5. Digital Signal Processing A Computer -Based Approach, Mitra S.K, Tata McGraw- Hill
6. Lyons, Richard. "Digital signal processing." *New York* (2006): 23-54.
Project Based Learning:
Students are expected to perform a project (in a group) based on the course and prepare a report for the same. The report should be as per the standard guidelines.

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B. Tech. (Electronics & Communication Engineering) Sem V
EMBEDDED SYSTEM DESIGN

Teaching Scheme:	**Examination Scheme:**	**Credits Allotted:**
Theory: 04	End Semester Examination (ESE): 60 Marks	Credits: 04
Practical: 02	Internal Assessment (IA): 40 Marks	Credit: 01
	TW: 25 Marks & Practical: 25 Marks	
	Total:150 Marks	Total Credits: 05

Course Pre-requisites:

The students should have knowledge of

1	Fundamentals of Computer, Computer Organization, and Architecture
2	Microcontroller and Applications

Course Objectives:

1	To make the student understand the need & application of embedded system.
2	To learn the Micro-python programming
3	To make the student aware of the ESP modules
4	To understand the concept of RTOS.
5	To introduce the concept of task communication
6	To interpret the applications of ESP modules

Course Outcomes: After learning this course students will be able to

1	Describe the architecture of embedded systems
2	Write Micro-python program for hardware application
3	Identify the features & architecture of the ESP modules
4	Elaborate the need of real time systems
5	Discuss the issues related to real time operating system
6	Select & use the appropriate ESP module for real world application

UNIT – I	**Introduction to Embedded Systems**	**(06 Hours)**
	Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems,Characteristics and Quality Attributes of Embedded Systems. Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs.	
UNIT – II	**Introduction to Micro-python language**	**(08 Hours)**
	Introduction, Physical computing, Micro-Python hardware, Micro-	

	python workflow, The Micro-python interactive Interpreter mode (aka REPL) Auto-intent, Auto-Completion, interrupting a running Program, paste mode, soft reset.	
UNIT – III	**Introduction to ESP modules**	**(09 Hours)**
	Espress if systems, Introduction to ESP 8266 and ESP32, block diagram, features, functional description, peripherals & sensors, applications.	
UNIT – IV	**Concepts of real time operating system**	**(08 Hours)**
	Operating system basics, Types of OS, Tasks, process, Threads Multiprocessing and, Multitasking , Task scheduling,Introduction to Free RTOS and Mbed OS .	
UNIT – V	**Task Communication**	**(08 Hours)**
	Shared Memory, stack memory, Context switching, Tasks and queues, semaphores, Controlling tasks, task management, inter-task communication	
UNIT – VI	**Interfacing of ESP modules to external devices**	**(09 Hours)**
	Interfacing of ESP 8266 and ESP 32 real world applications with Arduino IDE using Micro-python, Embedded C.	

Term Work:

The term work shall consist of record of minimum eight experiments using ESP 8266/ESP 32 and programming in Embedded C/Micro python/Free RTOS.

1. To Interface LED and write a program to turn on LED.
2. To Interface digital sensor (IR/LDR) and write a program to turn on LED at sensor detection.
3. To Interface motor through relay and write a program to turn on motor when push button is pressed
4. Interfacing of LCD module
5. Create a web page to be hosted by ESP 32
6. To interface Seven Segment display
7. Generation of PWM signal for motor control
8. Program/code to estimate the stack memory
9. Program/code to communicate between two tasks using queues
10. Program/code to understand the application of mutex
11. Program/code to understand the application of binary semaphore
12. Interface DHT22 using Micropython

Text Book/Reference Books:
1. J.W. Valvano, "Embedded Micro computer System: Real Time Interfacing", Brooks/Cole, 2000.
2. Jack Ganssle, "The Art of Designing Embedded Systems", Newnes, 1999.
3. David Simon, "An Embedded Software Primer", Addison Wesley, 2000.
4. A. Gupta, “Microcontroller and Embedded Systems”, S.K. Kataria & Sons (India), 2019.
5. Vedat O Oner,”Developing IoT projects with ESP32”, Packet Publishing, 2021
6. Koen Vervloesem,”Getting started with ESPHome, Elektar, 2021
7. Kamal, Raj. Embedded systems: architecture, programming and design. Tata McGraw-Hill Education, 2011.
Project Based Learning:
Students are expected to perform a project (in a group) based on the course and prepare a report for the same. The report should be as per the standard guidelines.

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B. Tech. (Electronics & Communication Engineering) Sem V
FUZZY LOGIC, NEURAL NETWORKS & GENETIC ALGORITHMS

Teaching Scheme:	Examination Scheme:	Credits Allotted:
Theory: 04	End Semester Examination (ESE): 60 Marks	Credits: 04
Practical: 02	Internal Assessment (IA): 40 Marks	Credit: 01
	TW: 25 Marks and OR: 25 Marks	
	Total:150 Marks	Total Credits: 05

Course Pre-requisites:

The students should have knowledge of

1	Probability and Statistics
2	Signals and Systems

Course Objectives:

1	To introduce a relatively new computing paradigm for creating intelligent machines useful for solving complex real-world problems
2	To give insight into the tools that make up the soft computing technique: fuzzy logic, artificial neural networks, and evolutionary algorithms.
3	To create awareness of the application areas of neural network techniques.
4	To provide alternative solutions to the conventional problem-solving techniques in signal processing, pattern recognition, and classification, control system.
5	To understand Genetic algorithm and Evolutionary Algorithm

Course Outcomes: After learning this course students will be able to

1	Describe the fundamentals of Crisp sets, Fuzzy sets, Fuzzy Relations, and Fuzzy Logic Controller.
2	Design fuzzy system for application in electronics and communication engineering.
3	Compare the various architectures for building an ANN and its applications
4	Develop neural network systems to solve real-world problems.
5	Categorize Genetic and Evolutionary algorithm
6	Program Genetic and Evolutionary algorithm

UNIT – I	Fuzzy Sets, Uncertainty, and Relations	(08 Hours)
	Uncertainty and information, fuzzy sets and membership functions, chance versus fuzziness, properties of fuzzy sets, and fuzzy set operations. Cardinality, operations, properties, fuzzy Cartesian product and composition, fuzzy tolerance and equivalence relations, forms of composition operation	
UNIT– II	**Fuzzification, Defuzzification, and Membership Function**	**(08 Hours)**

	Various forms of membership functions, fuzzification, defuzzification to crisp sets and scalars. Membership value assignments: intuition, inference, rank-ordering, neural networks, genetic algorithms, inductive reasoning.	
UNIT – III	**Artificial Neural Network-I**	**(08 Hours)**
	Introduction to Early ANN architectures (basics only)- McCulloch & Pitts model, Perceptron, learning paradigms: supervised, unsupervised, reinforcement, Linear neuron model: the concept of error energy, gradient descent algorithm and application of linear neuron for linear regression, Activation functions: binary, bipolar (linear, signup, log sigmoid, tan-sigmoid) Learning mechanisms: Hebbian, Delta Rule.	
UNIT – IV	**Artificial Neural Network-II**	**(08 Hours)**
	Multilayer perceptron (MLP) and back propagation algorithm, Application of MLP for classification and regression, Self-organizing Feature Maps, k-means clustering, Learning vector quantization Radial Basis Function, Application of RBFN for classification and regression.	
UNIT – V	**Introduction to Genetic Algorithm**	**(08 Hours)**
	Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, schema theorem, Classification of genetic algorithm, Holland classifier systems, genetic programming, applications of genetic algorithm, Convergence of GA.	
UNIT – VI	**A Brief Introduction to Deep Learning**	**(08 Hours)**
	Introduction, Neural Nets as Universal Approximators, Modelling a specified input-output relationship: the problem of learning a Neural Net, Learning from data: Empirical risk minimization, Models of vision, Convolutional Neural Networks, Learning in Convolutional Neural Networks. Learning in CNNs, transpose Convolution, Time Series and Recurrent Networks.	

List of Tutorials/Experiments: The students have to perform a minimum of eight experiments using MATLAB/SCILAB, and Python libraries.

1. Study of Fuzzy sets and operations.
2. Study of fuzzy relation, Max-min composition.
3. Analyze t-norms and t-conorms.
4. Analyze Fuzzy Inference systems with any of the models (Mamdani, Sugeno, and Tsukamoto).
5. Study of learning mechanisms, approaches, and activation functions in ANN.
6. Implement Multilayer perceptron (MLP) and back propagation algorithm
7. Implement Radial Basis Function networks.

8. Implement Crossover, mutation, crossover, and mutation rates.
9. Implement Mixing different search operators.
10. Study of Genetic Algorithm
11. Build CNN and Test for synthetic data/time series data.
Text Book/ Reference Books:
1. Principles of Soft Computing, S. N. Sivanandam, S. N. Deepa, John Wiley & Sons, 2007.
2. Evolutionary Computation: A Unified Approach, Kenneth A, De Jong, Prentice-Hall of India Pvt.Ltd.
3. Fuzzy Logic with Engineering Applications, Third Edition Thomas, Timothy Ross, John Wiley & Sons,2010.
4. A First Course in Fuzzy Logic, Third Edition, Hung T. Nguyen, Elbert A. Walker, Taylor & Francis Group, LLC, 2008.
5. Introduction to Fuzzy Logic using MATLAB, S. N. Sivanandam ,S.Sumathi, S. N. Deepa, Springer Verlag, 2007.
6. Neuro- Fuzzy and Soft Computing, J.S. Jang, C.T. Sun, E. Mizutani, PHI Learning Private limited.
7. Fundamentals of Neural Networks: Architectures, Algorithms and Applications, Laurene Fausett, Pearson Education, Inc, 2008.
8. Neural Networks A comprehensive foundation, Simon Haykin, Prentice Hall International Inc- 1999.
9. Neural Networks and Deep Learning, Michael Nielsen, *Online book, 2016*
10. Deep Learning Step by Step with Python: A Very Gentle Introduction to Deep Neural Networks for Practical Data Science, N. D. Lewis
Project-Based Learning:
Students are expected to perform a project (in a group) based on the course and prepare a report for the same. The report should be as per the standard guidelines.

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B. Tech. (Electronics & Communication Engineering) Sem V
ITC-III:TELECOM SWITCHING TECHNIQUES

Teaching Scheme:	**Examination Scheme:**	**Credits Allotted:**
Theory: 03	End Semester Examination (ESE): 60 Marks	Credits: 03
	Internal Assessment (IA): 40 Marks	
	Total:100 Marks	Total Credits: 03

Course Pre-requisites:
The students should have knowledge of

1	Probability & Statics Digital Communication

Course Objectives:

1	To learn the concepts of switching system and networks in detail.
2	To educate the students about measurement of telecommunication network traffic using mathematical model, performance and quality of service.

Course Outcomes: After learning this course students will be able to

1	Comprehend the basic concepts and architecture of SS7.
2	Exemplify about the session initiation protocol.
3	Infer about the switching techniques and its relative merits.
4	Apply the principles of queuing theory for performance measurement of telecommunication networks.
5	Identify the IP Multimedia Subsystem's (IMS) role in Next Generation Networking.
6	Evaluate the ISDN architecture and plethora of services provided by ISDN.

UNIT – I	**Switching:**	**(08Hours)**
	Electronic Space Division Switching: Stored Program Control, Centralized SPC, Distributed SPC, Enhanced Services, Two stage networks, Three stage network n-stage networks. **Time Division Switching:** Time multiplexed Space Switching, Time Multiplexed time switching, combination Switching, three stage combination switching, n-stage combination switching.	
UNIT – II	**Signalling System No.7 -SS7:**	**(05 Hours)**
	Signaling Overview, Network Architecture, SS7 Signal Data Links, SS7 Applications, Signaling Connection Control Part (SCCP).	
UNIT – III	**Session Initiation Protocol-SIP:**	**(05 Hours)**
	Introduction, Network Elements, SIP system architecture, SIP basic call flow, SIP-Mobility.	

UNIT – IV	**Traffic Engineering:**	**(06Hours)**
	Network Traffic load and parameters, Grade of service and blocking probability, Modeling Switching Systems, Incoming Traffic and Service Time Characterization, Blocking Models and Loss Estimates, Delay systems.	
UNIT – V	**Integrated Services:**	**(07Hours)**
	Digital Networks: Motivation for ISDN, New services, Network and Protocol architecture, Transmission Channels, User Network Interface, Numbering and Addressing, Service characterization, Interworking, ISDN standards, Broadband ISDN, Voice data Integration.	
UNIT – VI	**IP Multimedia Subsystem (IMS):**	**(05 Hours)**
	Introduction, IMS Concepts, Functional Entities and their Roles, Architecture, IMS Call Flow.	

Text /Reference Books:

1. Thiagarajan Vishwanathan, "Telecommunication Switching Systems and Networks"; PHI Publications.
2. J. E. Flood, "Telecommunications Switching, Traffic and Networks", Pearson Education.
3. R. A. Thomson, "Telephone switching Systems", Artech House Publishers.
4. Vijay Garg, "Wireless Communications and networking ", Elsevier.
5. James P. Martin, "Modern Telecommunication networks", PHI Publication
6. T. N. Saadawi, M. H. Ammar, A. E. Hakeem, "Fundamentals of Telecommunication Networks", Wiley Interscience.
7. W.D. Reeve, "Subscriber Loop Signaling and Transmission Handbook", IEEE Press (Telecomm Handbook Series).
8. https://datatracker.ietf.org/doc/html/rfc3261
9. https://www.eventhelix.com/ims/

Project-Based Learning:

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B. Tech. (Electronics & Communication Engineering) Sem V
CALIBRATION & MEASURING INSTRUMENTS

Teaching Scheme:	Examination Scheme:	Credits Allotted:
Practical:02	TW:25 Marks	Credit: 01
	OR: 25 Marks	
	Total:50 Marks	Total Credits: 01

Course Pre-requisites:

The students should have knowledge of

1	Electronic Devices
2	Integrated Circuits
3	Digital Electronics

Course Objectives:

1	To classify measuring electronic equipment based on the applications.
2	To familiarize with measurement methods of electronic measuring equipment.
3	To analyze various signals using different measuring equipment.
4	To calibrate electronic measuring equipment.

Course Outcomes: After learning this course students will be able to

1	Distinguish electronic instruments viz signal generators, wave analyzers, and various oscilloscopes by knowing their specifications for electronic measurements.
2	Reproduce the required signals using various measuring equipment.
3	Calibrate digital oscilloscope, function generator, and signal generator.
4	Use True RMS meter and DMM as per practical applications.
5	Calculate unknown frequency/phase shift with Lissajous pattern
6	Analyzeanalog/digital signal for a particular application.

Term Work:

The term work shall consist of record of minimum eight experiments

1. Use of Signal generator, Universal counter & DSO for electronic signal measurements.
2. Use of Distortion factor meter for electronic signal measurements.
3. Measure phase shift using CRO/DSO.
4. Analyze the frequency using spectrum analyzer.
5. Use of Logic analyzer to analyze digital signal.
6. Use of Vector network analyzer to analyze electronic signal.
7. Configure dual power supply for OP-AMP applications.
8. Measure True RMS value with DMM/True RMS meter.

9. Troubleshoot front panel functions of the oscilloscope.
10. To calculate Q factor using LCR-Q meter.
11. To plot the characteristics of various transistors using Curve tracer.
Text Book/Reference Books:
1. “Troubleshooting Electronic Equipment”, by R. Khandpur
2. “How to Diagnose and Fix Everything Electronic”, Second Edition by Michael Jay Geier
3. Datasheets and manuals
4. H. S. Kalsi, “Digital Instrumentation”, Tata McGraw Hill
5. Clyde F. Coombs “Electronic Instrumentation Handbook” McGraw Hill
6. Cooper Helfric, “Electronic Instrumentation & Measurement Techniques”, PrenticeHall Publication.

Bharati Vidyapeeth
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College of Engineering, Pune

B. Tech. (Electronics & Communication Engineering) Sem V

WEB DEVELOPMENT

Teaching Scheme:	Examination Scheme:	Credits Allotted:
Practical: 02	TW: 25 Marks	Credit: 01
	Total: 25 Marks	Total Credits: 01

Course Pre-requisites:

The students should have knowledge of

1	Computation & Programming using C
2	Data Structures

Course Objectives:

1	To introduce the basics of web development technologies
2	To explain web servers and understanding of DNS and HTTP
3	To make aware of vanilla JavaScript for writing business logic
4	To introduce MongoDB database
5	To familiarize various concepts of SQL
6.	To make students aware of cloud technology

Course Outcomes: After learning this course students will be able to

1	Create web pages using HTML
2	Identify the recursive and non-recursive query in DNS
3	Understand Javascript for writing websites
4	Install React, MongoDB, Express library for Frontend app
5	Apply SQL to create database connectivity
6	Design Cloud to push local database using MongoDB Atlas

Term Work:

The term work shall consist of a record of any ten experiments.

List of Practicals:

1. Introduction to web development technologies Create your first HTML document. Learn CSS properties and use it add design and make the HTML Attractive. Simple Javascript Primer. Create a navbar with dropdowns using javascript and load related pages on mouse click. Access the DOM with JS event properties and make the page dynamic.
2. Web server and understanding DNS, by creating an image searching app, using unspash api to retrieve images via HTTP request and showing the requested data on UI using vanilla JavaScript. with use of HTTP protocol.
3. Creating domains,(getting an original domain name) Project, create a sample static website with vanilla JavaScript, HTML, CSS(Use JavaScript to create drop downs, or handling event listeners such as on Click, using the same js to alter DOM element with a inBuilt JS function.e.g (geteElementById, getElementByClass etc.). make the site responsive without bootstrap using only media queries.Using FTP protocol to host data on the domain.
4. Create a todolist app with vanilla JS, without database saving feature. Create a to-do list app with react, saving the to-do items to database MongoDB(Install MongoDB and start local mongo server) and just add another button for delete on every To-do. Basically to-do

	adding and deleting should work
5.	React frontend library. Understanding Virtual DOM. What is JSX. The Component system. Understanding props and state in React. Create your first react app with a simple component and another component within it, sending data through props.
6.	What is server. Create your first server-side document. Setup server port configuration. What is the Express middleware. Installing the Express library. Create your first route and display Hello World on Browser.
7.	Connecting React frontend with server side backend using HTTP protocol by fetch method.
8.	Bootstrap. Installing Bootstrap. Creating sample Website and making it responsive visually appealing with Bootstrap and CSS.
9.	Database and why its needed. Two types of database SQL and noSQL. Difference between SQL and NoSQL. Creating simple queries and different types of join in SQL
10.	What is MongoDB noSQL database. Setting up local MongoDB development environment. MongoDB Queries in mongo console.
11.	What is Mongoose library and why its easy way to handle MongoDB operations. Simple types of Mongo queries to access data from database. Create you first data by model by mongoose schema and access the database by simple Mongo query.
12.	The MVC architecture and how its related to Nodejs full stack.
13.	Putting it all together. Setting up document structure. Setup express node js server and send data to parent route. Create your first React app by simple react command in the document structure. Create three routes Home, About and Contact and create a form on contact page, access the filled parameters from react and send it to express backend, save it to database
14.	Use CRUD. Server backend data to show details in frontend. Add a delete method.
15.	Cloud fundamentals. Using MongoDB Atlas to push local database to cloud. Use Netlify to push client React code by using Build command. Connect both cloud parameters. Format the code with best practices. Introduction to industry tools and best practices.

Text Books/ Reference Books:

1. Web Technologies, Uttam K Roy, Oxford University Press
2. Java Server Pages – Hans Bergsten, SPD O'Reilly
3. Java Script, D.Flanagan, O'Reilly, SPD
4. Java Server Pages – Hans Bergsten, SPD O'Reilly
5. Beginning Web Programming-Jon Duckett WROX.
6. Programming world wide web, R.W. Sebesta. Fourth Edition, Pearson.

Bharati Vidyapeeth (Deemed to be University),Pune
Faculty of Engineering and Technology
Programme:B.Tech.(Electronics & Communication)–CBCS 2021 Course

B.Tech.(Electronics & Communication)Sem VI

Sr. No.	Course Code	Name of Course	Teaching Scheme(Hrs ./Week)			Examination Scheme(Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
34		Computer Communication Networks	4	2	0	60	40	25	25	0	150	4	1	0	5
35		Cellular Technology and 4G	3	0	0	60	40	0	0	0	100	3	0	0	3
36		VLSI Design Technology	4	2	0	60	40	25	0	25	150	4	1	0	5
37		Quantitative Techniques Communication and Values	4	0	0	60	40	0	0	0	100	4	0	0	4
38		Industrial IOT and ML*	3	2	0	60	40	25	0	25	150	3	1	0	4
39		Vocational Course-IV RF Cell Planning & Drive Test Analysis	0	2	0	0	0	25	25	0	50	0	1	0	1
40		Power Electronics	0	2	2	0	0	50	0	0	50	0	1	2	3
	Total		**18**	**10**	**2**	**300**	**200**	**150**	**50**	**50**	**750**	**18**	**5**	**2**	**25**
	MOOC-II**		--	--	--	-	-	--		--	--	-	-	-	2

**Industry Taught Course– IV
** Add on course

Bharati Vidyapeeth **(Deemed to be University)** **College of Engineering, Pune**			
B. Tech. (Electronics & Communication Engineering) Sem VI **COMPUTER COMMUNICATION NETWORKS**			
Teaching Scheme	**Examination Scheme**		**Credits Allotted**
Theory: 04	End Semester Examination (ESE): 60 Marks		Credits: 04
Practical: 02	Internal Assessment (IA): 40 Marks		Credit: 01
	TW: 25 Marks & OR: 25 Marks		
	Total: 150 Marks		Total Credits: 05
Course Pre-requisites:			
The students should have knowledge of			
1	Telecom Switching Network		
Course Objectives:			
1	To understand the layering architecture of OSI reference model and TCP/IP protocol suite.		
2	To describe the protocols associated with each layer.		
3	To learn the different networking architectures and their representations.		
4	To interpret the various routing techniques		
5	To formulate the security issues in the network and various security algorithms		
Course Outcomes: After learning this course students will be able to			
1	Describe the layering architecture of computer networks and distinguish between the OSI reference model and TCP/IP protocol suite.		
2	Identify the protocols and services of Data link layer.		
3	Design a network model and determine the routing of packets using different routing algorithms.		
4	Articulate the protocols and functions associated with the transport layer services.		
5	Exemplify the protocols and services of the application layer		
6	Design the wireless network using IEEE 802.11		
UNIT – I	**Data Communications and Network Model**		**(08 Hours)**
	Introduction: Data Communications: Components, Representations, Data Flow, Networks: Physical Structures, Network Types: LAN, WAN, Switching, Internet. Network Models: Protocol Layering: Scenarios, Principles, Logical Connections. The OSI Model and TCP/IP Protocol Suite: Layered Architecture, Layers in model, Description of layers, Encapsulation and De-capsulation, Addressing, Multiplexing and De-multiplexing, OSI Versus TCP/IP		
UNIT – II	**Data-Link Layer**		**(08 Hours)**
	Design issues, error detection and correction, sliding window protocols, example data link protocols - HDLC, the data link layer in the internet. THE MEDIUM ACCESS SUBLAYER: Channel allocations problem, multiple access protocols- Random Access: ALOHA, CSMA, CSMA/CD, CSMA/CA. Controlled Access: Reservation, Polling, Token Passing, Ethernet, Data Link Layer switching, Wired LANs: Ethernet: Ethernet Protocol: IEEE802,		

	Ethernet Evolution, Standard Ethernet, Fast Ethernet, Gigabit Ethernet, 10 Gigabit Ethernet: Characteristics, Addressing, Access Method, Efficiency, Implementation, Access	
UNIT – III	**Network Layer**	**(10 Hours)**
	Network Layer services, Packet Switching: Datagram Approach, Virtual Circuit Approach, IPV4 Addresses: Address Space, Classful Addressing, Classless Addressing, DHCP, Network Address Resolution, IPV4 Datagram format, IPV6 Addresses, and IPV6 Datagram format, Forwarding of IP Packets Network Layer Protocols: Internet Protocol (IP): Datagram Format, Security of IPv4 Datagrams, ICMPv4, Mobile IP , routing algorithms: Distance Vector Routing, Link State Routing, Routing Information Protocol, Open Shortest Path First, Border gateway protocol (BGP), Hot potato routing and socio-political aspects of routing	
UNIT – IV	**Transport Layer**	**(08 Hours)**
	Introduction: Transport Layer Services, Connectionless and Connection oriented Protocols, Transport Layer sliding window protocols, User Datagram Protocol: User Datagram, UDP Services, UDP Applications, Transmission Control Protocol: TCP Services, TCP Features, Segment, Connection, State Transition diagram, Windows in TCP, Flow control, Error control, TCP congestion control.	
UNIT – V	**Application layer and Security**	**(07 Hours)**
	Domain name system, electronic mail, World Wide Web: architectural overview, dynamic web document and http. Application layer protocols: Simple Network Management Protocol, File Transfer Protocol, Simple Mail Transfer Protocol, Telnet, network security	
UNIT – VI	**Wireless LANs**	**(07 Hours)**
	Introduction: Architectural Comparison, Characteristics, IEEE 802.11: Architecture, MAC Sublayer, Addressing Mechanism, Physical Layer, Bluetooth: Architecture, Layers. Connecting Devices: Hubs, Switches, Virtual LANs: Membership, Configuration, Communication between Switches and Routers, Advantages.	
Term Work: The term work shall consist of record of minimum eight experiments		
1. LANs and its components, practically implement the cross-wired cable and straight through cable using clamping tool.		
2. Study of network IP		
3. Connect the computers in Local Area Network.		
4. Performing an Initial Switch Configuration using CISCO Packet Tracer		
5. Configuring WEP on a Wireless Router using CISCO Packet Tracer		
6. Planning Network-based Firewalls using CISCO Packet Tracer		
7. Configure Virtual LANs using CISCO Packet Tracer		
8. Configure DHCP server & Helper address feature in Cisco router using CISCO Packet		

Tracer
9. Examining WAN Connections using CISCO Packet Tracer
10. Simulation of various Topologies using CISCO packet Tracer
11. Write a program in C for RSA
12. Examine packets of different protocols using Wireshark (Network Traffic Analysis and Filtering) using CISCO Packet Tracer
Text Book/ Reference Books:
1. Data Communications and Networking, Forouzan,6th Edition, McGraw Hill, 2021 ISBN: **978-1260597820** **2.** Computer Networking A Top-Down Approach – Kurose James F, Keith W, 7th Edition, Pearson, 2016.ISBN: 978-0133594140 **3.** Cryptography and Network Security - Principles and Practice, Stallings William,7th Edition Pearson, 2020, ISBN: 9780135764213 **4.** Introduction to Data Communication and Networking, Wayarles Tomasi, 1st edition, Pearson Education, 2007, ISBN:0130138282 **5.** Understanding Communications and Networks, W. A. Shay, Cengage Learning. 3rd Edition,2008, BS Publications, ISBN: 978-0534950545
Project Based Learning: Students are expected to perform a project (in a group) based on the course and prepare a report for the same. The report should be as per the standard guidelines. Also, write pseudo code/proof for it, wherever applicable. Use CISCO Packet Tracer for simulation.

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B. Tech. (Electronics & Communication Engineering) Sem VI
CELLULAR TECHNOLOGY & 4G

Teaching Scheme	Examination Scheme	Credits Allotted
Theory: 03	End Semester Examination (ESE): 60 Marks	Credits: 03
	Internal Assessment (IA): 40 Marks	
	Total:100 Marks	Total Credits:03

Course Pre-requisites:

The students should have knowledge of

1	Electronics Communication

Course Objectives:

1	To understand the cellular technology and propagation models
2	To overview various communication standards like GSM, EDGE, GPRS, CDMA
3	To interpret various wireless networks, mobile networks, and their basic architecture starting from 2G through to 3G and 4G.
4	To investigate evolution and architecture of 4G wireless generations

Course Outcomes: After learning this course students will be able to

1	Understand the basics of mobile communication systems.
2	Design the cellular system and improve the coverage and capacity of a system
3	Examine various mobile propagation model
4	Differentiate GSM and CDMA wireless networks.
5	Examine the 3G and future communication technology's evolution
6	Evaluate 4G digital mobile technology

UNIT – I	**Evolution of Mobile Communication System**	**(06 Hours)**
	Introduction-base station, mobile station, MSC, forward and reverse channel, control channel, Cordless telephone system, Cellular telephone system, Advantages and disadvantages of mobile communications, Comparison of wireless systems, applications of wireless communications. Small cells: Past, present, and future trends of cellular networks coverage and capacity of small cell networks, Interference management.	
UNIT – II	**Cellular Concept – System Design Fundamentals**	**(06 Hours)**
	Introduction, frequency reuse, channel assignment strategies, handoff strategies, umbrella cell concept, interference and system capacity, Erlang Capacity, co-channel and adjacent channel interference, cell splitting, sectoring, microcell zone concept.	
UNIT – III	**Mobile Communication Engineering**	**(06 Hours)**
	Radio paths, Propagation attenuation, Basic propagation mechanisms, Link budget, Free-space path loss, Noise figure of a receiver, Multipath fading, Shadowing, Fading margin, Shadowing margin, Wireless Channel Capacity, OFDM and LTE, Large Scale	

	Propagation effects, and free space propagation model, The Three Basic propagation Mechanisms, Reflection, Ground Reflection (Two-Ray) Model, Diffraction, Scattering, outdoor propagation model (Okumura model & Hata model).	
UNIT – IV	**GSM Technology**	**(06 Hours)**
	GSM network architecture, GSM signaling protocol architecture, Identifier used in GSM systems, GSM speech coding, authentication and security in GSM, Call processing and Roaming in GSM, GSM call procedures, GSM handoff procedures, GSM services and features, Concept of spread spectrum, GSM vs CDMA.	
UNIT – V	**Evolution of 3G and Future Mobile Technology**	**(06 Hours)**
	2.5G TDMA evolution path, GPRS technology, EDGE technology, Need for 3G and 4G mobile networks, IMT-2000 Global standards, UMTS technology, introduction to LoRa technology, introduction to Radar, mmWave frequency communication, introduction to THz frequencies for communication: 5G & 6G mobile networks.	
UNIT – VI	**4G Digital Mobile Technology**	**(06 Hours)**
	4G-LTE. Next-generation wireless systems: Features of 4G and 4G LTE, VoLTE, 4.5G, 5G, Architecture, advantages, disadvantages, and applications of 4G. 4G Technologies – Multicarrier modulation, Smart Antenna Techniques, OFDM-MIMO Systems, Adaptive Modulation, and Coding with Time-Slot Scheduler.	

Text Book/ Reference Books:

1. T. S. Rappaport, “Wireless Communications: Principles and practice”, Pearson, 2nd Edition, 2010.
2. Raj Pandya, “Mobile & Personnel communication Systems and Services”, Prentice Hall India, 2001.
3. T. L. Singal, “Wireless Communications”, Tata McGraw Hill, 2nd Edition, 2011.
4. A. Goldsmith, “Wireless Communications”, Cambridge university press, 1st Edition, 2005.
5. B. Razavi, “RF Microelectronics”, Prentice-Hall, 1st Edition, 1998.
6. W.C.Y. Lee, “Mobile Communications Engineering”, McGraw Hill Telecomm., 2nd Edition, 1998.
7. 4G LTE/LTE – Advanced for Mobile Broadband, Erik Dahlman, Stefan Parkvall, Johan Skold, Academic Press 2011.
8. V.K.Garg, J.E.Wilkes, “Principle and Application of GSM”, Pearson Education, 5th edition, 2008.

Project-Based Learning (PBL):

Students are expected to perform a project (in a group) based on the course and prepare a report for the same. The report should be as per the standard guidelines.
Also, write pseudo code/proof for it, wherever applicable.

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B. Tech. (Electronics & Communication Engineering) Sem VI
VLSI DESIGN TECHNOLOGY

Teaching Scheme	Examination Scheme	Credits Allotted
Theory: 04	End Semester Examination (ESE): 60 Marks	Credits: 04
Practical: 02	Internal Assessment (IA): 40 Marks	Credit: 01
	TW: 25 Marks & PR: 25 Marks	
	Total: 150 Marks	Total Credits: 05

Course Pre-requisites:

The students should have knowledge of

1	Switching Theory and Logic Design
2	Analog Electronics

Course Objectives:

1	To understand the VLSI Design Flow and design styles.
2	To introduce the VHDL Hardware Description Language (HDL) for front end design implementation
3	To articulate MOSFET physics and CMOS logic gates.
4	To interpret the layout design of combinational and sequential circuits.
5	To study internal structure of programmable logic devices.

Course Outcomes: After learning this course students will be able to

1	Design and simulate digital system using Structural, Behavioural, Dataflow or Mixed style of Modelling.
2	Apply concepts of Finite State Machine on sequential circuits
3	Implement CMOS combinational logic Design
4	Identify MOSFET Physics and CMOS structures.
5	Correlate the physical design of CMOS Technology
6	Realize digital hardware system utilizing PLDs

UNIT – I	**Implementation Technology & Introduction to VHDL**	**(08 Hours)**
	Introduction to VLSI design flow, Brief description of VHDL, Entity Declaration, Architecture Declaration, Modelling styles: Data Flow, Structural, Behavioural and Mixed Style. Assignment Statements, Select Signal Assignment, Conditional Signal Assignment, Component Declaration, Generate Statements, Concurrent and Sequential Assignment Statement, Process Statement, Case Statement. VHDL programming of basic logic gates, Multiplexer, Decoder, Encoder, Half Adder, Full Adder	
UNIT – II	**Sequential Logic Design using VHDL**	**(08 Hours)**
	VHDL Programming for D- Flip-Flop, SR Flip-Flop, JK Flip-Flop,	

	T-Flip-Flop & D-Latch, Shift Registers, Synchronous Counter: UP counter, Down counter, BCD counter; design of finite state machines and state minimization, Modelling of FSM-Mealy and Moore machines. Test Bench generation	
UNIT – III	**Analysis of CMOS circuit**	**(08 Hours)**
	Complexity and Design: Design Flow, Moore's Law; MOSFETs as Switch: FET Threshold Voltages, Pass Characteristics; Basic Logic Gates in CMOS: NOT Gate, NOR Gate, NAND Gate; Complex Logic Gates in CMOS: Structured Logic Design, XOR and XNOR Gates; Transmission Gate Circuits: Multiplexers, OR Gate, XOR/XNOR Gate	
UNIT – IV	**CMOS Device**	**(08 Hours)**
	CMOS structure, CMOS I/V characteristics, DC characteristics of the CMOS inverter, Switching Characteristics: Fall Time, Rise Time, Propagation Delay; Power Dissipation. Body effect, Scaling of MOS circuits, MOSFET capacitances, MOS small signal model, MOS amplifiers.	
UNIT – V	**Fabrication & Physical Design of CMOS Integrated Circuits**	**(08 Hours)**
	Fabrication steps of MOS device, Overview of Silicon Processing; Material Growth and Deposition; Lithography; Ion-implantation, CMOS Process Flow; CMOS Design Rules; Physical Design (Stick diagram & Layout Design) of Logic Gates: NOT, NAND & NOR Schematic and Layout of CMOS Combinational Circuits.	
UNIT – VI	**Programmable logic devices**	**(08 Hours)**
	FPGA: Introduction, study of architecture, PLAs, PALs, function implementation using PLDs, CPLD: Introduction, study of architecture, Programming design Approach.	

Term Work:
The term work shall consist of record of minimum eight experiments using VHDL
1. To model all basic logic gates: AND, OR, NAND, NOR, XOR, XNOR
2. To model adder and subtractor
3. To model 8:1mux, 1:8 demux, 3:8line decoder, 8:3 encoder using VHDL
4. To model synchronous and asynchronous D FF
5. To model 4- bit universal shift register
6. To model 4-bit counter
7. To model bidirectional buffer
8. To model parity generator and checker
9. Study of RAM/FIFO
10. Study of Temperature sensing using ADC

Text Book/ Reference Books:
1. CMOS Digital Integrated Circuits: Analysis & Design; Sung-Mo Kang & Yusuf Leblebici, TMH.
2. Neil E. Weste and Kamran Eshraghain, “Principles of CMOS VLSI Deign", Pearson Education Publication.
3. J. Bhaskar “A VHDL primer” Pearson Education Publication
4. Introduction to VLSI Circuits and Systems – John P. Uyemura, John Wiley, 2003.
5. Sung-Mo Kang, Yusuf Leblebici, “CMOS Digital Integrated Circuits Analysis and Design”, TMH, 3rd Ed., 2011.
6. Chip Design for Submicron VLSI: CMOS Layout & Simulation, John P. Uyemura, Thomson Learning.
7. Douglas Perry, “VHDL", Pearson Education Publication.
8. John Walkerly, “Digital Design Principles and Practices”, Prentice Hall Publication.
Project Based Learning:
Students are expected to perform a project (in a group) based on the course and prepare a report for the same. The report should be as per the standard guidelines.

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B. Tech. (Electronics & Communication Engineering) Sem VI
QUANTITATIVE TECHNIQUES, COMMUNICATION AND VALUES

Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory: 04	End Semester Examination (ESE): 60 Marks	Credits: 04
	Internal Assessment (IA): 40 Marks	
	Total: 100 Marks	Total Credits: 04

Course Pre-requisites:
The students should have knowledge of

1	Basic math's and reasoning, and comprehensive ability
2	Basic knowledge of communication process, soft skills
3	Basic knowledge and ideas about leaders and leadership qualities, ethics, etiquettes, and values

Course Objectives:

1	To augment students to face the campus recruitment test and train them on applying short techniques/ tricks to solve questions of Maths, reasoning and English in very less amount of time.
2	To articulate aspects of communication and soft skills such as grooming personality for leading team, presentation, business communication which would enable graduates to project themselves as a professional in the corporate sector and/or otherwise.

Course Outcomes: After learning this course students will be able to

1	Solve the aptitude test in the recruitment and competitive exam by applying short techniques and solve the question in less amount of time
2	Apply the short mnemonics and techniques to solve the questions of logical reasoning in the placement and competitive exam in lesser time.
3	Develop the verbal ability to communicate effectively using suitable vocabulary and proper sentence pattern
4	Understand the concept of soft skills and its implication at workplace
5	Build up the ability to study employment business correspondences and its proper implications
6	Understand business ethics, etiquettes and values and apply them in the professional ventures.

UNIT – I	**Quantitative Aptitude**	**(08 Hours)**
	Number system, Percentage, profit and loss, Simple Interest and Compound Interest, Ratio, Proportion and Average, Mixture and Allegation, Time, Speed & Distance, Time & Work , Permutation & Combination, Probability, Pipes and Cisterns	

UNIT – II	**Non-Verbal Reasoning**	**(08 Hours)**
	Coding, Decoding, Number series, Blood relation Directions, cubes & dices, Data Interpretation, Data Sufficiency, Set Theory & Syllogisms, Matching, Selection & Arrangement, Clocks & Calendars, Visual Reasoning, Input, Output & Flow Chart.	
UNIT – III	**Verbal Reasoning**	**(08Hours)**
	Sentence Patterns, Sentence correction and spotting errors, Vocabulary, antonyms and synonyms and analogy, Phrasal Verbs, idiomatic expressions, reading comprehension, closest, sentence rearrangement and theme detection	
UNIT – IV	**Self-Awareness and Soft Skills Development**	**(08Hours)**
	Concept of SWOT, Importance of SWOT, Individual & Organizational SWOT Analysis, Soft skills, meaning, need and importance, difference between soft skills and hard skills, life skills and personal skills, Leadership skills,-Importance ,Types, Attributes of good leader Motivational theories and leadership ,Emotional intelligence in personal and professional lives its importance need and application, Team Building and conflict resolution Skills ,Problem solving skills, Time Management and Stress Management Skills Pareto Principle(80/20) Rule in time management, Time management matrix, creativity and result orientation, working under pressure, stress management	
UNIT – V	**Communication And Honing Employment Skills**	**(08Hours)**
	Communication process, Non-verbal codes in communication, importance of LSRW in communication, Barriers to communication, Principles of effective Technical writing, Email writing and Netiquettes, Letter writing – formal letters, job application letter, cover letter, structure of technical report writing, Building Resume and CV, Tips to build an effective Resume Group discussion, Skills required for Group Discussion Interview skills, Ways of handling telephonic interviews, Importance of body language, grooming &etiquettes for getting right impression in PI&GD , Extempore, Introduction to PowerPoint presentation, ,Structure & flow of presentation,	
UNIT – VI	**Business Ethics, Etiquettes and Values**	**(08Hours)**
	The Importance of Ethics and Values in Business World, Respect for Individuality and diversity at workplace values of a good manager Key features of corporate etiquette, corporate grooming & dressing, etiquettes in social & office Setting-Understand the importance of professional behaviour at the work place, Corporate social responsibility (CSR) its importance and need.	

Text Book:
1. Quantitative Aptitude, R. S. Agarwal, S. Chand publication, 1 January 2021
2. The Book of Numbers, Shakuntala Devi, Orient Paperbacks 3rd 1984, 8122200060 (ISBN13: 9788122200065)
3. A Modern Approach To Logical Reasoning, R. S. Agarwal, published by S. Chand publication,2nd edition,2018, ISBN: 9789352832194
4. A New Approach to Reasoning Verbal & Non-Verbal, Indu Sijwali, B.S. Sijwali, Indu Sijwali, Arihant publication,2014
5. Business Communication, Meenakshi Raman, Prakash Singh, Oxford University press, second edition ,2012
6. Communication Skills, Sanjay Kumar, Pushp Lata, published by Oxford University press, 2nd edition ,2012
7. Technical Communication, Meenakshi Raman, Sangeeta Sharma published by Oxford University press ,4th edition,2022, ISBN-10: 0-19-948296-9
8. Developing Communication Skills, Krishna Mohan, Meera Banerji Macmillan India Pvt Ltd publication,2nd edition, 2009, 9780230638433, 0230638430
9. Soft Skills, Meenkashi Raman, Cengage publishers ,2017, ISBN13:9789386858252
10. Soft Skills by Dr. K Alex published by Oxford University press
11. Soft skills for Managers, Dr. T. Kalyana Chakravarthi ,Dr. T. Latha Chakravarthi, biztantra publisher, 2011
Project Based Learning:
Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples.

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B. Tech. (Electronics & Communication Engineering) Sem VI
INDUSTRIAL INTERNET OF THINGS AND MACHINE LEARNING

Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory: 03	End Semester Examination (ESE): 60Marks	Credits: 03
Practical:02	Internal Assessment (IA): 40 Marks	Credit: 01
	TW: 25 Marks &PR: 25 Marks	
	Total:150 Marks	Total Credits: 04

Course Pre-requisites:

The students should have knowledge of

1	Embedded System Design
2	Essentials of Data Science

Course Objectives:

1	To understand the basic concept and the industrial IoT Paradigm
2	To know the state of art architecture for IoT applications
3	To learn the available protocols used for IoT for optimal IoT applications.
4	To design basic IIoT Applications
5	To learn security in IIoT protocols
6	To apply ML algorithms in IIoT

Course Outcomes: After learning this course students will be able to

1	Identify the IoT Components and its capabilities
2	Explain the architectural view of IoT under real world constraints
3	Analyse the different Network and link layer protocols
4	Evaluate and choose among the transport layer protocols
5	Evaluate and choose among Layer Protocols & Security Service Layer
6	Design an IOT application with ML and Arduino /Raspberry Pi

UNIT – I	**IoT-Introduction**	**(06Hours)**
	Understanding IoT fundamentals, overview of IOT Architecture and protocols , Various Platforms for IoT , Components of IIoT , IoT Vs. IIoT, History of IIoT ,Real time Examples of IIoT ,Overview of IoT components and IoT Communication Technologies ,Challenges in IIOT	
UNIT – II	**IoT Architecture**	
	IoT reference Model - IoT Reference Architecture; Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints Introduction, Technical Design constraints	**(06Hours)**
UNIT – III	**IoT Data Link Layer & Network Layer Protocols**	**(06Hours)**

	PHY/MAC Layer (3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy, Network Layer-IPv4, IPv6, 6LoWPAN, DHCP, ICMP, RPL, CORPL,RFID	
UNIT – IV	**Transport & Session Layer Protocols**	**(06Hours)**
	Transport Layer (TCP, MPTCP, UDP, SCTP)-(TLS, DTLS) – Session Layer-HTTP, CoAP, MQTT, RFID	
UNIT – V	**Layer Protocols & Security Service Layer**	**(05Hours)**
	One M2M, ETSI M2M, BBF – Security in IoT Protocols – MAC 802.15.4, 6LoWPAN, RPL	
UNIT – VI	**Application of IOT using ML**	**(07Hours)**
	Introduction to cloud - Azure, Thingspeak ,Programming using Python, Integration of Sensors and Actuators with ESP8266. IoT Based Home Automation using Relays, IoT based, Pollution monitoring, IOT based weather monitoring, Evaluation of Power options and Communication Options	

Term Work:
The term work shall consist of record of minimum eight experiments using Node MCU board-ESP8266, ESP32, Arduino IDE
1. Write a program for object detection the ultrasonic sensor HC-SR04
2. Case Study on cloud services SAAS, PAAS,IAAS
3. write a program to send humidity and temperature data to cloud
4. write a program to retrieve humidity and temperature data from cloud
5. Write a program to publish temperature data to MQTT broker
6. Write a program to subscribe to MQTT broker for temperature data and print it
7. Write a program to read temperature and its predication using ML algorithm
8. Write a program to read humidity and its predication using ML algorithm
9. Write a program for any real time application and it’s prediction using ML
10. Set up Cloud IoT Infra using MQTT, MIddleWare (Node Red), MySQL
11. Setup Temperature and Humidity Web Server with Arduino IDE
12. Write a program for power measurement and save it on cloud
Text Book:
1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014.
2. Peter Waher, Learning Internet of Things, PACKT publishing, BIRMINGHAM – MUMBAI.
3. Tim Cox, Steven Fernandes ,Raspberry Pi 3 Cookbook for Python Programmers,3rd edition, Packt Publishing,2018.
4. Sai Yamanoor,SrihariYamanoor ,Python programming with Raspberry Pi , Packt Publishing,2017
5. Bernd Scholz-Reiter, Florian Michahelles, Architecting the Internet of Things, ISBN 978-

3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer.
6. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6",Wiley,2013
7. Simon Monk, Programming the Rasberry Pi ,2nd edition McGraw Hill,2015
Project Based Learning:
Students are expected to perform a project (in a group) based on the course and prepare a report for the same. The report should be as per the standard guidelines. Also, write pseudo code/proof for it, wherever applicable. Use ESP8266 for implementation

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B. Tech. (Electronics & Communication Engineering) Sem VI
ITC-IV RF CELL PLANNING & DRIV TEST ANALYSIS

Teaching Scheme	Examination Scheme	Credits Allotted
Practical: 02	TW: 25 Marks & OR: 25 Marks	Credit: 01
	Total: 50 Marks	Total Credits: 01

Course Pre-requisites:

The students should have knowledge of

1	Electronics Communication

Course Objectives:

1	To understand the telecom frequency bands
2	To overview the radio network design & planning process
3	To interpret Coverage Areas and User Density
4	To investigate the Basics of RF Drive Test

Course Outcomes: After learning this course students will be able to

1	Understand the basics of the telecom frequency bands
2	Design the radio network design
3	Survey various Coverage Areas and User Density for wireless sites
4	Distinguish the various hopping techniques
5	Evaluate the RF drive testing methods
6	Use App-based RF measurement tools

UNIT – I	**Telecom Frequency Bands**	**(06 Hours)**
	Radiofrequency bands, Paired and unpaired frequency bands, International telecommunications regions, liberalized and non-liberalized spectrum	
UNIT – II	**Radio Network Design & Planning Process**	**(06 Hours)**
	Major tasks in the planning process, planning tools for different phases, planning environment, dimensioning, capacity and quality coverage analysis and studies – frequency planning & coordination services – network design (cellular and transmission) – network implementation – network optimization: coverage, interferences, capacity – geo data: consulting, generation, conversion, and acquisition	
UNIT – III	**Site Survey and Site Selection**	**(06 Hours)**
	Identify Coverage Areas and User Density, conduct a wireless site survey, networking monitoring tools, footprint thewireless network by active or passive method, Use Maps to Document Wireless Signal Leakage, radio frequency spectrum analysis	

UNIT – IV	**Frequency Hopping**	**(06 Hours)**
	Definition, Slow frequency and fast frequency hopping, Hybrid direct sequence and frequency hopping, frequency hopping spread spectrum	
UNIT – V	**Basics of RF Drive Test**	**(06 Hours)**
	Significance of drive test, types of drive testing, drive test analysis, RF Drive test measurements, Classification of drive test in the telecom industry, Outcomes of drive test analysis, Drive test analysis for 4G LTE network	
UNIT – VI	**Drive test tools & Equipment**	**(06 Hours)**
	Features of the RF drive test tools, RF drive tools(RF spectrum analyzer, RF scanners, App-based RF measurement tools, RF layer capable tools, voice quality measurement, the load generator	

Term Work: The term work shall consist of the record of a minimum of eight experiments based on the above syllabus

Text Book/Reference books

1. Sharawi, Mohammad S. "RF Planning and Optimization for LTE Networks." CRC Press, 2010.
2. E-books related to RF Cell planning.

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B. Tech. (Electronics & Communication Engineering) Sem VI
POWER ELECTRONICS

Teaching Scheme	Examination Scheme	Credits Allotted
Practical: 02	TW: 50 Marks	Credit: 01
Tutorial: 02		Credit: 02
	Total: 50 Marks	Total Credits: 03

Course Pre-requisites:

The students should have knowledge of

1	Knowledge of the principals and applications of electronic devices including semiconductor diodes, bipolar-junction and field-effect transistor.
2	Understanding of transformers and magnetically coupled circuits.

Course Objectives:

1	To understand and acquire knowledge about various power semiconductor devices.
2	To study the characteristics, operation and performance parameters of controlled rectifiers.
3	To acquire knowledge about power electronics applications such as UPS, induction motor etc.

Course Outcomes: After learning this course students will be able to

1	Identify and compare various power semiconductor devices
2	Perform the operations of single-phase converters
3	Analyze the performance of three phase converters circuits.
4	Distinguish between single and three-phase inverters
5	Perform the operations of dc-to-dc converters (Choppers)
6	Validate the basic principles of HVDC, UPS, motors etc.

Term Work:

The term work shall consist of eight experiments and ten tutorials.

List of Practicals:

1. To study V-I characteristics of SCR and measure latching and holding currents.
2. To study V-I characteristics of :i) MOSFET ii) IGBT
3. Study of (R/RC/UJT) triggering for SCR.
4. To study operation of Single phase fully controlled converter.
5. To study operation of IGBT/MOSFET chopper circuit.
6. To study MOSFET/IGBT based single phase inverter.
7. Study of AC voltage controller.
8. Study of speed control of motor.

List of Tutorials:

1. Study of Power BJT and Power diodes. Describe any two applications of each in detail.
2. Study of Single-phase semi-converter with R and RL load.
3. Study of three phase full converter with R & RL load.
4. Study of single-phase half and full bridge inverter.
5. Study of three phase inverter in 120 degree and 180-degree conduction mode.
6. Study of step-down chopper.

7. Study of step-up chopper.
8. Study of cyclo-converters.
9. Study of UPS.
10. Study of induction motor.
11. Study of Servomotor.
12. Study of Universal motor
13. Study of Electronic ballast and HVDC transmission.
14. Study of electric welding and induction heating.
15. Study of separately excited DC motor.
Text Books/ Reference Books:
1. Power Electronics- M D Singh & K B Khanchandani, TMH, New Delhi
2. Modern Power Electronics- P. C. Sen, S. Chand & Co., New Delhi
3. Electric Motors & Drives-Austin Hughes, Bill Drury, Newnes,4th Edition
4. Power Electronics, Devices, Circuits & Industrial Applications- V. R. Moorthi
5. Power Electronics Circuits, Devices and Applications- M. H. Rashid, PHI, 3rd Edition, 2004, New Delhi
6. Electrical Machine Drives: Fundamental Basics and Practices-Claiton Moro Franchi, CRC Press

B. Tech. (Electronics & Communication) Sem VII

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
41		FTTH-Optical communication	3	2	0	60	40	25	25	0	150	3	1	0	4
42		Radar & Satellite Communication	4	0	1	60	40	0	0	0	100	4	0	1	5
43		AI and Data Mining*	4	2	0	60	40	50	0	0	150	4	1	0	5
44		Elective- I	3	2	0	60	40	00	50	0	150	3	1	0	4
45		Project Stage-I	0	2	0	0	0	50	50	0	100	0	3	0	3
46		Android App Development	0	2	0	0	0	50	0	0	50	0	1	0	1
47		Internship#	0	0	0	0	0	25	25	0	50	0	3	0	3
	Total		**14**	**10**	**1**	**240**	**160**	**200**	**150**	**0**	**750**	**14**	**10**	**1**	**25**

*Industry Taught Course- – V
Period- 60 days

Sr. No.	Name of the Elective-I
1	Augmented Reality & Virtual Reality
2	Data Centre Engineering
3	RF & Microwave Communication
4	Cyber Security & Forensics
5	Wireless Robots

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B. Tech. Electronics and Communication Engineering Sem VII FTTH-OPTICAL COMMUNICATION		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hrs/week	Examination (UE):60 Marks	Credits: 03
Practical: 02 Hrs/week	Internal Assessment (IA): 40 Marks	
	TW: 25 Marks, OR:25 Marks	Credits:01
	Total:150 Marks	**Total Credits:04**

Course Pre-requisites:

The students should have knowledge of

Analog Circuits & Applications, Digital Communication, EM Waves & Propagation, Integrated Circuits& Amplifier Design.

Course Objectives:

1	To understand the basic elements of optical fiber Communication & FTTH.
2	To enrich the knowledge about optical communication systems and networks
3	To learn about the various optical sources, detectors and transmission techniques,
4	To explore various idea about optical fiber measurements and various coupling techniques.
5.	To learn the fiber optical network components, variety of networking aspects, FDDI, SONET/SDH and operational principles WDM.

Course Outcomes: After learning this course students will be able to

1	Identify and classify the structures of FTTH & Optical fiber.
2	Compare different optical sources and detectors and their principle.
3	Analyse the performance of various digital and analog fiber-optic access solutions.
4	Analyse various coupling losses and Design considerations of FTTH.
5	Compare the factors affecting the performance of different optical fibre communication systems.
6	Comprehend design, construction and testing of optical fiber communication system**.**

UNIT – I	**Introduction to FTTH-Optical Communication.**	**(06 Hrs)**
	Introduction, Historical development, general system, advantages, disadvantages, and applications of optical fiber communication. FTTH, FTTH Components, optical fiber waveguides, Ray theory, Types of fiber, cutoff wavelength, mode filed diameter. Optical Fibers: fiber materials, photonic crystal, fiber optic cables specialty fibers.	
UNIT – II	**Optical Transmitter and Receiver**	**(06 Hrs)**
	Optical Transmitter Introduction, LED’s, LASER diodes, Photo detectors, Photo detector noise, Response time, double hetero junction structure, Photo diodes,	

	comparison of photo detectors. drive circuits for digital and analog transmission. **Optical Receivers** Photodetector types and performance characteristics, PiN photodiodes, Direct detection receivers, Coherent receivers, Advanced measurement techniques for optical fiber links.	
UNIT– III	**Analog and Digital Links**	**(06 Hrs)**
	Analog links – Introduction, overview of analog links, CNR, multichannel transmission techniques, RF over fiber, key link parameters, Radio over fiber links, microwave photonics. Digital links – Introduction, point–to–point links, System considerations, link power budget, resistive budget, short wave length band, transmission distance for single mode fibers, Power penalties, nodal noise and chirping.	
UNIT– IV	**FTTH Technology and its network design**	**(06 Hrs)**
	FTTH technology & architectures, Passive Optical Network and types of splitting, GPON, EPON, Planning and Design issues, Link design and related considerations. ONT and its configurations, optical loss budget for a FTTx network, Testing FTTx Networks.	
UNIT – V	**Optical Components and Optical Networks:**	**(06 Hrs)**
	WDM concepts, overview of WDM operation principles, WDM standards, Types of Optical Amplifier and its applications, Amplifier Noise, Optical SNR, Raman Amplifier, Fiber optic splices, connectors & couplers & Coupling losses. Optical couplers, Isolators and Circulators. Network Concepts, network Topology, SONET/SDH.	
UNIT– VI	**Optical Fiber measurements and Applications**	**(06 Hrs)**
	Test Equipment, OTDR, Set ups for Measurement of Attenuation, Dispersion, NA and EYE pattern. Application in military, Industrial applications and applications in local area network.	

List of Practicals: The term work shall consist of record of minimum eight experiments
1. Optical Source Characteristics: Aim: To plot the electrical and optical characteristics of different light sources.
2. Numerical Aperture of fiber: To estimate the numerical aperture of given fiber.
3. To measure the attenuation of given MMSI and SMSI fibers.
4. To measure the attenuation variation in length of optical cable.
5. To measure the attenuation due to bending of optical fiber.
4. Optical detector characteristics: To plot the frequency response of detectors with different values of load resistor.
5. Fiber Bandwidth/Data rate: To estimate the bandwidth of given fiber.
6. Transmission of analog & Digital signal using a simple fiber optic link.
7. To test & study fiber optics connector & splicing of optical fibers
8. To perform Frequency modulation using optical fiber.

9. To perform PWM using optical fiber.
10. To find the optical power using “Optical Power Meter”.
11. To find the optical response using OTDR.
12. Determination of input, output and transfer characteristics of Optocoupler.

Content Delivery Methods: Chalk & talk, ICT Tools

Assessment Methods:
1. Internal Assessment (IA)(Unit Test, PBL)
2. End-term Examination (UE)

Text Books:

1. Gerd Keiser, “Optical Fiber Communications”, Tata McGraw Hill, Fourth Edition.
2. John M. Senior, “Optical Fiber Communications-Principles and Practice”, Prentice Hall of India, second Edition.
3. “Fiber to the Home: The New Empowerment”, Wiley Survival Guides in Engineering and Science Book

Reference Books:

1. Jasprit Singh, “Opto Electronics – As Introduction to materials and devices”, Tata McGraw-Hill International Edition.
2. Djafar K.Mynbaev and Lowell L.Scheiner, “Fiber optic communication Technology”, Pearson Education.
3. J.H. Franz and V. K. Jain, “Optical Communication - Components and systems”, Narosa Publishing house.
4. Bhattacharya, “Semiconductor Opto Electronic Devices”, PHI Learning, New Delhi.
5. Jim Hayes, “Fiber Optic Association Fiber to the Home-Handbook”

Project Based Learning:

Students are expected to perform a project (in a group) based on the course and prepare a report for the same. The report should be as per the standard guidelines.

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B. Tech. Electronics & Communication Engineering Sem VII **RADAR AND SATELLITE COMMUNICATION**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04 Hrs/week	Examination (UE):60 Marks	Credits: 04
	Internal Assessment (IA): 40 Marks	
Tutorial: 01 Hr/week		Credit:01
	Total:100 Marks	**Total Credits:05**

Course Pre-requisites:
Basic Communication Engineering

Course Objectives:	
1	To give the knowledge about satellite communication.
2	To introduce the concept radar communication.
3	To make the student aware of the function of satellite transmitter and receiver.
4	To impart the mathematical concepts & types of radar.

Course Outcomes: After learning this course, students will be able to	
CO1	Learn the basics of satellite communication.
CO2	Comprehend subsystem for satellite Communication.
CO3	Describe the design of satellite link.
CO4	Categorise the satellite navigations and GPS.
CO5	Interpret the working of the radar
CO6	Analyse the performance using the Radar Equations.

UNIT– I	**Introduction of Satellite Communication:**	**(08 Hrs)**
	A brief History of satellite communication, satellite frequency bands, satellite system, Application of satellite, orbital period and velocity, coverage and slant range, orbital perturbations, placement of satellite in geostationary orbit	
UNIT–II	**Satellite subsystems**:	**(08 Hrs)**
	Altitude and orbital control system, Telemetry Tracking and command system, Altitude control subsystem, power system, communication subsystem, Satellite antenna equipment.	
UNIT-III	**Satellite Link**:	**(08 Hrs)**
	Basic transmission theory, system noise temperature and G/T ratio, Basic link analysis, interference analysis, Design of satellite link for specified C/N Ratio, Link budget.	
UNIT–IV	**Earth Station Technology, Satellite Navigation and GPS:** Satellite transmitter, satellite receivers, satellite antenna, tracking system,	**(08 Hrs)**

	Radio and satellite navigations, GPS, position location principle, GPS receiver.	
UNIT–V	**Introduction of Radar**	**(08 Hrs)**
	Nature of RADAR, Maximum unambiguous range, Radar waveforms, simple form of radar equations, Radar block diagram, Radar frequencies and applications	
UNIT–VI	**Radar Equations and Types**:	**(08 Hrs)**
	Predications of radar performance, Minimum detectable signal, Receiver noise and SNR, Integration of Radar pulses, Radar cross section of target, transmitter power, system losses, Doppler effect	

Content Delivery Methods: Chalk & talk, ICT Tools

Assessment Methods:
1. Internal Assessment (IA)(Unit Test, PBL)
2. End-term Examination (UE)

Text Books:

1. Merrill I. skolnik "Introduction to radar system" third edition, Tata MGgraw Hill.
2. Dennis Roddy, "Satellite Communicatons" McGraw-Hill- 4th edition.
3. Giriraj Kumar Prajapati "Basic of RADAR and Its Applications in Wireless Communication" Scholar's Press.
4. Timothy Pratt , "Satellite communication", Wiley publication.
5. Dharma Raj Cheruku "Satellite Communication" I K International Publication House Pvt. Ltd.

Reference Books:

1. Bruce R. Elbert, "Introduction to satellite communication" Artech House.
2. Michal "Satellite Communication Engineering" , CRC press.

Project Based Learning:

Students are expected to perform a project (in group) based on the course and prepare report for the same. The report should be as per the standard guidelines.

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B. Tech. Electronics & Communication Engineering SemVII **ITC-V:ARTIFICIAL INTELLIGENCE AND DATA MINING**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04 Hrs/week	Examination (UE): 60 Marks	Credits: 04
Practical: 02 Hrs/week	Internal Assessment (IA): 40 Marks	
	TW- 50 marks	Credit: 01
	Total:150 Marks	**Total Credits:05**

Course Pre-requisites:	
The students should have knowledge of	
1	Essentials of data science
2	Fuzzy Logic, Neural Networks, and Genetic Algorithms
Course Objectives:	
1	Introduce a relatively new computing paradigm for creating intelligent machines
2	Utilize data mining as a cutting-edge business intelligence tool.
3	Develop and apply critical thinking, problem solving and decision-making skills.
4	Describe and demonstrate basic data mining algorithms, methods, tools
Course Outcomes: After learning this course students will be able to	
CO1	Evaluate various problem-solving agents in AI
CO2	Design and analyse search techniques and game playing techniques
CO3	Implement the various expert systems in AI
CO4	Apply the basic concept of data mining and its functionality
CO5	Apply the concept of association rules, different techniques and implementation details
CO6	Design and implement the various the ML based algorithm.

UNIT – I	**Introduction to Artificial Intelligence**	**(05 Hrs)**
	AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.	
UNIT – II	**Search Techniques and Game Playing**	**(07 Hrs)**
	Defining The Problems as a state space search, Production Systems, Production Characteristics, Production System Characteristics, Generate-And-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis. Game Playing-Adversial search, Games, mini-max algorithm, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.	

UNIT – III	**Expert System**	**(8 Hrs)**
	Introduction, Structure of expert systems, the human element in expert systems, problem areas addressed by expert systems, expert systems success factors, types of expert systems, Internet interacts web, knowledge engineering, methods, machine learning, intelligent agents, selecting an appropriate knowledge acquisition method, societal impacts reasoning in artificial intelligence, inference with rules, with frames: model based reasoning, case based reasoning, explanation & meta knowledge inference with uncertainty representing uncertainty	
UNIT – IV	**Introduction to Data mining**	**(08 Hrs)**
	Overview, Motivation (for Data Mining), Data Mining-Definition & Functionalities, Data Processing, Form of Data Preprocess-ing, Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. Data Reduction: -Data Cube Aggregation, Data 35 Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation.	
UNIT – V	**Data mining various aspects**	**(10 Hrs)**
	Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases, mining Single-Dimensional Boolean Association rules from Transactional Databases– Apriori Algorithm, Mining, Multilevel Association rules from Transaction Databases and Mining Multi-Dimensional Association rules from Relational Databases.	
UNIT – VI	**Classification and Predictions**	**(10 Hrs)**
	What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K-nearest neighbor classifiers, Genetic Algorithm. Cluster Analysis: Data types in cluster analysis, Clustering methods, Partitioning methods. Hierarchical Clustering-CURE and Chameleon, Density Based Methods-DBSCAN, OPTICS, Grid Based Methods- STING, CLIQUE, Model Based Method – Statistical Approach, Neural Network approach, Outlier Analysis.	
Content Delivery Methods: Chalk & talk, ICT Tools **Assessment Methods:** 1. Internal Assessment (IA)(Unit Test, PBL)		

2. End-term Examination (UE)

List of Experiments: The term work shall consist of record of minimum eight experiments

1. Write a program to implement Tic-Tac-Toe game problem
2. Write a program to implement BFS (for 8 puzzle problem or Water Jug problem or any AI search problem) .
3. Write a program to implement DFS (for 8 puzzle problem or Water Jug problem or any AI search problem)
4. Write a program to implement Single Player Game (Using Heuristic Function)
5. Write a program to implement Back propagation
6. Write a program to implement K-nearest neighbor classifiers
7. Write a program to implement Hierarchical Clustering
8. Write a program to implement Density Based Methods- DBSCAN
9. Write a program to implement Grid Based Method- STING
10. Write a program to implement Grid Based Method- CLIQUE
11. Write a program to implement Outlier Analysis
12. Write a program to implement Neural Network based approach

Text Books:

1. S. Russel and P. Norvig, “Artificial Intelligence – A Modern Approach”, Second Edition, Pearson Education
2. David Poole, Alan Mackworth, Randy Goebel” , Computational Intelligence: a logical approach”, Oxford University Press.
3. H.Dunham,”Data Mining: Introductory and Advanced Topics” , Pearson Education.
4. J. Han and M. Kamber Morgan Kaufmann , ”Data Mining Concepts and Techniques”, 2006, ISBN 1-55860- 901-6
5. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, “Introduction to Data Mining”, Pearson Education (Addison Wesley), 0-321-32136-

Reference Books:

1. G. Luger, “Artificial Intelligence: Structures and Strategies for complex problem solving”, Fourth Edition, Pearson Education.
2. J. Nilsson, “Artificial Intelligence: A new Synthesis”, Elsevier Publishers.
3. Elaine Rich, Kevin Knight “Artificial Intelligence” -2nd Edition, Tata Mcgraw-Hill.
4. Jiawei Han, Micheline Kamber,” Data Mining Concepts & Techniques” Elsevier.
5. Anand Rajaram, Jure Leskovec and Jeff Ullman, “Mining Massive data sets” , Cambridge University Press.

Project Based Learning:

Students are expected prepare report on any one topic related to this subject, write its definition, applications and illustrate with few examples. Also, write pseudo code/proof for it, wherever applicable. Use python for implementation

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B. Tech. Electronics & Communication Engineering Sem VII ELECTIVE-I: AUGMENTED REALITY & VIRTUAL REALITY		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hrs/week	Examination (UE): 60 Marks	Credits: 03
Practical: 02 Hrs/week	Internal Assessment (IA): 40 Marks	
	Oral :50 Marks	Credits:01
	Total:150 Marks	**Total Credits:04**

Course Pre-requisites:	
The students should have knowledge of	
	Computer Graphics
Course Objectives:	
1	To introduce AR VR technology, its principles and Human-Computer interaction techniques related to VR/AR.
2	To familiarise the student with various types of hardware and software in Virtual Reality systems.
3	To introduce Virtual/ reality and Augmented Reality to variety of applications.
Course Outcomes: After learning this course, students will be able to	
CO1	Describe how Virtual reality systems work and list the applications of VR.
CO2	Identify various geometric modelling techniques.
CO3	Comprehend the hardware and sensors used in Virtual Environment.
CO4	Understand the concepts of Augmented Reality and related technologies.
CO5	Apply various types of hardware and software in virtual reality systems.
CO6	Apply the acquired knowledge for analysis Virtual/Augmented Reality Applications

UNIT – I	**Introduction to Virtual Reality (VR)**	**(05 Hrs)**
	Virtual Reality and Virtual Environment, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR.	
UNIT–II	**Computer Graphics and Geometric Modelling**	**(08 Hrs)**
	The virtual world space, positioning the virtual observer, human vision, stereo perspective projection, colour theory, 2D to 3D conversion, 3D space curves, 3D boundary representation, Simple 3D modelling, Illumination models, Reflection models, Geometrical Transformations: Introduction, Frames of reference, Modelling transformations.	
UNIT-III	**Virtual Environment**	**(06 Hrs)**
	Input/Output devices: Input (Tracker, Sensor, Digital gloves, movement capture, video-based Input, 3D Menus & 3D Scanner, etc.), Output	

	(Visual/Auditory/Haptic Devices) Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems, Animating the Virtual Environment	
UNIT–IV	**Introduction to Augmented Reality (AR)**	**(05 Hrs)**
	History of augmented reality, Technology and Features of Augmented Reality, AR Vs VR, Challenges with AR, AR systems and functionality, Augmented Reality Methods, Visualization Techniques for Augmented Reality, Enhancing interactivity in AR Environments.	
UNIT – V	**Development Tools and Frameworks**	**(06 Hrs)**
	Human factors: Introduction, the eye, the ear, the somatic senses Hardware: Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems Software: Introduction, Modelling virtual world, Physical simulation, VR toolkits, Introduction to VRML.	
UNIT–VI	**AR / VR Applications**	**(06 Hrs)**
	Applications of VR/AR in medical, manufacturing, education, entertainment, Science, game development, etc. future of VR/AR	

Content Delivery Methods: Chalk & talk, ICT Tools

Assessment Methods:
1. Internal Assessment (IA)(Unit Test, PBL)
2. End-term Examination (UE)

Textbooks:
1. Coiffet, P., Burdea, G. C., "Virtual Reality Technology," Wiley-IEEE Press.
2. Schmalstieg, D., Höllerer, T. "Augmented Reality: Principles & Practice," Pearson.
3. Norman, K., Kirakowski, J., "Wiley Handbook of Human Computer Interaction," Wiley-Blackwell.
4. John Vince, J., "Virtual Reality Systems", Pearson.

Reference Books:
1. Craig, A. B., "Understanding Augmented Reality, Concepts and Applications," Morgan Kaufmann.
2. Craig, A. B., Sherman, W. R., Will, J. D., "Developing Virtual Reality Applications, Foundations of Effective Design," Morgan Kaufmann.
3. Anand, R., "Augmented and Virtual Reality," Khanna Publishing House.
4. Fowler, A., "Beginning iOS AR Game Development: Developing Augmented Reality Apps with Unity and C#," Apress

List of Experiments:- The term work shall consist of record of minimum eight experiments
1. Installation of Unity and Visual Studio, setting up Unity for VR development.
2. Demonstration of the working of HTC Vive, Google Cardboard, Google daydream.
3. Develop a scene in Unity that includes a cube, plane and sphere

4. Apply transformations on the 3 game objects.
5. Add a video and audio source.
6. Develop a scene in Unity that includes a cube, plane and sphere.
7. Create a new material and texture separately for three Game objects. Change the colour, material and texture of each Game object separately in the scene.
8. Write a C# program in visual studio to change the colour and material/texture of the game objects dynamically on button click
9. Develop a scene in Unity that includes a sphere and plane. Apply Rigid body component, material and Box collider to the game Objects.
10. Write a C# program to grab and throw the sphere using VR controller.
11. Develop a simple UI (User interface) menu with images, canvas, sprites and button.
12. Write a C# program to interact with UI menu through VR trigger button such that on each successful trigger interaction displays a score on scene
Project-Based Learning:
Students are expected to perform a project (in a group) based on the course and prepare a report for the same. The report should be as per the standard guidelines.

Bharati Vidyapeeth
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B. Tech. Electronics & Communication Engineering Sem VII ELECTIVE-I: DATA CENTER ENGINEERING		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hrs/week	Examination (UE): 60 Marks	Credits: 03
Practical: 02 Hrs/week	Internal Assessment (IA): 40 Marks	
	Oral :50 Marks	Credits: 01
	Total:150 Marks	**Total Credits:04**

Course Pre-requisites:	
The students should have knowledge of	
	Digital Communication, Computer Communication Networks
Course Objectives:	
1	To introduce the fundamental knowledge of data centers, architecture, software-defined networks (SDN) and virtualization technologies.
2	To familiarise the student with datacenter infrastructure, operations and management best practices.
3	To educate the student about networking in data center.
Course Outcomes: After learning this course, students will be able to	
CO1	Describe data centres , its types and priorities.
CO2	Classify the various types of data centers.
CO3	Understand the concept of network visualisation
CO4	Identify the networking features in data center
CO5	Interpret the IT of data center
CO6	Justify the need of security systems in data center

UNIT – I	**Introduction to Data Center**	**(05 Hrs)**
	History of data centers & Engineering importance, evolving to modern facilities; Concepts of redundancy, availability & reliability; Data center types & sizes, Data Center Components, Data Center Key players, Tools and Techniques.	
UNIT–II	**Data Center Engineering Process & Classification**	**(08 Hrs)**

	Data Center Engineering Process: The Data Center EPS, Phased Process, Adaptive Need Conversion, Understanding Application, App Architecture, ETT, TPS, Load and Complexity Factor. **Data Center Classification:** Data Center Tiers and Classes, Data Center Grade Levels, Data Center Definitions and Options, The Infinity Paradigm Review, Standard Requirements, Designing with Limitations.	
UNIT-III	**Network Virtualization**	**(06 Hrs)**
	Network virtualization - Uses of Network virtualization in the Data Center - Network virtualization Models- Network Tunnels - Network virtualization solutions for the Data Center - Practical limits on the number of Virtual networks - Packet forwarding control protocol for Network virtualization.	
UNIT–IV	**Networking for a Data Center**	**(05 Hrs)**
	Data Center Telecommunications Cabling, Virtualization, Cloud, SDN, and Software-defined data center (SDDC) in Data Centers Data Center Layer 2 Interconnect - Overview of high availability clusters - Data center interconnect.	
UNIT – V	**Information Technology**	**(07 Hrs)**
	Load Balancing Types & Methods, 6-Pack Architecture, Firewalls and Intrusion Detection, Virtual Private Networks, VPN Protocols: IPsec, L2TP, PPTP, SSL, Virtualization Types & Methods, Cloud Infrastructure, OpenStack.	
UNIT–VI	**Data Center Safety & Security Systems**	**(05 Hrs)**
	Safety Principle , CCTV, DVR, NVR, etc., Access Control Systems, Mantraps & Airlocks, Tracking & Tracing, IT Security,	

Content Delivery Methods: Chalk & talk, ICT Tools

Assessment Methods:
1. Internal Assessment (IA)(Unit Test, PBL)
2. End-term Examination (UE)

Text Books:

1. Samee U Khan, Albert Y. Zomaya, “Handbook of data centers”, Springer.
2. Hwaiyu Geng P.E, “Data Center Handbook: Plan, Design, Build, and Operations of a Smart Data Center”, Wiley Publication.

Reference Books:

1. Mauricio Arregoces, : Data Center Fundamentals”.
2. Lui zhang, Le chen, “Cloud Data Center Network Architectures and Technologies”.

List of Assignments

Students are expected to submit eight assignments based on the above syllabus.

Project-Based Learning:

Students are expected to perform a project (in a group) based on the course and prepare a report. for the same. The report should be as per the standard guidelines.

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B. Tech. Electronics & Communication Engineering Sem VII
ELECTIVE-I : RF & MICROWAVE COMMUNICATION

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hrs/week	Examination (UE): 60 Marks	Credits: 03
Practical: 02 Hrs/week	Internal Assessment (IA): 40 Marks	
	Oral :50 Marks	Credit:1
	Total: 150 Marks	**Total Credits: 04**

Course Pre-requisites:

The students should have knowledge of

	Maxwells Equations, EM waves propagation, Transmission lines, Waveguides.

Course Objectives:

1	To make the student learn RF circuit fundamentals for designing various circuit building blocks in a typical RF transceiver.
2	To lay the foundation for microwave engineering.
3	To introduce the applications of microwave engineering.
4	To make the student learn the microwave network analysis.

Course Outcomes: After learning this course, students will be able to

CO1	Perceive the importance of RF amplifier & RF Oscillator designs
CO2	Design amplifier using appropriate components
CO3	Understand the working principles of all the microwave tubes
CO4	Identify the various microwave components.
CO5	Choose a suitable microwave tube and solid state device for a particular application.
CO6	Illustrate the microwave bench set up and conduct measurements of different parameters.

UNIT – I	**Introduction to RF**	**(06 Hrs)**
	Importance of RF Design, RF Behavior of Passive Components: High Frequency Resistors, High-Frequency Capacitors, High-Frequency Inductors. Chip Components and Circuit Board Considerations: Chip Resistors, Chip Capacitors, Surface-Mounted Inductors. RF Filter Design, Basic Resonator, Filter Realizations.	
UNIT–II	**RF Transistor Amplifier Design**	**(06 Hrs)**
	Characteristics of Amplifiers, Amplifier Power Relations, Constant Gain: Unilateral Design, Unilateral Figure of Merit, Bilateral Design, Operating and Available Power Gain Circles, Constant VSWR Circles, broadband, High Power and Multistage Amplifiers. RF Oscillators and Mixers, Oscillator Model, Feedback Oscillator Design, Quartz Oscillators. High Frequency Oscillator Configuration, Basic Characteristics of Mixers, Frequency Domain Considerations.	
UNIT-III	**Introduction to Microwaves engineering**	**(06 Hrs)**
	History of Microwaves, Microwave Frequency bands. Applications of Microwave. General solution for TEM, TE and TM waves, Parallel plate waveguide, and rectangular waveguide. Wave guide parameters. Introduction to coaxial line, rectangular waveguide cavity resonators, Circular waveguide cavity resonators	
UNIT–IV	**Microwave Components:**	**(06 Hrs)**
	Multi port junctions: Construction and operation of E-plane, H-plane, Magic Tee and Directional couplers. Ferrites components, Faraday rotation, Construction and operation of Gyrator, Isolator and Circulator, Impedance and Admittance matrices, Scattering Matrix: -Significance, formulation and properties. S-Matrix calculations for-2 port network junction, E plane, H-plane and E-H (Magic Tee) Tees, Directional coupler, Isolator and Circulator.	
UNIT – V	**Microwave Tubes:**	**(06 Hrs)**
	Limitations of conventional tubes, O and M type classification of microwave tube cavity, velocity modulation. O type tubes, Two cavity Klystron, Reflex Klystron: Construction and principle of operation, velocity modulation and bunching process, M-type tubes Magnetron: 8 cavity cylindrical travelling wave magnetron, hull cut-off condition, Slow	

	wave devices, Helix TWT: Construction and principle of operation, Applications.	
UNIT–VI	**Microwave Solid State Devices:**	**(06 Hrs)**
	Microwave bipolar transistor, FET, MESFET, Varactor Diode, PIN Diode, Shottky, Tunnel Diode, TEDs, Gunn Diodes, IMPATT diode and TRAPATT diode. Microwave Measurements: Measurement devices: Slotted line, Tunable detector, VSWR meter, Power Meter, Measurements: S-parameter, frequency, Power, attenuation, Phase shift, VSWR impedance, Q of cavity resonator measurement.	

Content Delivery Methods: Chalk & talk, Collaborative Learning,
Assessment Methods:
1. Continuous Assessment (Unit Test, PBL)
2. End-term Examination (UE)

Text Books:

1. M. Kulkarni, “Microwave and Radar engineering”, 3rd edition, Umesh Publications
2. M L Sisodia& GS Raghuvamshi, “Microwave Circuits and Passive Devices”Wiley.
3. M L Sisodia& G S Raghuvanshi, “Basic Microwave Techniques and Laboratory Manual”, New Age International (P) Limited, Publishers.

Reference Books:

1. RF Circuit Design Theory and Application, Reinhold Ludwig and Pavel Bretchko, Ed. 2004, Pearson Education Kaufmann.
2. Samuel Y. Liao, “Microwave Devices and Circuits”, 3rd edition, Pearson
3. David M. Pozar, “Microwave Engineering", Fourth edition, Wiley.

List of Experiments:

1. Frequency & Wavelength measurement of Klystron tube.
2. Study of directional Couplers, Isolators,
3. I-V characteristics of Gunn diode.
4. Microwave Frequency, S-parameter, power Measurement
5. Study of E-plane, H-plane tees.
6. Design of RF Oscillators & Mixer

7. Design of RF amplifier.
Project-Based Learning:
Students are expected to perform a project (in a group) based on the course and prepare a report for the same. The report should be as per the standard guidelines.

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B. Tech. (Electronics & Communication Engineering) Sem VII **ELECTIVE-I: CYBER SECURITY AND FORENSICS**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hrs/week	End Semester Examination (ESE): 60 Marks	Credits: 03
Practical: 02 Hrs/week	Internal Assessment (IA): 40 Marks	
	OR: 50 Marks	Credit: 01
	Total:150 Marks	**Total Credits: 04**

Course Pre-requisites:

The students should have knowledge of

	Basic understanding of IT

Course Objectives:

1	To introduce the foundations of Cyber security and threat landscape.
2	Familiarise the student with technical knowledge and abilities necessary for protecting and defending against cyber and computer crimes and vulnerabilities.
3	Develop skills to plan, execute, and monitor cyber security mechanisms of social media.
4	To expose students to e-commerce, digital payments and computer forensics
5	To create awareness among students effectively use Computer Forensics and data retrieval with responsibility.

Course Outcomes: After learning this course, students will be able to

CO1	Understand the cyber security landscape.
CO2	Develop a deeper understanding and familiarity with various types of cyber and computer crimes and vulnerabilities.
CO3	Distinguish and review of the security aspects of social media platforms.
CO4	Analyse and evaluate the digital payment system security and remedial measures against digital payment frauds.
CO5	Define and cite appropriate instances for the application of computer forensics.
CO6	Identify the essential tools, and methodology of Computer Forensics and data retrieval.

UNIT – I	**Introduction to Cyber security**	**(06 Hrs)**
	Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet, World wide web, Advent of internet, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security.	

UNIT– II	**Cyber and computer crime**	**(06 Hrs)**
	Introduction to Digital Forensics, Definition and types of cybercrimes, electronic evidence and handling, electronic media, collection, searching and storage of electronic media, Classification of cyber crimes, Common cyber crimes- cyber crime targeting computers and mobiles, financial frauds, social engineering attacks, malware and ransomware attacks, case study	
UNIT –III	**Social Media Overview and Security**	**(06 Hrs)**
	Introduction to Social networks. Types of Social media, Social media platforms, Social media monitoring, Hashtag, Viral content, Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Case studies.	
UNIT –IV	**E - Commerce and Digital Payments**	**(06 Hrs)**
	Definition of E- Commerce, Main components of E-Commerce, Elements of E-Commerce security, E-Commerce threats, E-Commerce security best practices, Introduction to digital payments, Components of digital payment, Modes of digital payments- Banking Cards, Unified Payment Interface(UPI), Aadhar enabled payments.	
UNIT – V	**Computer Forensics**	**(06 Hrs)**
	Definition and Cardinal Rules, Data Acquisition and Authentication Process, Windows Systems - FAT32 and NTFS, UNIX file Systems, mac file systems, computer artifacts, Internet Artifacts, OS Artifacts and their forensic applications.	
UNIT –VI	**Forensic tools and data retrieval**	**(06 Hrs)**
	Introduction to Forensic Tools, Usage of Slack space, tools for Disk Imaging, Data Recovery, Vulnerability Assessment Tools, Encase and FTK tools, Anti Forensics and probable counters, retrieving information, retrieving deleted data: desktops, laptops and mobiles, retrieving data from slack space, renamed file, ghosting, compressed files.	

Content Delivery Methods: Chalk & talk, ICT Tools

Assessment Methods:
1. Internal Assessment (IA)(Unit Test, PBL)
2. End-term Examination (UE)

List of Tutorials/Experiments: The students should perform a minimum of eight experiments

1. Checklist for reporting cyber crime at Cyber crime Police Station.
2. Reporting phishing emails.
3. Demonstration of email phishing attack and preventive measures.
4. Basic checklist, privacy and security settings for popular Social media platforms.
5. Reporting and redressal mechanism for violations and misuse of Social media platforms.
6. Setting and configuring two factor authentication in the Mobile phone.
7. Setting, configuring and managing three password policy in the computer (BIOS, Administrator and Standard User).
8. Security patch management and updates in Computer and Mobiles.

9. Retrieving information from Mobile phone.
10. Installation and configuration of FAT and NTFS file system
11. Artifacts identification
Text Books/ Reference Books:
1. Sumit Belapure and Nina Godbole , “Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives” , Wiley India Pvt. Ltd.
2. Dorothy F. Denning, “Information Warfare and Security”, Addison Wesley.
3. Henry A. Oliver, “Security in the Digital Age: Social Media Security Threats and Vulnerabilities , Create Space Independent Publishing Platform.
4. Natraj Venkataramanan and Ashwin Shriram, “Data Privacy Principles and Practice” , CRC Press.
5. W. KragBrothy, “Information Security Governance, Guidance for Information Security Managers” 1st Edition, Wiley Publication.
6. C. Altheide & H. Carvey, “Digital Forensics with Open-Source Tools”,Syngress, 2011.
Project-Based Learning:
Students are expected to perform a project (in a group) based on the course and prepare a report for the same. The report should be as per the standard guidelines

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B. Tech. Electronics & Communication Engineering Sem VII

ELECTIVE-I: WIRELESS ROBOTS

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hrs/week	Examination (UE): 60 Marks	Credits: 03
Practical: 02 Hrs/week	Internal Assessment (IA): 40 Marks	
	Oral-50 Marks	Credit: 01
	Total:150 Marks	**Total Credits:04**

Course Pre-requisites:

Basic Communication Engineering, Control system engineering, Wireless communication mechanical and automobile Engineering

Course Objectives:

1	To introduce the concept of wireless locomotion
2	To familiarise the student with wireless robot kinematics and dynamics
3	To expose the localization and mapping techniques
4	To acquaint the student about motion control in wireless robots.

Course Outcomes: After learning this course students will be able to

CO1	Describe working principle of advanced wireless robot.
CO2	Perceive the concept of kinematics & dynamics of wireless robots
CO3	Understand the localisation & mapping parameters.
CO4	Explain the motion control involved in wireless robots
CO5	Classify the different types of robots.
CO6	Distinguish the performance of various robot applications.

UNIT – I	**Introduction To Wireless Robot**: Introduction to wireless robot and wireless manipulators, Principles of locomotion and types of locomotion, Types of wireless robots, ground robots (wheeled and legged robots), Aerial robots, underwater robots, water surface robots	**(06 Hrs)**
UNIT – II	**Kinematics and Dynamics:** Kinematics of wheeled wireless robots, degree of freedom and maneuverability, generalized wheel model,different wheel configuration, holonomicand nonholonomic robots, Dynamics of wireless robot. Lagrange -Euler and Netwon-Euler metods, Computer based dynamics simulation of different wheeled wireless robots	**(06 Hrs)**
UNIT –III	**Localization And Mapping:** Magnetic and optical position sensor, gyroscope, accelometer, magnetic compass, inclinometer, tactile and proximity sensor, ultrasound rangefinder, laser scanner, infrared rangefinder, visual and motion sensing	**(06 Hrs)**

	system, localization, Map based localization, Markov localization, Kalman filter localization, Error propagation model, Probabilistic map-based localization, Autonomous map building.	
UNIT– IV	**Motion Control**: Collision free planning and sensor-based obstacle avoidance, Motion controlling methods, Kinematics control, dynamics control and cascaded control	**(06 Hrs)**
UNIT –V	**Modern Wireless Robots**: Introduction, Swarm robots, cooperative robots, wireless manipulators, autonomous wireless robots	**(06 Hrs)**
UNIT –VI	**Classification and Application of Robots:** Classification of different types of robots, control related robots, wireless behind robots, automobile related to robots, communication related to robots and different application of different robots	**(06 Hrs)**

Content Delivery Methods: Chalk & talk, ICT Tools

Assessment Methods:
1. Internal Assessment (IA)(Unit Test, PBL)
2. End-term Examination (UE)

Text Books

1. Kelly, **"**Mobile robotics: Mathematics, Model, Methods**" ,** Cambridge University Press, USA**.**
2. Dudek, M Jenkin**, "**Computational principles of mobile robotics", Cambridge University, USA.

Reference Books:

1. Thrun, W. Burgard, D. Fox, Probabilistic robots, MIT Press , USA.
2. Siegwart, R.Hourbaksh and Scara Muzza, "Introduction to autonomous mobile robots", MIT press, USA.

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B. Tech. Electronics & Communication Engineering Sem VII **PROJECT STAGE-I**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
	Examination (UE): NA	
Practical: 02 Hrs/week	Internal Assessment (IA): -NA	
	TW :50 Marks OR:50 Marks	Credits:03
	Total:100 Marks	**Total Credits:03**

Course Objectives:	
1	To familiarize the students with the product development cycle.
2	To impart the importance of working as a team. .
3	To introduce the student to literature survey and documentation process.
4	To encourage the students to visualize & formulate a viable solution to practical engineering problems.

Course Outcomes: After learning this course, students will be able to	
CO1	Identify various technologies and fields for projects.
CO2	Understand the process to make reports and presentation.
CO3	Apply engineering knowledge to solve industrial problems.
CO4	Analyze ethical practices and tools used in different technologies for projects.
CO5	Justify the performance on parameters such as communication skills, technical knowledge.
CO6	Develop the skills to use software/hardware related to industrial projects

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B. Tech. Electronics & Communication Engineering Sem VII		
ANDROID APPLICATION DEVELOPMENT		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
	Examination (UE): NA	
Practical: 02 Hrs/week	Internal Assessment (IA): -NA	
	TW :50 Marks	Credits:01
	Total:50 Marks	**Total Credits:01**

Course Pre-requisites:	
The students should have knowledge of	
1	Java programming
Course Objectives:	
1	To create robust mobile applications and learn how to integrate them with other services.
2	To Create intuitive, reliable mobile apps using android services and components.
3	To simulate and apply seamless user interface that works with different mobile screens.
Course Outcomes: After learning this course, students will be able to	
CO1	Understand how the process of developing software.
CO2	Install and configure Android application development tools
CO3	Design and develop user Interfaces for the Android platform.
CO4	Understand the basic concept such Drag and Drop.
CO5	Apply Java programming concepts to Android application development.
CO6	Create any application on the Android Platform.
***	**Tool required and use:** Java Programming

Unit-I	**Overview of Java:** What Are Variables? Basic Output in java, Basic Input, Comments in Java, Data Types, Type Conversion & Type Casting, Stack & Heap, Arrays	
Unit-II	**Android Basics**: Architecture, application components, resources, activities, services broadcast receivers, content, providers, fragments, intents/filters, Kotlin	
Unit- III	**Android User Interface Matching**: UI Layouts, UI Controls, event handling styles and themes, custom components,	
Unit- IV	**Android Advanced Concepts**:	

	Drag and Drop, Notifications, Location Based Services, Sending Email, Sending SMS, Phone Calls, Publication Android application.	
Unit-V	**Android applications-I:** Android - Alert Dialoges, animations. audio capture, audio manager, autocomplete, Bluetooth, camera, clipboard, custom fonts, data backup, developer tools, emulator, Facebook integration, gestures, Google maps, image effects, image switcher, JetPlayer, JSON parser, NFC guide, PHP/MySQL, ProgressBar , push notification, RenderScript, RSS reader, screencast, SDK manager, sensors, SIP protocol, spelling checker, SQLite database, support library, testing, text to speech, TextureView, twitter integration, UI design, UI patterns, UI testing, WebView layout, Wi-Fi, widgets, XML parsers.	
Unit-VI	**Android applications-II:** SDK manager, sensors, session management, shared preferences, SIP protocol, spelling checker, SQLite database, support library, testing, text to speech, TextureView, twitter integration, UI design, UI patterns, UI testing, WebView layout, Wi-Fi, widgets, XML parsers.	

Content Delivery Methods: Chalk & talk, ICT Tools

Assessment Methods:
1. Internal Assessment (IA)(Unit Test, PBL)
2. End-term Examination (UE)

Text Books:
1. Dawn Griffiths, "Head First Android Development: A Brain-Friendly Guide Paperback," Shroff/O'Reilly; Second edition.
2. Michael Burton, "Android App Development for Dummies, 3ed Paperback," Wiley; Third edition.

Reference Books:
1. William Stallings , "Wireless Communications & Networks," Second Edition, Pearson.
2. Asoke K Telukder, Roopa R Yavaga, "Mobile Computing Technology, Applications and service creation," TMH.
3. Android Application Development Black Book, Pradeep Kothari, dreamtech press.
4. Dr. Sunilkumar S. Manvi, Dr. Mahabaleshwar S.Kakkasageri, "Wireless and mobile networks", WILEY.
5. John Horton , "Android Programming with Kotlin for Beginners: Build Android apps starting from zero programming experience with the new Kotlin programming language", Packt Publishing; 1st edition.

List of Experiments:
1. Installation of Android studio
2. Development of Hello world application
2. Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button
3. Create a screen that has input boxes for User Name, Password, Address, Gender(radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner)

and a Submit button. On clicking the submit button, print all the data below the Submit Button (use any layout)
4. Design an android application to create page using Intent and one Button and pass the Values from one Activity to second Activity
5. Design an android application Send SMS using Intent
6. Design an android application Using Radiobuttons
7. Design an android application for menu.
8. Create a user registration application that stores the user details in a database table.

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B. Tech. Electronics & Communication Engineering Sem VII **INTERNSHIP**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
	Examination (UE): NA	
	Internal Assessment (IA): -NA	
	TW :25 Marks OR: 25 Marks	Credits:03
	Total:50 Marks	**Total Credits:03**

Course Objectives:	
1	To familiarize the students to industrial work processes.
2	To acquire practical knowledge and hands-on experience.
3	To work as an effective team member and solve managerial problems.
4	To introduce the student to work ethics in industry.

Course Outcomes: After learning this course, students will be able to	
CO1	Identify various technologies and fields for practical training to enhance employability skills.
CO2	Apply various skills such as time management, positive attitude and communication skills during the performance of the tasks.
CO3	Explore career alternatives prior to graduation.
CO4	Understand the ability to adapt with the latest changes in the technological world.

Internship Training:

Every student has to undergo training on site or in office of some company for a period of 60 days to get the exposure and practical experience. He/ She has to submit the detail report of training on the basis of which the term work and oral marks should be awarded.

B. Tech. (Electronics & Communication) Sem VIII

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
48		Light Wave Communication	3	0	1	60	40	0	0	0	100	3	0	1	4
49		5G Architecture	4	2	0	60	40	50	0	0	150	4	1	0	5
50		Elective-II	3	2	0	60	40	0	25	0	125	3	1	0	4
51		Blockchain Technology*	4	2	0	60	40	0	50	0	150	4	1	0	5
52		Project Stage-II	0	4	0	0	0	100	100	0	200	0	6	0	6
53		Cloud Computing	0	2	0	0	0	25	0	0	25	0	1	0	1
	Total		**14**	**12**	**1**	**240**	**160**	**175**	**175**	**0**	**750**	**14**	**10**	**1**	**25**
	Research Paper Publication**		-	-	-	-	-	-	-	-	-	-	-	-	2

*Industry Taught Course – VI
** Add on course

Sr. No.	Name of the Elective-I
1	Smart Cities
2	Image Processing & Computer Vision
3	Biomedical Electronics
4	Software Defined Networks
5	Software Testing

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B. Tech. Electronics & Communication Engineering Sem VIII **LIGHTWAVE COMMUNICATION**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hrs/week	Examination (UE):60 Marks	Credits: 03
Practical:00	Internal Assessment (IA): 40 Marks	
Tutorial:1 Hr/week		Credit:01
	Total:100 Marks	**Total Credits:04**

Course Pre-requisites:	
The students should have knowledge of	
	Basics of Communication, Optical Communication, Computer Networks
Course Objectives:	
1	To enable the student to understand the importance of the backbone infrastructure for our present and future communication needs.
2	To enable the student to understand the differences in the design of data plane and the control plane, the routing, switching and the resource allocation methods.
3	To expose the student to the advances in network control and management.
Course Outcomes: After learning this course students will be able to	
CO1	Apply knowledge of basic optical network elements for realizing lightwave network.
CO2	Identify and formulate different optical networking topologies
CO3	Design Optical Network Routing Algorithms.
CO4	Apply the basic Networking knowledge to realize any sort of end-to-end communication
CO5	Analyse the various design parameters of optical network.
CO6	Manage the optical networks in its configuration, fault and performance.

UNIT – I	**Introduction to WDM Network Elements**	**(06 Hrs)**
	Operational principle of WDM, WDM network elements: Switches, Wavelength Converters, Optical Line Terminals, Optical Line Amplifiers, WDM Point to Point link, Wavelength Add/Drop Multiplexers, Optical Cross connects.	
UNIT – II	**Optical Networks Architecture**	**(06 Hrs)**
	SONET/SDH, Computer Interconnects, MANS, Layered architecture for SONET and Second Generation Networks, Broadcast and Select Networks – Topologies for Broadcast Networks, Wavelength Routed Networks, Linear Lightwave Networks, Media-Access Control Protocols.	
UNIT–III	**Packet Switching and Access Networks**	**(06 Hrs)**

	Photonic Packet Switching – OTDM, Multiplexing and Demultiplexing, Synchronization, Broadcast OTDM networks, Switch-based networks. Access Networks – Network Architecture overview, Future Access Networks and OTDM networks.	
UNIT –IV	**Wavelength Routing Networks**	**(06 Hrs)**
	Optical layer, Node design, Network design and operation, routing and wavelength assignment architectural variations. Optical Network Routing Principles - Impairment Aware Routing Optical Circuit Switching, Optical Packet Switching Optical Burst Switching.	
UNIT – V	**Design of Optical Networks**	**(06 Hrs)**
	Core Optical Networks, Metro Optical networks, Access Optical Networks Wavelength Routing and Assignment, Traffic Grooming and Protection, Multilayer Network Structure Transmission system model, power penalty-transmitter, receiver optical amplifiers, crosstalk, dispersion, wavelength stabilization	
UNIT– VI	**Network Control and Management**	**(06 Hrs)**
	Control and management, Network management configuration management, Performance management, fault management. Network management functions, Optical safety.	

Content Delivery Methods: Chalk & talk, ICT Tools

Assessment Methods:
1. Internal Assessment (IA)(Unit Test, PBL)
2. End-term Examination (UE)

Text Books:

1. Kumar Sivarajan and Rajiv Ramaswamy, Morgan Kauffman, Optical Networks: A Practical Perspective, Elsevier Publication Elsevier India Pvt. Ltd, 3rd Edition, 2010.
2. Harry G. Parros, Communication Oriented Networks, Wiley
3. G. Agarwal, Fiber Optic Communication Systems, John Wiley and Sons, New York, 2014.

Reference Books:

1. C. Siva Ram Moorthy and Mohan Gurusamy, WDM Optical Networks: Concept, Design and Algorithms, Prentice Hall of India.
2. Biswajit Mukherjee, Optical Communication Networks, TMG.
3. Jane M. Simoons, Optical Network Design and Planning, Second Edition, Springer
4. John M. Senior, “Optical Fiber Communications Principles and Practice”, Prentice Hall.
5. Ulysees Black, Optical Networks, Pearson education.
6. Cvijetic, Ivan B. Djordjevic, Advanced Optical Communication Systems and Networks, Artech House Applied Photonics.

Project-Based Learning (PBL):

Students are expected to perform a project (in a group) based on the course and prepare a report for the same. The report should be as per the standard guidelines.

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B. Tech. Electronics & Communication Engineering Sem VIII		
5G ARCHITECTURE		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04 Hrs/week	Examination (UE): 60 Marks Internal Assessment (IA): 40 Marks	Credits: 04
Practical: 02 Hrs/week	TW:50 Marks	Credit:01
	Total:150 Marks	**Total Credits:05**

Course Pre-requisites:	
The students should have knowledge of	
1	Basic understanding of telecommunications.
2	Basic understanding of computer networks and wireless communications

Course Objectives:	
1	To introduce the student to 5G architecture.
2	To familiarise the student to various radio access technologies in 5G
3	Tomake the student learn the various cases of 5G communication

Course Outcomes: After learning this course students will be able to	
CO1	Design & simulate the use cases for 5G.
CO2	Draw and explain 5G architecture, its components and functional criteria.
CO3	Identify the 5G radio-access technologies.
CO4	Implement the 5G wireless propagation channel models and MIMO.
CO5	Evaluate device to device (D2D) and mmWave communication.
CO6	Design application of various 5 G wireless Technologies using WiFi, Zigbee and WiMax.

UNIT – I	**Introduction, 5G Use Cases and System Concept**	**(08 Hrs)**
	Industrial and technological revolution: Mobile communications generations: from 1G to 4G, IoT: relation to 5G. Standardization activities: ITU-R , 3GPP & IEEE Use cases and requirements: Use cases, Requirements and key performance indicators , 5G system concept, Extreme mobile broadband, Massive machine-type communication, Ultra-reliable machine-type communication, Dynamic radio access network , Lean system control plane, Localized contents and traffic flows, Spectrum toolbox, RF cell planning for 5G.	
UNIT –II	**The 5G architecture, Spectrum**	**(08 Hrs)**
	Introduction: NFV and SDN, Basics about RAN architecture, High-level requirements for the 5G architecture.Cell structure for 5G.	

	Functional architecture and 5G flexibility: Functional split criteria, Functional optimization for specific applications, Integration of LTE and new air interface to fulfill 5G requirements, 5G spectrum landscape and requirements, 5G spectrum technologies	
UNIT -III	**The 5G Radio-Access Technologies**	**(10 Hrs)**
	Access design principles for multi-user communications:- Orthogonal multiple-access systems, Capacity limits of multiple-access methods. Multi-carrier with filtering:- Filter-bank based multi-carrier, Universal filtered OFDM. Non-orthogonal schemes for efficient multiple access:- Sparse code multiple access (SCMA), Interleave division multiple access (IDMA). Radio access for dense deployments:- OFDM numerology for small-cell deployments.	
UNIT– IV	**The 5G wireless propagation channel models and Massive multiple-input multiple-output (MIMO) systems.**	**(08 Hrs)**
	Introduction, Modeling requirements and scenarios: Channel model requirements, Propagation scenarios. METIS channel models: Map-based model, Stochastic model.MIMO in LTE, Theoretical background: Single user MIMO, Multi-user MIMO. Pilot design for massive MIMO. Resource allocation and transceiver algorithms for massive MIMO. RF field measurement parameter for 5G.	
UNIT –V	**Enabling Technologies for 5G**	**(07 Hrs)**
	Device-to-device (D2D) communications from 4G to 5G. Radio resource management for mobile broadband D2D. Multi-hop D2D communications for proximity and emergency services. Multi-operator D2D communication, Milimeter wave Communication: Hardware technologies for mmW systems Antennas Beamforming architecture Deployment scenarios, Architecture and mobility.	
UNIT –VI	**5 G Wireless Technologies**	**(07 Hrs)**
	IEEE802Std: 802.11 (WiFi), 802.15.1 (Bluetooth), 802.15.4 (Zigbee), 802.16 (WiMax), BLE, 4G/5G: Frame Structures and applications.	

Content Delivery Methods: Chalk & talk, ICT Tools

Assessment Methods:
1. Internal Assessment (IA)(Unit Test, PBL)
2. End-term Examination (UE)

Text Books:

1. Andrea Goldsmith , "Wireless Communications ", Cambridge University Press, 2nd edition, March 3, 2020
2. Afif Osseiran & Jose F. Monserrat, "5G Mobile and Wireless Communications Technology", Cambridge University Press 2016

3.Sassan Ahmadi , "5G NR: Architecture, Technology, Implementation, and Operation of 3GPP New Radio Standards" , Elsevier-Science, 2019
Reference Books:
1. Erik Dahlman, Stefan Parkvall, Johan Skold, " 5G NR:The Next Generation Wireless Access Technology," Academic Press, 2018.
2. J. Rodriguez, "Fundamentals of 5G Mobile Networks," John Wiley & Sons, 2015
List of Experiments: The students must perform a minimum of eight experiments
1. 5G Communications Link Analysis with Ray Tracing using MATLAB
2. Wireless Connectivity in the 5G Era for WLAN using MATLAB
3. MIMO Wireless System Design for 5G using MATLAB
4. 5G Waveforms generation using MATLAB
5. 5G Beamforming Design
6. Numerology in 5G
7. Frame Structure of 5G technology
8. MIMO System Implementation with Perfect CSI
9. Recent developments in 5G
10. Case Study: Factors affecting deployment of 5G in Indian scenario
Project-Based Learning (PBL):
Students are expected to perform a project (in a group) based on the course and prepare a report for the same. The report should be as per the standard guidelines.

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B. Tech. Electronics & Communication Engineering Sem VIII		
ELECTIVE II: SMART CITIES		
TEACHING SCHEME	**EXAMINATION SCHEME**	**CREDITS ALLOTTED**
Theory: 03 Hrs/Week	Examination (UE): 60 Marks Internal Assessment: 40 Marks	Credits: 03
Practical: 02 Hrs/Week	OR: 25 Marks	Credit:01
	Total:125 Marks	**Total Credits:04**

Course Pre-requisite:		
	Knowledge of IoT and Wireless protocols	
Course Objectives :		
1.	To introduce the concept of smart city and challenges.	
2.	To familiarize students with smart objects and devices.	
3.	To introduce the wireless protocols needed for smart city.	
4.	To familiarize students about the impact of ICT on quality life.	
Course Outcomes: After learning this course, students will be able to		
CO1	Summarize the philosophy of smart city and the challenges	
CO2	Apply the concept of IoT for smart systems.	
CO3	Classify the objects in IoT system.	
CO4	Explain the planning on interplay between the human and smart devices.	
CO5	Determine the wireless protocols needed for smart system.	
CO6	Paraphrase the impact of smart technologies on urbanization, human quality life and environment.	
Unit -I	**Smart City**	**(06 Hrs)**
	Necessity of SMART CITY The Smart City Philosophy, Development of Asian Cities, Megacities of India: Current Challenges, The India Story of Smart Cities, Conceptual Basis of a Smart City, Global Smart City Programs, Recommendations for Smart City Framework in GCC	

Unit -II	**IOT Applications in Smart City**	**(06 Hrs)**
	IoT applications in smart city: smart environment, smart streetlight and smart water management, smart waste management and smart energy management system.	
Unit- III	**Smart Objects**	**(06 Hrs)**
	Smart objects, Wired – Cables, hubs, etc., Wireless – RFID, WiFi, Bluetooth, etc. Different functional building blocks of IOT architecture	
Unit -IV	**Distributed Intelligence and Central Planning**	**(06 Hrs)**
	Central Planning on the Interplay between Humans and Smart Devices, BIM in smart cities, Artificial Intelligence (Machine Intelligence), Information Dynamics, Synergetic, Information Dynamics and Allometry in Smart Cities.	
Unit-V	**Wireless Protocols for Smart Cities**	**(06 Hrs)**
	Wireless Networking Basics, Wireless Networking Assumptions, Protocols: Message Queue Telemetry Protocol. RPL, REST, AMQP, CoAP	
Unit-VI	**ICT and Smart City**	**(06 Hrs)**
	Using technologies to improve the citizens quality of life, Smart city goals: The impact on citizens well-being and quality of life, Critical dimensions: Urbanization, local climate change, and energy poverty, Environmental issues: Role of local and global climate change.	

Content Delivery Methods: Chalk & talk, PowerPoint presentation
Assessment Methods:
1. Continuous Assessment (Unit Test, PBL, Attendance)
2. End-term Examination

Text Books:

1.	Olivier Hersent, David Boswarthick, and Omar Elloumi, "The Internet of Things: Key Applications and Protocols‖", Wiley Publications.
2.	Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.

References Books:

1.	Carlo Ratti and Matthew Claudel, "The City of Tomorrow: Sensors, Networks, Hackers, and the Future of Urban Life (The Future Series)", Yale University Press.
2.	Stephen Goldsmith, Susan Crawford, "The Responsive City: Engaging Communities Through Data-Smart Governance", 1st Edition Jossey Bass – Wiley.

3.	Michale Miller, “The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World”, Pearson Education.
List of Experiments: Case studies based on following:	
1.	Water waste management system.
2.	Smart street light management system.
3.	GIS based management Information System
4.	Smart RFID based traffic monitoring system.
5.	GIFT smart city
6.	Planning process for smart cities.
7.	Smart energy management system.
8.	Smart grid system
9.	Wireless protocols for Smart city
10.	Smart air quality monitoring system
Project-Based Learning:	
Students are expected to perform a project (in a group) based on the course and prepare a report for the same. The report should be as per the standard guidelines.	

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B. Tech. (Electronics & Communication Engineering) Sem VIII ELECTIVE-II: IMAGE PROCESSING AND COMPUTER VISION		
TEACHING SCHEME	**EXAMINATION SCHEME**	**CREDITS ALLOTTED**
Theory: 03 Hrs/week	End Semester Examination (ESE): 60 Marks	Credits: 03
Practical: 02 Hrs/week	Internal Assessment (IA): 40 Marks	
	OR: 25 Marks	Credit:01
	Total:125 Marks	**Total Credits:04**

Course Pre-requisites:	
The students should have the knowledge of	
1	Engineering Mathematics
2	Basics of Image processing

Course Objectives:	
1	To introduce the concepts of image processing and basic analytical methods to be used in image processing.
2	To familiarize students with image enhancement and restoration techniques.
3	To introduce different image segmentation techniques.
4	To make student aware of various techniques to implement computer vision algorithms efficiently.

Course Outcomes: After learning this course students will be able to	
CO1	Explain the fundamentals of digital image and its processing and perform image enhancement techniques.
CO2	Compare various geometric camera models and multiple view geometry.
CO3	Implement different feature extraction techniques for image analysis.
CO4	Apply the concept of Image segmentation.
CO5	Identify a suitable classifier to address a desired pattern recognition problem.
CO6	Apply three-dimensional image analysis techniques & motion analysis algorithms

UNIT – I	**Introduction to Image Processing**	**(05 Hrs)**
	Overview and State-of-the-art, Fundamentals of Image formation, Transformation: Orthogonal, Euclidean, Affine, Projective, etc; Fourier Transform, Convolution and Filtering, Image enhancement, Restoration, Histogram processing	
UNIT – II	**Depth Estimation and Multi-camera views**	**(06 Hrs)**

	Perspective, Binocular stereopsis: Camera and Epipolar geometry; Homography, rectification, DLT, RANSAC, 3-D reconstruction framework; Auto-calibration	
UNIT –III	**Feature Extraction**	**(06 Hrs)**
	Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT.	
UNIT –IV	**Image Segmentation**	**(05 Hrs)**
	Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation; Object detection.	
UNIT –V	**Pattern Analysis**	**(06Hrs)**
	Clustering: K-Means, Supervised, Un-supervised, Semi-supervised; Classifiers, Introduction to Bayes, KNN, ANN models.	
UNIT– VI	**Motion Analysis**	**(08 Hrs)**
	Background Subtraction and Modelling, Optical Flow, KLT, Spatio-Temporal analysis, Dynamic Stereo; Motion parameter estimation. Shape from X: Light at surfaces; Phong model; Reflectance map; Albedo estimation. Photometric stereo; Use of surface smoothness Constraint; Shape from texture, colour, motion and edges.	

Textbooks /Reference Books:

1. Rafael C. Gonzalez and R.E. Woods, “Digital Image Processing”, Addison- Wesley.
2. Richard Szeliski, “Computer Vision: Algorithms and Applications”, Springer-Verlag London Limited.
3. D.A. Forsyth, “Computer Vision: A modern approach”, Pearson Education
4. Richard Hartely & Andrew Zisserman, “Multiple View Geometry in Computer vision”, Second Edition, Cambridge University Press.
5. Milan Soanka, Vaclav Hlavac and Roger Boyle, “Digital Image Processing and Computer Vision”, Cengage Learning.

List of Experiments: The students should perform a minimum of eight experiments

1. Perform basic Image Handling and Processing operations on the image.
2. Study of Geometric Transformation
3. Object detection in target domain using weakly supervised, semi supervised
4. Face recognition using face images obtained from internet.
5. Monocular 3D object detection for indoor objects.
6. Scene segmentation of indoor panorama
7. Joint Image Deblurring/Super-Resolution and Low-light Image Enhancement
8. Image to Image transformation (few samples) using VAE, GANs etc
9. Object-Goal Navigation task by learning from environment
10. Real (True) depth estimation from indoor scenes, given a model (DL tool) for virtual depth estimation

11. Project based on Computer Vision Applications
Project-Based Learning (PBL)
Students are expected to perform a project (in a group) based on the course and prepare a report for the same. The report should be as per the standard guidelines.

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B. Tech. Electronics & Communication Engineering Sem VIII **ELECTIVE-II: BIOMEDICAL ELECTRONICS**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hrs/week	Examination (UE):60 Marks	Credits: 03
Practical: 02 Hrs/week	Internal Assessment (IA): 40 Marks	
	OR: 25 Marks	Credit:01
	Total:125 Marks	**Total Credits:04**

Course Pre-requisites:	
The students should have knowledge of	
1	Electrodes, Sensors and transducers, Electronic Circuits and Applications

Course Objectives:	
1	To introduce various biopotentials, their measurements and interpretations associated with human body.
2	To familiarize the student with different medical equipments.
3	To expose the student to clinical laboratory equipments.
4	To imbibe the importance of patient's safety

Course Outcomes: After learning this course, students will be able to	
CO1	Classify systems in human body and identify bio-potentials
CO2	Correlate the parameters like B.P., ECG and PCG with the functioning of Heart.
CO3	Categorize life saving devices such as cardiac and respiratory equipments.
CO4	Identify equipments present in ICU/NICU.
CO5	Categorize blood tests and clinical laboratory instruments
CO6	Recognize surgical diathermy and radiology equipments.

UNIT – I	**Human body & Origin of Bio-potentials**	**(06 Hrs)**
	Human body: cell structure, overview of different systems in the body: cardiovascular system, respiratory system, nervous system, musculoskeletal system, gastrointestinal system, endocrine system and lymphatic system, Origin of Bio-potentials: action potential, bio-potentials such as ECG, EEG, EMG.	
UNIT – II	**Electrocardiograph, Phonocardiograph and Blood pressure measurements**	**(06 Hrs)**
	Electrocardiography: ECG lead configurations, ECG machine, ECG electrodes, Phonocardiograph: heart sounds and heart murmurs, microphones used in Phonocardiograph, recording set up of PCG,Blood pressure measurement techniques: direct and indirect method, relationship between ECG, PCG and Blood pressure.	

UNIT - III	**Cardiac and Respiratory Equipments**	**(06 Hrs)**
	Fibrillation, need of defibrillator, Types of defibrillator and electrodes, natural pacemaker, need of external pacemaker, types of pacemaker and batteries, mechanical ventilation, need of ventilator, ventilator block schematic and modes of ventilator, spirometry	
UNIT – IV	**ICU and NICU-Architecture and monitoring systems**	**(06 Hrs)**
	Architecture of ICU and NICU, patient monitoring system, central monitoring system, holter monitor, Basics of telemetry and Multi-channel telemetry, Baby incubator and Phototherapy unit	
UNIT – V	**Clinical Laboratory Instruments and hemodialysis**	**(06 Hrs)**
	Colorimeter, spectrophotometer, centrifuge, auto analyzer, blood cell counter, Basic principle of dialysis, Artificial kindney, different types of dialyzer membranes, typical setup of hemodialysis	
UNIT – VI	**Electrosurgical and Radiographic Instruments**	**(06 Hrs)**
	Basic principle of electrosurgery, Electrosurgical unit, Basic principle and working of X-ray, Computed Tomography (CT), Magnetic Resonance Imaging (MRI) and Ultrasound, Digital X-Ray, Positron Emission Tomography (PET)	

Content Delivery Methods: Chalk & talk, Powerpoint presentation
Assessment Methods:
1. Continuous Assessment (Unit Test, PBL, Attendance)
2. End-term Examination

Text Book:

1. R. S. Khandpur, "Hand book of Biomedical Instrumentation", Tata McGraw Hill Publishing Company limited, New Delhi.
2. Leslie Cromwell, Fred J. Weibel, Erich A. Pfeiffer, "Biomedical Instrumentation and Measurements", Second Edition, PHI.

Reference Books:

1. John G. Webster, "Medical Instrumentation- Application and Design", Third Edition, John Wiely and Sons Inc., New York.
2. Joseph J. Carr & John M. Brown, "Introduction to Biomedical Equipment Technology", Forth Edition, PHI.
3. Richard Aston, "Principles of Biomedical Instrumentation and Measurement", Merrill Macmillan Publishing Company, New York.

List of Experiments:

1. Measurement of blood pressure using Sphygmomanometer.
2. Simulation of ECG waveform and heart rate measurement using ECG system.

3. Study of phonocardiograph for recognition of heart sound.
4. Detection of Apnea and Tachypnea using respiration rate simulator and monitor.
5. Detection of fibrillation condition and recovery using DC Defibrillator.
6. Observation and functioning of External Pacemaker over natural pacemaker.
7. To find out concentration of unknown samples uding Spectrophotometer.
8. Observation of cutting and coagulation operations using surgical diathermy unit.
Project-Based Learning (PBL)
Students are expected to perform a project (in a group) based on the course and prepare a report for the same. The report should be as per the standard guidelines.

B. Tech. Electronics & Communication Engineering Sem VIII
ELECTIVE –II: SOFTWARE DEFINED NETWORKS

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hrs/week	Examination (UE):60 Marks	Credits: 03
Practical: 02 Hrs/week	Internal Assessment (IA): 40 Marks	
	OR: 25 Marks	Credit:01
	Total:125 Marks	Total Credits:04

Course Pre-requisites:

The students should have knowledge of

1	Cellular Technology and 4G
2	Computer Communication Network

Course Objectives:

1	To introduce the fundamentals of software defined networks.
2	To understand the separation of the data plane and the control plane.
3	To enable the studnt to work on SDN Programming
4	To impart the knowledge about the security issues in SDN
5	To familiarise the applications of SDN

Course Outcomes: After learning this course, students will be able to

CO1	Understand the components of software defined networks
CO2	Use the various components of SDN.
CO3	Explain the use of SDN in the current networking scenario
CO4	Evaluate the various security aspects in SDN
CO5	Design and simullate various applications of SDN
CO6	Use SDN features in the future networking scenario

UNIT – I	**Introducing SDN**	**(06 Hrs)**
	SDN Origins and Evolution – Introduction – Need of SDN- Centralized and Distributed Control and Data Planes - The Genesis of SDN ,SDN APIs, Virtualization of Network Functions (VNF) and NFV, Open Virtual Networking (OVN), Open Network Operating Systems (ONOS)	
UNIT – II	**SDN Abstractions**	**(06 Hrs)**
	Working principle of SDn - The Openflow Protocol - SDN Controllers: Introduction - General Concepts - VMware - Nicira - VMware/Nicira - OpenFlow-Related - Mininet - NOX/POX - Trema - Ryu - Big Switch Networks/Floodlight - Layer 3 Centric - Plexxi - Cisco OnePK	
UNIT –III	**Programming SDN'S**	**(06 Hrs)**
	Network Programmability - Network FunctionVirtualization - NetApp Development, Northbound / southbound interfaces ,Application	

	Programming Interface, Current Languages and Tools, Composition of SDNs,Network Slicing , Mininet Environment and Implementation	
UNIT –IV	**SDN Applications in Security**	**(06 Hrs)**
	Switching and Load Balancers, Firewall and Access Control, Use cases in Legacy Networks security, Security in modern networks – Cloud, Fog, IoT, 5G, , Solutions, Fault Tolerance Designs, Debugging and Trouble Shooting.	
UNIT –V	**SDN Applications and Use Cases**	**(06 Hrs)**
	SDN in the Data Center - SDN in Other Environments - SDN Applications - SDN Use Cases - The Open Network Operating System	
UNIT –VI	**SDN'S future and perspectives**	**(06 Hrs)**
	SDN Open Source - SDN Futures - Final Thoughts and Conclusions	

List of Experiments: : The term work shall consist of record of minimum eight experiments.

1. Setting up the Environment and Implementation of Controllers in Mininet 3
2. To create Custom Topologies in POX, ODL
3. To set ONOS
4. To implement Northbound Interfacing
5. To implement Southbound Interfacing
6. To implement ONOS deployment ONOS
7. ONOS deployment ONOS – OPNFV – SDN Application development
8. ONOS, Northbound – Southbound Interfacing, ONOS deployment ONOS – OPNFV – SDN Application development
9. To measure network performance in Mininet
10. Use case of SDN in Network Virtualization
11. Use case of SDN in Traffic Engineering WAN
12. Use case of SDN in Network Telemetry

Text Books:

1. Thomas D. Nadeau ,"SDN: Software Defined Networks, An Authoritative Review of Network Programmability Technologies" ,Ken Gray Publisher: O'Reilly Media, August 2013.
2. Vivek Tiwari , "SDN and OpenFlow for Beginners", Amazon Digital Services, Inc., ASIN:, 2013.
3. Nunes, Bruno AA, et al. "A survey of software-defined networking: Past, present, and futureof programmable networks." Communications Surveys & Tutorials, IEEE 16.3 (2014): 1617-1634.
4. Network Innovation through OpenFlow and SDN: Principles and Design, Edited by Fei Hu, CRC Press, ISBN-10: 1466572094, 2014.
5. Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud" – William Stallings.

6. Kreutz, Diego, et al. "Software-defined networking: A comprehensive survey." Proceedings of the IEEE 103.1 (2015): 14-76.

Reference Books:

1. Paul Goransson and Chuck Black,"Software Defined Networks: A Comprehensive Approach", Morgan Kaufmann Publications, 2014.
2. Lantz, Bob, Brandon Heller, and Nick McKeown. "A network in a laptop: rapid prototyping for software-defined networks." Proceedings of the 9th ACM SIGCOMM Workshop on Hot Topics in Networks. ACM, 2010.
3. Siamak A zodolmolky, "Software Defined Networking with OpenFlow", Packt Publishing, 2013.
4. Paul Goransson and Chuck Black, Software Defined Networks: A Comprehensive Approach, First Edition, Morgan Kaufmann, 2014.
5. Thomas D. Nadeau, Ken Gray, SDN: Software Defined Networks, OReilly Media, 2013.
6. Peterson, Cascone, O'Connor, Vachuska, and Davie.,"Software-Defined Networks: A Systems Approach ystems Approach LLC (Publisher),2022.

Project Based Learning:

Students are expected prepare report on any one topic related to this subject, write its definition, applications and illustrate with few examples.

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B. Tech. Electronics & Communication Engineering Sem VIII
ELECTIVE-II: SOFTWARE TESTING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED
Theory: 03 Hrs/week	Examination (UE): 60 Marks	Credits: 3
Practical: 02 Hrs/week	Internal Assessment (IA): 40 Marks	
Tutorial: 00	Oral -25 Marks	Credit:1
	Total:125 Marks	**Total Credits:04**

Course Pre-requisite:

The students should have knowledge of

1	Knowledge of Software Engineering
2	Knowledge of UML

Course Objectives: -

1	Familiarise the student with software testing, important concepts and the testing process
2	To make the student Learn about dynamic testing and Test case design techniques. How to do the testing after executing the program and how to design test cases with examples
3	To introduce the student to testing tools.

Course Outcomes: After learning the course, student will able to

CO1	Perceive importance of testing techniques in software quality management and assurance
CO2	Categorize the different types of testing methodology.
CO3	Apply different testing methodologies used in industries for software testing
CO4	Identify various types of software risks and its impact on different software application.
CO5	Create test case Design scenarios for different application software s using various testing techniques.
CO6	Create test case execution scenarios for different application software s using various testing techniques.

Unit -I	**Introduction**	**(05 Hrs)**
	Software Testing, Importance of testing, Roles and Responsibilities, Testing Principles, Attributes of Good Test, V-Model, Test Case Generation, SDLC vs STLC, Software Testing Life Cycle-in detail.	
Unit -II	**Types of Testing:**	**(05 Hrs)**

	Testing Strategies: Unit Testing, Integration Testing, System Testing, Smoke, Regression Testing, Acceptance Testing. Clean Room Software Engineering. Functional/Non-functional Testing. Testing Tools, Categorization of testing methods: Manual Testing, Automation Testing and Automated Testing Vs. Manual Testing	
Unit-III	**Software Testing Methodologies:**	**(08 Hrs)**
	Validation & Verification, White/Glass Box Testing, Black Box Testing, Grey Box Testing, Statement Coverage Testing, Branch Coverage Testing, Path Coverage Testing, Conditional Coverage Testing, Loop Coverage Testing, Boundary Value Analysis, Equivalence Class Partition, State Based Testing, Cause Effective Graph, Decision Table, Use Case Testing, Exploratory testing and Testing Metrics, Testing GUI	
Unit -IV	**Software Testing Life Cycle:**	**(06 Hrs)**
	Requirements Analysis/Design, Traceability Matrix, Test Planning, Objective, Scope of Testing, Schedule, Approach, Roles & Responsibilities, Assumptions, Risks & Mitigations, Entry & Exit Criteria, Test Automation, Deliverables.	
Unit- V	**Test Cases Design:**	**(06 Hrs)**
	Write Test cases, Review Test cases, Test Cases Template, Types of Test Cases, Difference between Test Scenarios and Test Cases. Test Environment setup, Understand the SRS, Hardware and software requirements, Test Data.	
Unit-VI	**Test Execution:**	**(06 Hrs)**
	Execute test cases, Error/Defect Detecting and Reporting, DRE (Defect Removal Efficiency), Object, Types of Bugs, Art of Debugging, Debugging Approaches, Reporting the Bugs, Severity and priority, Test Closure, Criteria for test closure, Test summary report.	

Content Delivery Methods: Chalk & talk, PowerPoint presentation, Animations
Assessment Methods:
1. Continuous Assessment (Unit Test, PBL, Attendance)
2. End-term Examination

List of Experiments:

1	Implement all techniques of Black Box-Testing, White Box Testing taking your Mini Project as the Context System.
2	Write aprogram to find the roots of a quadratic equation and perform boundary value analysis
3	Write a program to find area of circle, square, triangle and rectangle and perform equivalence class testing.
4	Write a program to perform a raise to power b andperform decision table testing.
5	Write a program to compute previous date, given present date as input and perform decision table testing.
6	Write a program to read three sides of a triangle and determine whether they form scalene, isosceles or equivalent triangle and test it using cause – effect testing techniques.

7	Write aprogram to calculate total salary of an employee, given his salary. The slab is as follows HRA=30% of basic salary, DA=80% of basic salary, MA=100, TA=800, Income tax=700, Pf=780. Draw its path graph and finds its V(G) by all three methods.
8	Draw a DD path graph for the program written for experiment 6.
9	Write a program to read the marks of 10 students in 5 subjects calculate the average and assign grades. Now draw its graph matrix and find its V(G).
10	Perform Data Flow Testing on the program for quadratic equation program.
11	Case study on TestingTool-QTP.
Text books	
1	Roger S.Pressman, "Software engineering- A practitioner's Approach", McGraw-Hill International Editions
2	Ian Sommerville, "Software Engineering", Pearson Education Asia
3	Boris Beizer , "Software Testing Techniques", 2nd edition, , 1990
Reference Books	
1	Srinivasan Desikan , "Software Testing: Principles and Practices", Dorling Kindersley (India).
2	Kshirasagar Naik and Priyadarshi Tripathy , "Software Testing and Quality Assurance: Theory and Practice", Wiley Publication.
3	Michael Haug and Eric W Olsen ,"Software Quality Approaches: Testing, Verification, and Validation: Software Best Practice" Springer.
	Project Based Learning: Students are expected to perform a project (in a group) based on the course and prepare a report for the same. The report should be as per the standard guidelines.

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College of Engineering, Pune

B. Tech. Electronics & Communication Engineering Sem VIII **ITC-VI: BLOCKCHAIN TECHNOLOGY**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04 Hrs/week	Examination (UE): 60 Marks	Credits: 04
Practical: 02 Hrs/week	Internal Assessment (IA): 40 Marks	
Tutorial: 00	Oral :50 Marks	Credits:01
	Total:150 Marks	**Total Credits:05**

Course Pre-requisites:	
The students should have knowledge of	
	Expertise In Programming
	Basic Knowledge Of Computer Security
	Cryptography
	Networking
	Concurrent Or Parallel Programming

Course Objectives:	
1	To introduce the student to blockchain systems.
2	To make student learn about the securely interact with bitcoin and ethereum.
3	To make the student ro design, build, and deploy smart contracts and distributed applications.
4	To make the student to integrate ideas from blockchain technology into their own projects.

Course Outcomes: After learning this course, students will be able to	
1	Understand the design principles of Bitcoin and Ethereum
2	Describe Nakamoto consensus.
3	Explain the Simplified Payment Verification protocol.
4	List and describe differences between proof-of-work and proof-of-stake consensus.
5	Interact with a blockchain system by sending and reading transactions.
6	Design, build, and deploy a distributed application.

UNIT – I	**Introduction**	**(08 Hrs)**
	Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance,Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof	
UNIT–II	**Blockchain**	**(08 Hrs)**
	Introduction, Advantage over conventional distributed database, Blockchain Network, MiningMechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee,Anonymity, Reward,	

	Chain Policy, Life of Blockchain application, Soft & Hard Fork, Privateand Public blockchain	
UNIT-III	**Distributed Consensus**	**(08 Hrs)**
	Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, SybilAttack, Energy utilization and alternate.	
UNIT–IV	**Cryptocurrency**	**(08 Hrs)**
	History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum -Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin	
UNIT – V	**Cryptocurrency Regulation**	**(08 Hrs)**
	Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy.	
UNIT–VI	**Cryptocurrency Applications**	**(08 Hrs)**
	Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain	

Content Delivery Methods: Chalk & talk, ICT Tools

Assessment Methods:

1. Internal Assessment (IA)(Unit Test, PBL)
2. End-term Examination (UE)

Text Books:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction”, Princeton University Press (July 19, 2016).
2. Imran Bashir, “Mastering blockchain: Distributed Ledger Technology, Decentralization and Smart Contract Explained”, Second Edition, Packt Publishing, 2018.

Reference Books:

1. S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, “Blockchain Technology: Cryptocurrency and Applications”, Oxford University Press, 2019.
2. Josh Thompson,“Blockchain:The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming”, Create Space Independent Publishing platform 201

List of Experiments

1. Demonstration of Blockchain https://andersbrownworth.com/blockchain.
2. Installation of Ganache, Flask and Postman
3. Write a Simple Python program to create a Block class that contains index, timestamp, and previous hash. Connect the blocks to create a Blockchain.
4. Demo of Remix-Ethereum IDE https://remix.ethereum.org and Test Networks
5. Write a Simple Smart Contract for Bank with withdraw and deposit functionality.

6. Write a Smart Contract for storing and retrieving information of Degree.
Project-Based Learning:
Students are expected to perform a project (in a group) based on the course and prepare a report for the same. The report should be as per the standard guidelines.

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<table>
<tr><td colspan="3">B. Tech. Electronics & Communication Engineering Sem VIII
PROJECT STAGE-II</td></tr>
<tr><td>TEACHING SCHEME:</td><td>EXAMINATION SCHEME:</td><td>CREDITS ALLOTTED:</td></tr>
<tr><td></td><td>Examination (UE): NA</td><td></td></tr>
<tr><td>Practical:
04 Hrs/week</td><td>Internal Assessment (IA): -NA</td><td></td></tr>
<tr><td></td><td>TW :100 Marks OR:100 Marks</td><td>Credits:06</td></tr>
<tr><td></td><td>Total:200 Marks</td><td>Total Credits:06</td></tr>
</table>

Course Objectives:	
1	To familiarize the students with the product development cycle.
2	To impart the importance of working as a team. .
3	To introduce the student to literature survey and documentation process.
4	To encourage the students to visualize & formulate a viable solution to practical engineering problems.

Course Outcomes: After learning this course, students will be able to	
CO1	Identify various technologies and fields for projects.
CO2	Understand the process to make reports and presentation.
CO3	Apply engineering knowledge to solve industrial problems.
CO4	Analyze ethical practices and tools used in different technologies for projects.
CO5	Justify the performance on parameters such as communication skills, technical knowledge.
CO6	Generate project report and present it effectively.

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B. Tech. Electronics & Communication Engineering Sem VIII **CLOUD COMPUTING**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
	Examination (UE): NA	Credits: 00
Practical: 02 Hrs/week	Internal Assessment (IA): NA	
	TW : 25 Marks	Credit:01
	Total: 25 Marks	**Total Credits:01**

Course Pre-requisites:

The students should have knowledge of

	Computer Networks, Basics of Operating System (O.S.)

Course Objectives:

1	To make the student learn and use version control systems.
2	To enable student to develop web applications in cloud.
3	To make student learn and work with virtual machine.
4	To design and develop a process involved in creating a cloud based application.
5	To introduce student to the advanced technologies in cloud computing
6	To implement parallel programming using Hadoop.

Course Outcomes: After learning this course students will be able to

CO1	Configure various virtualization tools such as virtual box, VMware workstation.
CO2	Design and deploy a web application in a PaaS environment.
CO3	Simulate a cloud environment to implement new schedulers.
CO4	Install a generic cloud environment as a private cloud.
CO5	Design open-source cloud.
CO6	Install and use Hadoop.

List of Experiments:

1. Use gcc to compile c-programs. Split the programs to different modules and create an application using make command.
2. Use version control systems command to clone, commit, push, fetch, pull, checkout, reset, and delete repositories.
3. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
4. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs.
5. Install Google App Engine. Create hello world app and other simple web applications using python/java.
6. Use GAE launcher to launch the web applications
7. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
8. Find a procedure to transfer the files from one virtual machine to another virtual machine.

9. Find a procedure to launch virtual machine using trystack (Online Openstack DemoVersion)
10. Install Hadoop single node cluster and run simple applications like wordcount.

Software requirements

- Open stack
- Hadoop
- Eucalyptus or Open Nebula or equivalent

Text Books:

1. Srinivasan, J.Suresh, “Cloud Computing: A Practical Approach for Learning and Implementation “ Pearson.
2. Barrie Sosinsky, “Cloud Computing Bible”, Wiley Publishing.

Reference Books:

1. Kailash Jayaswal, Jagannath Kallakurchi, Donald J. Houde, Deven Shah, “Cloud Computing Black Book”, Dreamtech Press.
2. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, “Mastering Cloud Computing”, McGraw Hill Education.
3. Arora Pankaj , “To the cloud: cloud powering an Enterprise”, Tata Mc Graw Hill Education.
4. Kai Hwang, “Distributed and Cloud Computing: From Parallel Processing to the Internet of Things”, Morgan Kaufmann.

Project Based Learning:

Students are expected to perform a project (in a group) based on the course and prepare a report for the same. The report should be as per the standard guidelines.

B. Tech. Electronics & Communication Engineering Sem VIII ADD ON COURSE: RESEARCH PAPER PUBLICATION		
TEACHING SCHEME:	**EXAMINATION SCHEME**	**CREDITS ALLOTTED:**
	Examination (UE): NA	
	Internal Assessment (IA): -NA	
		Total Credits:02

Course Objectives:

1	To expose students to various types of research papers, paper writing tools, and plagiarism
2	Develop skills to write research papers using various tools.
3	To create awareness among students effectively choose journal metrics for manuscript submission

Course Outcomes: After learning this course, students will be able to

CO1	Gain knowledge of various types of research papers
CO2	Choose various paper writing tools as per the need
CO3	Develop article writing skills
CO4	Apply skills to minimise plagairism
CO5	Effectively use journal maetrics for specific journal selection

Research Paper Publication:

Main objective of Research paper publication is to teach students how to do research and help them to acquire skills that students can use beyond the academic environment. Students should publish minimum one research paper in UGC care/Peer reviewed journal.

BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE

Faculty of Engineering & Technology
B. Tech - Electronics & Communication Engineering
Old Syllabus

College Information

Bharati Vidyapeeth University college of Engineering, Pune continued to take new strides towards evolving directions to further the growth and dissemination of scientific and technological knowledge.

The college established in 1983, is one of the oldest and largest Engineering Colleges in the state of Maharashtra. The college has well defined goals which are intensely practised and followed.

Their implementation encompass multi-faceted activities in the form of recruiting experienced faculty, organizing faculty development program, Identifying socio-economically relevant areas and emerging technologies. Constant review and upgradation of curricula, Upgradation of Laboratories, library and communication facilities, Collaboration with industries and research and development organizations, Sharing of knowledge, infrastructure and resources, training extension, testing and consultancy services and Promoting Interdisciplinary research.

The college has been ranked as 'A' grade Engineering college by the Government of Maharashtra. Meeting quality standards in education such as is been a motto of this institute. As a pedagogical effect, out of ten under graduate programmes being conducted, seven programmes eligible for accreditation are accredited by National Board of Accreditation(NBA).

The DATAQUEST - CMR conducts an annual survey of technical schools of India and publishes the list of best 100 technical schools in India. In the surveys, for the past seven years, the college has been consistently ranked among top 50 technical schools.

Another feather in Institute's cap is its selection for the grant of Rs. 4.0 Crore under Technical Education Quality Improvement Programme - II(TEQIP-II) by Ministry of Human Resource Development (MHRD) of Government of India supported by World Bank.

This Institute has been ranked to 45th position at all India level and 5th at the Western Region of AICTE in 2012.The Institute has been very sensitive to the human resource development and continues initiating new academic programmes. Presently it offers 09 undergraduate programmes in the field of Civil Engineering, Chemical Engineering, Computer Engineering, Information Technology, Electrical Engineering, Electronics Engineering, Electronics and Telecommunication Engineering, Mechanical Engineering and Production Engineering.

The college offers 08 postgraduate programmes in the field of Civil Engineering,Chemical Engineering, Computer Engineering, Information Technology, Electrical Engineering, Electronics Engineering, Mechanical Engineering and NanoTechnology.

Salient Features

The Department of Electronics Engineering offers undergraduate, postgraduate and doctoral degree courses. The programme focuses on design and analysis of electronic devices, integrated circuits, wireless devices, digital and analog circuitry for numerous applications.

'The Bharati Electronics Engineer' has many opportunities and tremendous scope for a rewarding career.

Major Topics of Research Undertaken:

- Design of fiber optic probe for measurement and analysis pH of acidic and basic solutions.
- Research grant worth Rs. 0.5 lacs was recieved from Institution of Engineers India(IEI) for research work.
- Developing text to speech synthesizer mainly for visually disabled people. This research work was funded by Institution of Engineers India(IEI) and grant worth Rs 0.2 lacs was recieved.
- Development of Biomechanics models which are controlled electronically to help the patients.

Research Facility Developed:

Eduvance & GAATSIS for setting up 'Center for Excellence in Embedded Systems' laboratory with hardware donated by ARM University and Cypress Semiconductors.

Conference Organized / Workship Organised

- National Conference on Emerging trends in Biomedical Engineering, BIOCON in Sept. 2005.
- National Conference on Instrumentation & Communication Engineering NACICE-2013 inApril 2013.
- STTP on 'Advanced VLSI Technology & FACE' sponsored by AICTE in June 2008.

Total Research Grants and Grant-in-Aid recieved from Academic year 2004-05 to 2014-15 : 45 lacs.

Research Publications from Academic Year 2010-11 to 2014-15:

Type of Publication	No of Publication
International Journal	132
National Journal	04
International Conference	21
National Conference	10
Total	167

Mission

To empower students with state of the art knowledge & latest trends in Electronics and allied engineering to meet real world challenges.

Vision

"To create technical manpower to suit global needs in Electronics and allied Engineering."

Program Educational Objectives

PEO 1 To make students competent for professional career in Electronics & allied fields.

PEO 2 To equip students with effective communication & teamwork skills to acquire professional excellence in national & multinational organizations.

PEO 3 To nurture students to be sensitive to ethical, societal & environmental issues while conducting their professional work.

PEO 4 To build strong fundamental knowledge amongst student to pursue higher education and continue professional development in Electronics & other fields.

Programme Outcomes

The Graduates Engineers will have the ability to

1. Apply basic knowledge of mathematics, science and engineering.
2. Identify, formulate and solve engineering problems.
3. Build, analyze & interpret Electronics Systems
4. Solve Engineering problems in Electronics & allied fields.
5. Use modern software tools in Electronics Engineering practice.
6. Understand effect of engineering solutions in global, economic, health, safety & societal context.
7. Understand the impact of engineering solutions on society & to be aware of contemporary issues.
8. Shoulder professional and ethical responsibilities for societal development.
9. Work as effective and efficient member of the team or leader.
10. Communicate effectively.
11. Manage projects in Electronics and multidisciplinary environment.
12. Engage in lifelong learning.

Sr. no.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)					Total	Credits		
		L	P	T	End Semester Exam	Continuous Assessment			TW		TH	TW	Total
						Unit Test	Atten-dance	Assign-ments					
1.	Engineering Mathematics - I	3	-	1	60	20	10	10	-	100	3	1	4
2.	Fundamentals of Civil Engineering	3	2	-	60	20	10	10	25	125	3	1	4
3.	Engineering Graphics *	4	2	-	60	20	10	10	25	125	4	1	5
4.	Engineering Chemistry	4	2	-	60	20	10	10	25	125	4	1	5
5.	Elements of Electronics Engineering	3	2	-	60	20	10	10	25	125	3	1	4
6.	Professional Skill Development - I	2	-	-	50	-	-	-	-	50	2	-	2
7.	Workshop Technology	-	2	-	-	-	-	-	50	50	-	1	1
	Total	19	10	1	350	100	50	50	150	700	19	6	25

*End Semester Exam of duration 4 hours

Note

1. Sem-I & Sem-II are common to the branches (Electronics, Biomedical & E & T/C)
2. * indicates subjects common to the branches (Electronics, Biomedical & E & T/C)
3. ** indicates subjects common to the branches (Electronics & E & T/C)
4. Engineering Mathematics –I, II, III are common to the branches (Electronics, Biomedical & E & T/C)
   Internal assessment of 40 marks comprises of 20 marks average of two Unit tests,10 marks tutorials/assignments and 10 marks attendanc

Sr. no.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)					Total	Credits		
		L	P	T	End Semester Exam	Continuous Assessment			TW		TH	TW	Total
						Unit Test	Atten-dance	Assign-ments					
1.	Engineering Mathematics - II	3	-	1	60	20	10	10	-	100	3	1	4
2.	Fundamentals of Mechanical Engineering	3	2	-	60	20	10	10	25	125	3	1	4
3.	Engineering Mechanics	4	2	-	60	20	10	10	25	125	4	1	5
4.	Engineering Physics	4	2	-	60	20	10	10	25	125	4	1	5
5.	Fundamentals of Electrical Engineering	3	2	-	60	20	10	10	25	125	3	1	4
6.	Professional Skill Development - II	2	-	-	50	-	-	-	-	50	2	-	2
7.	Fundamentals Of Computing	-	2	-	-	-	-	-	50	50	-	1	1
	Total	19	10	1	350	100	50	50	150	700	19	6	25

Total Credits

Sem - I = 25

Sem - II = 25

Grand Total = 50

ENGINEERING MATHEMATICS – I

TEACHING SCHEME

Lectures	:3 Hrs/week
Tutorial	:1 Hrs/week
Total	:4 Hrs/week

CREDIT

Theory	:3
Tutorial	:1
Total	:4

EXAMINATION SCHEME

Theory	: 60 Marks
Unit Test	: 20 Marks
Attendance	: 10 Marks
Assignment	: 10 Marks
Total	: 100 Marks

Course Prerequisite

Students should have knowledge about

1. Matrix
2. Complex Numbers
3. Derivatives

Course Objectives

To develop an ability to use the mathematical techniques, skills and tools necessary for engineering practice.

Course Outcomes

At the end of this course, a student will be able to

1. solve the consistency of any type of system.
2. find the roots of equation, using DeMoivre's Theorem and to locate imaginary points using Argand Diagram.
3. apply Leibnitz rule to find n^{th} Derivative.
4. test Convergence and Divergence of infinite series.
5. compute a total derivative.
6. compute Maxima and Mininma of any functiion of two variables

Unit-I
(8 Hours)

Matrices

Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations, Eigen values, Eigen Vectors, Cayley – Hamilton Theorem, Application to problems in Engineering .

Unit-II
(8 Hours)

Complex Numbers and Applications

Definition, Cartesian, Polar and Exponential Forms ,Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations, Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.

Unit-III
(8 Hours)

Expansion of Functions and Differential Calculus

Differential Calculus : Successive Differentiation, n^{th} Derivatives of Standard Functions, Leibnitz's Theorem.

Expansion of Functions : Taylor's Series and Maclaurin's Series.

Unit-IV
(8 Hours)

Differential Calculus

Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits.

Infinite Series

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence.

Unit-V
(8 Hours)

Partial Differentiation and Applications

Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables.

Errors and Approximations.

Unit-VI (8 Hours)

Jacobian

Jacobians and their applications, Chain Rule, Functional Dependence.

Maxima and Minima

Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.

Text Books

Applied Mathematics (Volumes I and II) by P.N. Wartikar and J.N. Wartikar, Pune Vidhyarthi Griha Prakashan, Pune 7th edition(1988).

Assignments

1. Rank , System of linear equations.
2. Complex Numbers.
3. Differential calculus and expansion of functions.
4. Indeterminate forms and infinite series.
5. Partial Derivatives, Euler's theorem on homogeneous functions.
6. Jacobians, Maxima and Minima of functions of two variables.

Reference Books

Advanced Engineering Mathematics by Peter V. O'Neil ,(Thomson Learning) 6th Edition (2007).

Advanced Engineering Mathematics, by M. D. Greenberg, (Pearson Education) 2nd Edition (2002).

Advanced Engineering Mathematics, by Erwin Kreyszig ,Wiley Eastern Ltd. 8th Edition (1999).

Higher Engineering Mathematics ,by B. S. Grewal ,(Khanna Publication, Delhi) 42nd Edition(2012).

Higher Engineering Mathematics , by B. V. Ramana, Tata McGraw- Hill, Edition(2012).

Syllabus for Unit Tests

Unit Test I	Unit I ,II & III
Unit Test II	Unit IV, V &VI

FUNDAMENTALS OF CIVIL ENGINEERING

TEACHING SCHEME

Lectures	: 3 Hrs/week
Practicals	: 2 Hrs/week
Total	: 5 Hrs/week

CREDITS

Theory	: 3
Term Work	: 1
Total	: 4

EXAMINATION SCHEME

Theory	: 60 Marks
Unit Test	: 20 Marks
Attendance	: 10 Marks
Assignment	: 10 Marks
Term work	: 25 Marks
Total	:125 Marks

Course Prerequisite

The Students should have the knowledge of

1.Concepts of units and conversions of units.
2.Basic knowledge of Chemistry
3.Basic knowledge of geography, concept of latitude and longitude.

Course Objective

To make student understand the scope and application of Civil Engineering

Course Outcomes

Students will be able to

1. Describe the scope of Civil Engineering and role of Civil Engineer in Construction project.
2. Explain use of surveying instruments for land survey .
3. Explain principles of building planning and bye laws.
4. Describe types of foundations and their stability.
5. Explain methods of irrigation, types of dams, canals, and water and sewage treatment process.
6. Describe the components of infrastructure like roads, railways, bridges and airports.

Unit-I

(6 Hours)

Civil Engineering scope and applications

Civil Engineering scope, importance and applications to other disciplines of Engineering; Civil Engineering construction process and role of Civil engineer; Government authorities related to Civil Engineering; Types of structures based on loading , material and configuration; Building components and their functions; Civil Engineering materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood , glass and aluminum.

Unit-II

(6 Hours)

Surveying

Objectives , Principles and Classification of Surveying; Linear ,angular ,Vertical and area Measurements and related instruments.

Unit-III

(6 Hours)

Building planning and Bye laws

Site selection for residential building; Principles of building planning; Building bye laws- necessity, Floor Space Index, Heights , open space requirements, set back distance , ventilation and lighting, concept of carpet and built up area, minimum areas and sizes for residential buildings, Concept of Eco friendly structures and Intelligent buildings.

Unit-IV

(6 Hours)

Foundations and Earthquakes

Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation.

Earthquakes causes, effects and guidelines for earthquake resistant design, earthquake zones .

Unit-V (6 Hours)

Irrigation and Water Supply

Rainfall measurement and its use in design of dams; Types of dams, canals, methods of irrigation and their merits and demerits; hydropower structures ;Water supply, drinking water requirements and its quality, water and sewage treatment flow chart.

Unit-VI (6 Hours)

Jacobian

Roads- types of roads and their suitability, cross section of roads, meaning of terms ; width of roads, super elevation, camber, gradient ,sight distance, materials used for construction of roads.

Railways- Types of gauges, section of railway track, components of railway track, advantages.

Bridges : Components - Foundation , Piers, Bearings, Deck.

Airways- Components -Runway , Taxiway and Hangers.

Waterways: components- port, jetty, breakwater.

Text Books

(Following Exercises should be carried out.)

1. Study and use of prismatic compass and measurement of bearings.
2. Study and use of Dumpy level and reduction of levels by collimation plane method.
3. Area measurement by Digital Planimeter.
4. Drawing- plan and elevation of a residential bungalow.
5. Study of features of topographical maps.
6. Assignment on collection of information on Civil Engineering materials.
7. Assignment on types of foundations.
8. Assignment on unit 6.

Reference Books

1. Surveying Vol I - S.K. Duggal , Tata Mc Graw Hill Publication.
2. Built Environment – Shah , Kale, Patki, , Tata Mc Graw Hill Publication
3. Building Construction – Dr. B.C. punmia , Laxmi Publication
4. Irrigation and water Power Engineering , Dr. P.N. modi
5. Text book of transportation Engineering- Arora, Charotar Publishers.
6. Water supply and sanitary engineering-Rangawala, Charotar Publishers.
7. Assignment on types of foundations.
8. Assignment on unit 6.

Syllabus for Unit Tests

Unit Test I	Unit I ,II & III
Unit Test II	Unit IV, V &VI

ENGINEERING GRAPHICS

TEACHING SCHEME

Lectures	: 4 Hrs/week
Practicals	: 2 Hrs/week
Total	: 6 Hrs/week

CREDIT

Theory	: 4
Practical	: 1
Total	: 5

EXAMINATION SCHEME

Theory	: 60 Marks
Unit Test	: 20 Marks
Attendance	: 10 Marks
Assignment	: 10 Marks
Term Work	: 25 Marks
Total	: 125 Marks

Course Prerequisites

Students should have basic knowledge of fundamentals of drawing.

Course Objectives

To apply fundamental principles of Engineering Graphics.

Course Outcomes

At the end of this course, a student will be able to understand

1. Different engineering curves and dimensions.
2. Differentiate first angle and third angle projection method in orthographic.
3. To interpret views of object and to draw by using Isometric Projection Method.
4. Projection of lines and its traces.
5. Projection of different planes
6. Projection of solids and its sections.

Unit-I (6 Hours)

Lines and Dimensioning in Engineering Drawing

Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.

Unit-II (6 Hours)

Curves used in Engineering Practice

Ellipse by Directrix-Focus method, Arcs of Circle method, Concentric circle method and Oblong method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone, Loci of points- Slider Crank mechanisms.

Projections of Points and Lines and planes

Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines, Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP

Unit-III (6 Hours)

Projection of Solids

Projection of prism, pyramid, cone and cylinder by rotation method.

Unit-IV (6 Hours)

Section of Solids

Types of section planes, projections of solids cut by different sections of prism, pyramid, cone and cylinder.

Unit-V (6 Hours)

Orthographic Projection

Basic principles of orthographic projection (First and Third angle method) . Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.

Unit-VI (6 Hours)

Isometric Projections

Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, Sphere.

Term work

- Term work shall consist of Seven half-imperial size or A2 size (594 mm x 420 mm) sheets.
- Assignment 05 Problems on each unit in A3 size Drawing Book

Sheets

- Types of lines, Dimensioning practice, Free hand lettering, 1nd and 3rd angle methods symbol.
- Curves and loci of points
- Projections of Points and Lines and planes
- Projection of Solids
- Section of solids
- Orthographic Projections
- Isometric views

Text Books

1. “Elementary Engineering Drawing”, N.D. Bhatt, Charotar Publishing house, Anand India.
2. “Text Book on Engineering Drawing”, K.L.Narayana&P.Kannaiah, Scitech Publications, Chennai.
3. “Fundamentals of Engineering Drawing”, Warren J. Luzzader, Prentice Hall of India, New Delhi .
4. “Engineering Drawing and Graphics”, Venugopal K., New Age International Publishers.
5. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005
6. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria and Sons, 2005.
7. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988.

Syllabus For Unit Tests

Unit Test I	Unit I ,II & III
Unit Test II	Unit IV, V &VI

ENGINEERING CHEMISTRY

TEACHING SCHEME

Theory	: 4 Hrs/week
Practicals	: 2 Hrs/week
Total	: 6 Hrs/week

CREDITS

Theory	: 4
Practical	: 1
Total	: 5

EXAMINATION SCHEME

Theory	: 60 Marks
Term Work	: 25 Marks
Unit Test	: 20 Marks
Assignments	: 10 Marks
Attendance	: 10 Marks
Total	: 125Marks

Course Prerequisites

Students should have basic knowledge of

Industrial use of water, crystal structure, fuels, corrosion, electrochemical cell and structure of organic molecules at Higher Secondary level of schooling.

Course Objectives

After completing this course the students will able to apply knowledge of Engineering Chemistry to different branches of engineering for better conceptual clarity and exploring emerging fields of technology and research.

Course Outcomes

At the end of this course, a student will be able to

1. Analyze the methods involved in improving quality of water for domestic and industrial purposes.
2. Express the crystal structure through X-ray diffraction technique to examine the internal structure of crystal.
3. Demonstrate the properties and applications of fossil fuels and derived fuels.
4. Define the fundamental principles of corrosion and methods used for minimizing corrosion.
5. Interpret the basic concepts of electrochemical techniques and its applications in society.
6. Develop the skills for correct stereo chemical assignment and interpretation in complex organic molecules.

Unit-I (8 Hours)

Water

Introduction, Hardness of water, Effect of hard water on boilers and heat exchangers: a) boiler corrosion b) caustic embrittlement c) scales and sludges d) priming and foaming Water softening methods for industrial purposes :a) Zeolite process b) Phosphate conditioning , Numerical based on the zeolite process.

Unit-II (8 Hours)

Material Chemistry

Crystallography

Unit cell, Laws of crystallography, Weiss indices and Miller indices, Crystal defects (point and line defects), X-ray diffraction – Bragg's Law and numericals.

Cement

Introduction of cement, Hydraulic/ Non-hydraulic cementing materials, classification of cement, chemistry of portland cement, chemical composition and compound constituents of portland cement, properties of cement and its applications.

Unit-III (8 Hours)

Fuels

Introduction, classification of fuels, calorific value of fuels, NCV and GCV, Determination of calorific values using Bomb calorimeter and Boys' gas calorimeter.
Theoretical calculation of calorific value of a fuel, Analysis of coal a) Proximate b) Ultimate analysis of coal, Numericals based on NCV, GCV.

Unit-IV (8 Hours)

Corrosion and its Prevention

Corrosion : Definition, atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic series, Factors affecting corrosion-nature of metal, nature of environment.
Methods of prevention of corrosion : Cathodic and Anodic protection, Metallic coatings, Electroplating, Hot dipping.

Unit-V
(8 Hours)

Electrochemistry

Introduction, Arrhenius Ionic theory, Kohlrausch's law of independent migration of ions Laws of electrolysis: Faradays Laws, Ostwald's dilution law, Acids and Bases, concept of pH and pOH, Buffer solutions, Solubility Product, Redox Reactions.

Electrode Potential, electrochemical cell, concentration cell, reference Electrodes, Overvoltage, Conductometric Titrations, Fuel cells, Lead Acid Storage Cell and numericals based on the above articles.

Unit-VI
(8 Hours)

Stereochemistry

Introduction, chirality, optical activity, Enantiomers, Diastereomers, projection formula of tetrahedral carbon- Newman projection, Wedge projection, Fischer projection,

Geometrical isomerism : cis and trans isomerism, E and Z isomers

Optical isomerism : Mesoform, the number of optical isomers for chiral molecules,

Conformations : conformations of ethane, conformations of n-butane

Term work

Practicals

Any Eight experiments from the following

1. Estimation of hardness of water by EDTA method.
2. Estimation of chlorine by Mohr's method.
3. Determination of percentage of Ca in given cement sample
4. Determination of coefficient of viscosity by Ostwald's viscometer.
5. Study of Bomb calorimeter for determination of calorific value.
6. Determination of calorific value of gas fuel by using Boy's gas calorimeter.
7. Determination of dissolved oxygen in a water sample.
8. To determine the Molecular Weight of polymer.
9. Estimation of Copper from brass sample solution by Iodometrically.
10. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method.
11. To standardize NaOH solution and hence find out the strength of given hydrochloric Acid solution .
12. To determine Surface Tension of given liquid by Stalagmometer.
13. Study of corrosion of metals in medium of different pH.
14. To set up Daniel cell.
15. To determine pH of soil .
16. To determine Acidity of soil.

Assignments

1. Effect of hard water on boilers and heat exchangers
2. Hydraulic/ Non-hydraulic cementing materials
3. Analysis of coal a) Proximate b) ultimate analysis of coal
4. Wet corrosion-mechanism, Electroplating, Hot dipping
5. Geometrical isomerism :- cis and trans isomerism, E and Z isomers
6. Fuel cells

References / Text Books

1. Engineering Chemistry by Jain and Jain, Dhanpat Rai Company (P) Ltd, New Delhi.
2. Chemistry of Engineering Materials, Agarwal C.V, Rata Publication Varanasi, 6^{th} edition (1979)
3. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company Ltd, New Delhi (1988)
4. Applied Chemistry, O. P. Vidyankar, J. Publications, Madurai, (1955)
5. Engineering Chemistry, S. N. Chand and Co., Jalandhar, 31^{st} Edition (1990)
6. Engineering Chemistry by Dara S. S. Chand Publications
7. Fundamentals of Electrochemistry, V. S. Bagotsky (Ed) Wiley NY (2006)

Syllabus for Unit Tests

Unit Test I	Unit I ,II & III
Unit Test II	Unit IV, V &VI

ELEMENTS OF ELECTRONICS ENGINEERING

TEACHING SCHEME

Lectures	:3 Hrs/week
Practicals	:2 Hrs/week
Total	:5 Hrs/week

CREDITS

Theory	:3
Term work	:1
Total	:4

EXAMINATION SCHEME

Theory	: 60 Marks
Unit Test	: 20 Marks
Attendance	: 10 Marks
Assignments	: 10 Marks
Term work	: 25 Marks
Total	:125 Marks

Course Prerequisite

Students have completed a course in Physics and have the knowledge of laws of

Course Objective

This course will introduce the concepts of electronic engineering . By the end of the course, student will be familiar with electronic components, semiconductor devices and their applications. The course emphasizes on Electronic devices, ICs and Digital

Course Outcomes

At the end of the course, a student will be able to

1 understand the basic semiconductor physics and semiconductor devices.

2 understand transport phenomenon of semiconductor devices through energy band diagrams.

3. to identify electronic components like, resistors, capacitors, inductors and to study characteristics of semiconductor devices.

4. apply the knowledge of diodes to the rectifier and filter circuits.

5. to represent numerical values in various number systems and perform number conversions between different number system and study applications of logic

Unit-I
(6Hours)

Electron Dynamics

Motion of electron in electric , magnetic and combined electric and magnetic fields. Detection and focusing system of Oscilloscope tube-Television picture tube- LCD and Flat panel displays .

Unit-II
(6 Hours)

Transport phenomenon in semiconductor

Mobility and conductivity - Drift and Diffusion currents – Continuity Equation – Minority carrier injection and recombination in Homogeneous semiconductor – Thermistors – Piezo Resistors – Hall Effect – Thermoelectric effect.

Unit-III
(6 Hours)

Electronic components

Resistors -Inductors and Capacitors and their types – Construction and Characteristics of PN junction diode – Zener Diode – Tunnel diode - Bipolar junction transistors – CB,CC,CE circuits , Field Effect transistors .

Unit-IV
(6 Hours)

Electronic Devices and Linear ICs

Rectifiers : Half wave , Full wave and Bridge rectifiers - capacitor filter-wave forms-ripple factor regulation characteristics .Special semiconductor devices : FET - SCR - LED - VI characteristics – applications. Introduction to Op-Amp and Timers .

Unit-V
(6 Hours)

Digital system

Number system : Binary system , Decimal to Binary , Octal system, Hexadecimal system , binary –addition, subtraction ,multiplication and division .

Logic gates : OR, AND,NOT , Exclusive-OR, NOR, NAND gates, Logic networks, Gate Standardization, Introduction to Logic Circuits –Combinational and Sequential Circuits Introduction to Microprocessor.

Unit-VI

(6 Hours)

Consumer Electronics

Basic study of various products such as radio receivers , television sets , MP3 players, video recorders , DVD players , digital cameras , microwaves , personal computers , video game consoles , telephones and mobile phones , laptops and palmtops and fax machines

List of Practicals

1. To study various electronics components: Resistors, Inductors, Capacitors, diodes and transistors.
2. To plot V-I characteristics of PN junction diode.
3. To plot V-I characteristics of Zener diode.
4. To plot input-output characteristics of CE configuration of BJT.
5. To plot input-output characteristics of FET.
6. To study basic logic gates: AND, OR, NOT.
7. To study derived logic gates: NAND, NOR, Ex-OR, Ex-NOR.
8. To fabricate at least 5 electronic components on a PCB

Textbooks

1. Mottershed Allen, Electronic Devices & Circuits, PHI
2. R. P. Jain, Modern Digital Electronics, Mc Graw Hill

References

1. Thomas L. Floyd, Electronic Devices, Pearson Education (Sixth edition)
2. Millman & Halkis, Electronic Devices & Circuits, PHI
4. Malvino Leach, Digital Principles & Applications, Mc Graw Hill
3. Millman & Halkis, Integrated Electronics, MGH

Syllabus for Unit Tests

Unit Test I	Unit I ,II & III
Unit Test II	Unit IV, V &VI

PROFESSIONAL SKILL DEVELOPMENT - I

ENGLISH COMMUNICATION

TEACHING SCHEME

Lectures	: 2 Hrs/week
Total	: 2 Hrs/week

CREDITS

Theory	: 2
Total	: 2

EXAMINATION SCHEME

Theory	: 50 Marks
Total	: 50 Marks

Unit I: (5 hours)

Essential Grammar

Tenses: Basic forms and use, sentence formation (general & Technical), Common errors, Parts of speech through context, Direct and reported speech structures and voices.

Unit II: (2 hours)

Vocabulary Enrichment

Exposure to words from General Service List (GSL) by West, Academic word list (AWL) specific technical terms related to the field of technology. Phrases, idioms, significant abbreviations, formal (business) vocabulary.

Unit III: (3 hours)

Written Communication I

Letter Writing – Formal and Informal letter writing, Application letters, Report Writing-Academic and Business reports, Job application letter.

Unit IV: (2 hours)

Phonetics

Pronunciation, Reduction of MTI in spoken English, Question formation with emphasis on common errors made during conversation.

SOFT SKILLS

Unit I: (3 hours)

Communication Skill

a) Importance of effective communication, types of communication- verbal and non verbal, barriers of communication, effective communication

b) Listening Skills: Law of nature- Importance of listening skills, difference between listening and hearing, Types of listening.

Unit II: (3 hours)

Self Awareness & Self Development

a) Self Assessment, Self Appraisal, SWOT, Goal setting - Personal & career - Self-Assessment, Self-Awareness, Perceptions and Attitudes, Positive Attitude, Values and Belief Systems, Self-Esteem, Self appraisal, Personal Goal setting,

b) Career Planning, Personal success factors, Handling failure, Depression and Habit, relating SWOT analysis & goal setting, prioritization.

Unit III: (4 hours)

Interpersonal Relationship

Team work, Team effectiveness, Group discussion, Decision making - Team Communication. Team, Conflict Resolution, Team Goal Setting, Team Motivation Understanding Team Development, Team Problem Solving, Building the team dynamics. Multicultural team activity

Unit IV: (2 hours)

Time Management

The Time management matrix, apply the Pareto Principle (80/20 Rule) to time management issues, to prioritize using decision matrices, to beat the most common time wasters, how to plan ahead, how to handle interruptions , to maximize your personal effectiveness, how to say “no” to Time wasters.

WORKSHOP TECHNOLOGY

TEACHING SCHEME

Practicals	: 2 Hrs/week
Total	: 2 Hrs/week

CREDITS

Practical	: 1
Total	: 1

EXAMINATION SCHEME

Term Work	: 50 Marks
Total	: 50 Marks

Course Objectives

Introduction to different materials in engineering practices with respect to their workability, formability & machinability with hand tools & power tools and to develop skills through hands on experience. Special; emphasis shall be given to Safety in Workshop - Fire hazards, electric short circuit –causes and remedies, Machine protection, Human protection, Accident prevention methods, developing ability to observe safe working habits.

Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.

Course Outcomes

At the end of this course, students should be able to understand

1. Basic Manufacturing Processes used in the industry,
2. Importance of safety
3. Electrical circuit making.

Carpentry

Introduction to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances Term work includes one job involving joint and woodturning.

Fitting

Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping. Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

Sheet Metal Practice

Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

Joining

Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies. Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

Forging

Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

Moulding

Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

Electrical Board Wiring
(Demonstration Common for Electrical & Non electrical Group)

Electric power utilization, energy audit, Types of wiring - House wiring, stair case wiring, two-way switch wiring, Types of fuses and their uses, circuit breaker, Three phase wiring for electrical motors, earthing, minor fault finding.

Plumbing (Demonstration Common for Electrical & Non electrical Group)

Types of pipe joints, threading dies, Pipe fittings.

ENGINEERING MATHEMATICS – II

TEACHING SCHEME

Lectures	:3 Hrs/week
Tutorial	:1 Hrs/week
Total	:4 Hrs/week

CREDIT

Theory	:3
Tutorial	:1
Total	:4

EXAMINATION SCHEME

Theory	: 60 Marks
Unit Test	: 20 Marks
Attendance	: 10 Marks
Assignment	: 10 Marks
Total	: 100 Marks

Course Prerequisite

Students should have basic knowledge about

1. Derivatives
2. Integration

Course Objectives

To develop an ability to use the mathematical techniques, skills and tools necessary for engineering practice.

Course Outcomes

At the end of this course, a student will be able to

1. solve the differential equations of first order and first degree.
2. form mathemtical model of rectilinear motion , electric circuit , fourier heat conduction, newton's law of cooling.
3. represent periodic function as fourier series.
4. evaluate definite Integral by DUIS Rule and to trace cartesian and polar curves.
5. transform the cartesian coordinates into spherical polar and cylindrical coordinate systems.
6. apply methods to find area and volume by double and triple integration.

Unit-I
(8 Hours)

Differential Equations (DE)

Definition, Order and Degree of DE, Formation of DE, Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types

Unit-II
(8 Hours)

Application of Differential Equations

Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One–Dimensional Conduction of Heat, Chemical engineering problems

Unit-III
(8 Hours)

Fourier Series

Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis.

Integral Calculus

Reduction formulae, Beta and Gamma functions.

Unit-IV
(8 Hours)

Integral Calculus

Differentiation Under the Integral Sign, Error functions

Curve Tracing

Tracing of Curves, Cartesian, Polar and Parametric Curves. Rectification of Curves.

Unit-V
(8 Hours)

Solid Geometry

Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and

Unit-VI
(8 Hours)

Multiple Integrals and their Applications

Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.

Assignments

1.Differential equations.
2.Aplication of differential equations.
3.Fourier series and Integral calculus.
4.DUIS and curve tracing.
5.Solid geometry.
6.Double and triple integrations, area and volume.

Text Books

Applied Mathematics (Volumes I and II) by P.N. Wartikar and J.N. Wartikar, Pune Vidhyarthi Griha Prakashan, Pune 7th edition(1988).

Reference Books

Higher Engineering Mathematics ,by B. S. Grewal ,(Khanna Publication, Delhi) 42nd Edition(2012).
Higher Engineering Mathematics , by B. V. Ramana, Tata McGraw- Hill, Edition(2012).
Advanced Engineering Mathematics by Peter V. O'Neil ,(Thomson Learning) 6th Edition (2007).
Advanced Engineering Mathematics, by M. D. Greenberg, (Pearson Education) 2nd Edition (2002).
Advanced Engineering Mathematics, by Erwin Kreyszig ,Wiley Eastern Ltd. 8th Edition (1999).

Syllabus for Unit Tests

Unit Test I	Unit I ,II & III
Unit Test II	Unit IV, V &VI

FUNDAMENTALS OF MECHANICAL ENGINEERING

TEACHING SCHEME

Lectures	: 3 Hrs/week
Practicals	: 2Hrs/week
Total	: 5Hrs/week

CREDIT

Theory	: 3
Practical	: 1
Total	: 4

EXAMINATION SCHEME

Theory	: 60 Marks
Unit Test	: 20 Marks
Attendance	: 10 Marks
Assignment	: 10 Marks
Term Work	: 25 Marks
Total	: 125 Marks

Course Prerequisites

Students should have the basic knowledge of Thermal Science.

Course Objectives

Students will get the basic knowledge of Mechanical Engineering systems.

Course Outcomes

At the end of this course, a student will be able to understand

1. the fundamentals of thermal engineering.
2. working of power producing and absorbing devices.
3. different energy sources and fundamental laws of heat transfer.
4. the basic properties of fluids and materials.
5. the different mechanical devices and mechanisms.
6. machine tools and manufacturing processes.

Unit-I

(8 Hours)

Thermodynamics

Heat, work and Internal Energy, Thermodynamic State, Process, Cycle, Thermodynamic System, First Law of Thermodynamics, Application of First Law to steady Flow and Non Flow processes, Limitations of First Law, PMM of first kind (Numerical Treatment), Second Law of Thermodynamics – Statements, Carnot Engine and Carnot Refrigerator, PMM of Second Kind (Elementary treatment only)

Unit-II

(8 Hours)

Introduction to I.C. Engines and turbines

Two stroke, Four Stroke Cycles, Construction and Working of C.I. and S.I. Engines, Hydraulic turbines, steam turbines, gas turbines.(Theoretical study using schematic diagrams)

Introduction to refrigeration, compressors & pumps

Vapor compression and vapor absorption system, house hold refrigerator, window air conditioner. Reciprocating and rotary compressor, Reciprocating and centrifugal pump. (Theoretical study using schematic diagrams)

Unit-III

(8 Hours)

Energy Sources

Renewable and nonrenewable, solar flat plate collector, Wind, Geothermal, Wave, Tidal, Hydro power, Bio-gas, Bio-Diesel, Nuclear power.

Heat transfer

Statement and explanation of Fourier's law of heat conduction, Newton's law of cooling, Stefan Boltzmann's law. Conducting and insulating materials and their properties, types of heat exchangers and their applications.

Unit-IV

(8 Hours)

Properties of fluids

Introduction, Units of measurements, mass density, specific weight, specific volume and relative density, viscosity, pressure, compressibility and elasticity, gas laws, vapor pressure, surface tension and capillarity, regimes in fluid mechanics, fluid properties and analysis of fluid flow.

Properties of Materials and their Applications

Metals – Ferrous and Non-Ferrous, Nonmetallic materials, smart materials, Material selection criteria.

Unit-V

(8 Hours)

Mechanical devices

Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, friction clutch (cone and plate), brakes, Power transmission shafts, axles, keys, bush and ball bearings.

Mechanisms

Slider crank mechanism, Four bar chain mechanism, List of various inversions of Four bar chain mechanism, Geneva mechanism, Ratchet and Paul mechanism

Unit-VI

(8 Hours)

Machine Tools

Lathe Machine – Centre Lathe, Drilling Machine – Study of Pillar drilling machine, Introduction to NC and CNC machines, Grinding machine, Power saw, Milling Machine.

Introduction to manufacturing processes and Their Applications

Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes

List of experiments:

The Term Work shall consist of any Eight experiments of following list

1. Measurement of viscosity using Redwood viscometer.
2. Assembly and working of 4-bar, 6-bar, 8-bar planer mechanisms
3. Finding relation between input angle and output angle for various link lengths.
4. Study of domestic refrigerator & window air-conditioner
5. Demonstration of operations of centre lathe
6. Demonstration of operations on drilling machines
7. Demonstration of Two stroke and four stroke engine
8. Study of power transmitting elements: Coupling, Gears and bearings
9. Demonstration of pumps and compressor
10. Study and demonstration of different types of clutches.

References

1 Thermodynamics An Engineering Approach: Yunus A. Cengel and Michael A. Boles,McGraw-Hill, Inc,2005,6th edition.

2 Applied Thermodynamics for Engineering Technologists: T. D. Eastop and A. McConkey, 5th Edition, Prentice Hall.

3. I.C. Engines Fundamentals: J. B. Heywood, McGraw Hill, 3rd Edition, MacMillian

4 I.C.Engine : V.Ganeshan,Tata McGraw-Hill, 3rd edition.

5 Strength of Materials: H. Ryder, Macmillians, London, 1969, 3rd edition.

6 Mechanics of Materials: Johston and Beer TMH, 5th edition

7 Mechanisms and Machine Theory: Ambekar A.G., Prentice-Hall of India, 2007.

8 Theory of Machines: S S Rattan, Tata McGraw- Hill, 2nd edition.

9 A Textbook of production engineering: P.C. Sharma, S. Chand Publication, New Delhi, 2nd edition.

10 Fluid Mechanics & Fluid Power: D.S. Kumar, Katson Publishing Engineering House, Ludhiana. 8th edition

Syllabus for Unit Tests

Unit Test I	Unit I ,II & III
Unit Test II	Unit IV, V &VI

ENGINEERING MECHANICS

TEACHING SCHEME

Lectures	: 4 Hrs/week
Practicals	: 2 Hrs/week
Total	: 6 Hrs/week

CREDIT

Theory	: 4
Practical	: 1
Total	: 5

EXAMINATION SCHEME

Theory	: 60 Marks
Unit Test	: 20 Marks
Attendance	: 10 Marks
Assignment	: 10 Marks
Term Work	: 25 Marks
Total	: 125 Marks

Course Prerequisites

The Students should have knowledge of

1. Scalar and Vector .
2. Newton's law of motion.
3. Law of friction.
4. Concept of physical quantities, their units and conversion of units.
5. Concept of differentiation and integration.

Course Objectives

To develop and apply the concept of resultant and equilibrium for various static and dynamic engineering problems.

Course Outcomes

At the end of this course, a student will be able to understand

1. calculate resultant and apply conditions of equilibrium.
2. analyze the truss and calculate friction force.
3. calculate centroid and moment of inertia.
4. solve problem on rectilinear motion.
5. solve problems on curvilinear motion.
6. Use D'Alembert's principle, Work Energy principle and Impulse Momentum principle for particle.

Unit-I (8 Hours)

Resultant and Equilibrium

Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach..

Unit-II (8 Hours)

Truss and Friction

Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts.
Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.

Unit-III (8 Hours)

Centroid and Moment of Inertia

Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.

Unit-IV (8 Hours)

Kinematics of Rectilinear motion of a Particle

Equations of motion, Constant and variable acceleration, Motion Curves, Relative motion, Dependent motion.

Unit-V (8 Hours)

Kinematics of Curvilinear motion of a Particle

Motion of a Projectile, Cartesian components, Normal and Tangential components of a curvilinear motion.

Unit-VI (8 Hours)

Kinetics of a Particle

D'Alemberts Principle, Work-Energy Principle and Impulse-Momentum Principle, Coefficient of Restitution, Direct Central Impact.

Practicals

A) The term-work shall consist of minimum Five experiments from list below.

1. Determination of reactions of Simple and Compound beam.
2. Study of equilibrium of concurrent force system in a plane.
3. Determination of coefficient of friction for Flat Belt.
4. Determination of coefficient of friction for Rope.
5. Study of Curvilinear motion.
6. Determination of Coefficient of Restitution.

B)The term-work shall also consist of minimum Five graphical solutions of the problems on different topics.

Reference Books

1. Beer F.P. and Johnston E.R., “Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)”, Tata McGraw Hill Publication.
2. Hibbeler R.C., “Engineering Mechanics (Statics and Dynamics)”, McMillan Publication.
3. Shames I.H., “Engineering Mechanics (Statics and Dynamics)”, Prentice Hall of India (P) Ltd.
4. Singer F.L., “Engineering Mechanics (Statics and Dynamics)”, Harper and Row Publication.
5. Meriam J.L. and Kraige L.G., “Engineering Mechanics (Statics and Dynamics)”, John Wiley and Sons Publication.
6. Timoshenko S.P. and Young D.H., “Engineering Mechanics (Statics and Dynamics)”, McGraw Hill Publication.
7. Bhavikatti S.S. and Rajashekarappa K.G., “Engineering Mechanics”, New Age International (P) Ltd.
8. Tayal A.K., “Engineering Mechanics (Statics and Dynamics)”, Umesh Publication.
9. Mokashi V.S., “Engineering Mechanics-I and II (Statics and Dynamics)”, Tata McGraw Hill Publication.

Syllabus for Unit Tests

Unit Test I	Unit I ,II & III
Unit Test II	Unit IV, V &VI

ENGINEERING PHYSICS

TEACHING SCHEME

Lectures	: 4 Hrs/week
Practicals	: 2 Hrs/week
Total	: 6 Hrs/week
CREDITS	
Theory	: 4
Practicals	: 1
Total	: 5

EXAMINATION SCHEME

Paper	: 60 Marks
Unit Test	: 20 Marks
Assignment	: 10 Marks
Attendance	: 10 Marks
Term Work	: 25 Marks
Total	:125 Marks

Course Prerequisite

The Student should have basic knowledge of kinematics, electrostatic, wave mechanics and dimensions along with good knowledge of calculus of Higher Secondary level of schooling.

Course Objective

After completing this course the students will able to apply knowledge of Engineering Physics to different branches of engineering for better conceptual clarity and exploring emerging fields of technology and research.

Course Outcomes

1. To use the properties of charged particles to develop modern instruments and explain the mechanism of fusion and fission.
2. To understand the basics of semiconductor and its uses to develop devices such as diode.
3. Students will be capable of applying knowledge of nanoscience to develop new electronic devices.
4. Students will be able to associate the wave nature of light and apply it to measure stress, pressure and dimension etc..
5. To discuss the concept of transverse waves.
6. To judge the problems associated with architectural acoustics and give their remedies and use ultrasonic as a tool in industry for Non Destructive Testing.
7. To understand the behavior of quantum particles in different types of potentials.

Unit-I

(8 Hours)

Modern Physics

Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focussing, Wavelength and resolution, Specimen limitation, Depth of field and focus, Electron microscope, Positive rays, Separation of isotopes by Bainbridge mass spectrograph.

Nuclear Physics

Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium, Fission energy, Critical mass and size, Reproduction factor, Chain reaction and four factor formula, Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions, Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron

Unit-II

(8 Hours)

Solid State Physics

Band theory of solids, Free electron theory, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors and in extrinsic semi-conductors (with derivation), Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

Superconductivity

Introduction, Properties of a super conductor, Meissner's effect, Critical field, Types of superconductors, BCS theory, High temperature superconductors, Application of superconductors.

Unit-III

(8 Hours)

Thermodynamics

Zeroth law of thermodynamics, first law of thermodynamics, determination of j by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

Nanoscience

Introductions of nanoparticals, properties of nanoparticals (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticals(Physical and chemical), synthesis of colloids, growth of nanoparticals, synthesis of nanoparticals by colloidal route, applications.

Unit-IV (8 Hours)

Optics - I

Interference

Interference of waves, Visibility of fringes, interference due to thin film of uniform and non-uniform thickness, Newton's rings, Engineering applications of interference (optical flatness, non-reflecting coatings, multi-layer ARC).

Diffraction

Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima, Rayleigh's criterion for resolution, Resolving power of grating and telescope.

Unit-V (8 Hours)

Polarisation

Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism, Polaroids, Elliptical and circular polarisation, Quarter and half wave plates, Production of polarised light, Analysis of polarised light, half shade polarimeter, LCD.

Lasers

Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.

Unit-VI (8 Hours)

Architectural Acoustics

Elementary acoustics, Limits of audibility, Reverberation and reverberation time, Sabine's formula, Intensity level, Sound intensity level, Sound absorption, Sound absorption coefficient, different types of noise and their remedies, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies.

Quantum Mechanics

Wave nature of matter, De-Broglie waves, Wavelength of matter waves, Electron diffraction, Davisson and Germer's experiment, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box and non rigid box.

Term-work :

Experiments

Any eight experiments from the following

1. Determination of band gap of semi-conductor.
2. Solar cell characteristics.
3. e/m by Thomson's method.
4. Uses of CRO for measurement of phase difference and Lissajous figures.
5. Hall effect and Hall coefficient.
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode, Photo diode, LED, Ge/Si diode).
8. Plank's constant by photodiode.
9. Wavelength by diffraction grating.
10. Newton's rings.
11. Ultrasonic interferometer.
12. Sound intensity level measurement.
13. Wavelength of laser by diffraction.
14. Determination of refractive index for O-ray and E-ray.
15. Brewester's law.

Assignments

1. Recent advances in Nanotechnology
2. Nuclear radiation detectors.
3. Atomic force microscope (AFM).
4. Advanced opto-electronic devices.
5. Laser in Industry.
6. Different spectroscopic methods – a comparison (Raman, IR, UVR, etc.).

Text Books

1. Engineering Physics –Gaur and Gupta, Dhanpat Rai Publication
2. A text Book of Engineering Physics- M.N. Avadhanulu, P.G. Kshirsagar, S. Chand Technical

Syllabus for Unit Tests

Unit Test I	Unit I ,II & III
Unit Test II	Unit IV, V &VI

FUNDAMENTALS OF ELECTRICAL ENGINEERING

TEACHING SCHEME

Lectures	: 3 Hrs/week
Practicals	: 2 Hrs/week
Total	: 5 Hrs/week

CREDITS

Theory	: 3
Term work	: 1
Total	: 4

EXAMINATION SCHEME

Theory	: 60 Marks
Unit Test	: 20 Marks
Attendance	: 10 Marks
Assignments	: 10 Marks
Term Work	: 25 Marks
Total	: 125 Marks

Course Pre-requisites :

The Students should have basic knowledge about

1. Mathematics
2. Physics

Course Objectives :

The course introduces fundamental concepts of DC and AC circuits, electromagnetism, transformer and measuring instruments to all first year Engineering students.

Course Outcomes:

1. Understand and apply knowledge of basic concepts of work, power, energy for electrical, mechanical and thermal systems.
2. Understand and apply knowledge of Kirchoff's laws and network theorems to solve electrical networks.
3. Describe construction, principle of operation, specifications and applications of capacitors and batteries.
4. Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer.
5. Define basic terms of single phase and three phase ac circuits and supply systems.
6. Know and use electrical safety rules.

Unit-I

(6 Hours)

Basic concepts

Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems

Unit-II

(6 Hours)

Network Theorem

Voltage source and current sources, ideal and practical, Kirchoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series-parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.

Unit-III

(6 Hours)

Electrostatics

Electrostatic field, electric field intensity, electric field strength, absolute permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series& parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction& working.

Unit-IV

(6 Hours)

Magnetic Circuit & Transformer

Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit

Farady's law of electromagnetic induction, statically and dynamically induced emf, self inductance, mutual inductance, coefficient of coupling,

Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency & Regulation by direct load test.

Unit-V

(6 Hours)

AC Fundamentals & AC Circuits

AC waveform definitions , form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar & rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph AC Circuits.

(6 Hours)

Unit-VI

Electrical Wiring and Illumination system

Basic layout of distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED) , Study of Electricity bill.

Term-work :

The term work shall consist of record of minimum eight exercises / experiments.

List of Experiments

1. Determination of resistance temperature coefficient
2. Verification of Superposition Theorem
3. Verification of Thevenin's Theorem
4. Verification of Kirchoff's Laws
5. Verification of Maximum power transfer Theorem
6. Time response of RC circuit
7. Study of R-L-C series circuits for XL> XC , XL< XC & XL= XC
8. Verification of current relations in three phase balanced star and delta connected loads.
9. Direct loading test on Single phase transformer
   a)Voltage and current ratios.
   b) Efficiency and regulations .
10. Study of a Residential (L.T.) Bill

Text Books :

1. A Textbook of Electrical Technology Volume- I – B.L.Theraja, S.Chand and Company Ltd., New Delhi.
2. . Basic Electrical Engineering, V. K. Mehta, S. Chand and Company Ltd., New Delhi.
3. Electrical Engineering- G. K. Mittal
4. Theory and problems of Basic Electrical Engineering- I. J. Nagrath and Kothari, Prentice Hall of India Pvt. Ltd.

Reference Books

1. Electrical Technology- Edward Hughes, Seventh Edition, Pearson Education
2. Elements of Electrical Technology- H. Cotton, C.B.S. Publications
3. Basic circuits analysis by John Omalley Shawn Mc Graw Hill.
4. Principles of Electrical Engineering by Del. Toro, PHI

Syllabus for Unit Tests

Unit Test I	Unit I ,II & III
Unit Test II	Unit IV, V &VI

PROFESSIONAL SKILL DEVELOPMENT - II

ENGLISH COMMUNICATION

TEACHING SCHEME

Lectures	: 2 Hrs/week
Total	: 2 Hrs/week

EXAMINATION SCHEME

Theory	: 50 Marks
Total	: 50 Marks

CREDITS

Theory	: 2
Total	: 2

Unit I: (4 hours)

Essential Grammar II

Application of tenses, Auxiliaries- correct usage and importance in formal communication, Business Vocabulary - Vocabulary exercises through web-based applications

Unit II: (4 hours)

Written Communication II

Email writing- Formal and Informal email writing structure, Inquiry letters, Instruction letters, complaint letters, Routine business letters, Sales Letters etc. Technical writing, Essay writing, Paragraph writing.

Unit III: (2 hours)

Vocabulary Application

Vocabulary exercises through web-based applications, Usage and application through

Unit IV: (2 hours)

Situational Conversation

Application of grammar and correct spoken English according to context/ situation and application in business scenario.

SOFT SKILLS

Unit I: (3 hours)

Fundamentals Of Effective Communication

Public Speaking: fundamentals of effective public speaking, types- Extempore speech, manuscript speech, and ways to enhance public speaking skills, storytelling, oral review

Unit II: (3 hours)

Presentation Skills

PowerPoint presentations, Effective ways to structure the presentation, importance of body language.

Unit III: (3 hours)

Leadership Skills, Leader's Role, Responsibilities And Skill Required

Understanding good Leadership behaviors, Learning the difference between Leadership and Management, Gaining insight into your Patterns, Beliefs and Rules, Defining Qualities and Strengths of leadership, Determining how well you perceive what's going on around you, interpersonal Skills and Communication Skills, Learning about Commitment and How to Move Things Forward, Making Key Decisions, Handling Your and Other People's Stress, Empowering, Motivating and Inspiring Others, Leading by example, effective feedback.

Unit VI: (2 hours)

Problem Solving Skill

Problem solving skill, Confidence building

Unit V: (4 hours)

Corporate / Business Etiquettes

Corporate grooming & dressing, etiquettes in social & office setting-Understand the importance of professional behavior at the work place, Understand and Implement etiquettes in workplace, presenting oneself with finesse and making others comfortable in a business setting. Importance of first impression, Grooming, Wardrobe, Introduction to Ethics in engineering and ethical reasoning, rights and responsibilities

FUNDAMENTALS OF COMPUTING

TEACHING SCHEME

Practical : 2 Hours/week
Total : 2 Hours/week

EXAMINATION SCHEME

TW : 50 Marks

CREDITS
Term work : 1
Total : 1

Course Prerequisite

Students must possess knowledge about basic fundamentals of computer and professional microsoft office development tools.

Course Objective

This course will introduce the concepts of C language software development and compiling tool. By the end of the course, student will be familiar with various fundamentals of C- language, software file system, computer graphics and its various multimedia applications.

Course Outcomes

At the end of the course, a student will be able to

1. Write C programs using conditional statements and loops.
2. Execute the logic using Arrays and strings and perform matrix operation using them.
3. Perform logic operations using Structures &Unions and use them with pointers.
4. Write C program for File manipulations and Dynamic memory allocation

Unit-I

(8 Hours)

Introduction

Computer systems, Hardware & software concepts.
Algorithm / pseudo code, flowchart, program development steps, Computer Languages: machine, symbolic, and high-level languages, Creating and running programs: Writing, editing, compiling, linking, and executing.

Basics Of C

Structure of a C program, identifiers, basic data types and sizes. Constants, variables, arithmetic, relational and logical operators, increment and decrement operators, conditional operator, assignment operators, bit-wise Operators expressions, type conversions, conditional expressions, precedence and order of evaluation, Managing input and output operations, Sample programs.

Conditional Statements and Loops

Decision making within a program, conditions, if statement, if-else statement, loops: while loop, do while, for loop. Nested loops, infinite loops, switch statement, sample programs

Unit-II

(8 Hours)

Arrays & Strings

Arrays - concepts, declaration, definition, accessing elements, storing elements, Strings and string manipulations, 1-D arrays, 2-D arrays and character arrays, string manipulations, Multidimensional arrays , Array applications: Matrix Operations

Unit-III

(8 Hours)

Functions

Basics, parameter passing, storage classes- extern, auto, register, static, scope rules, user defined functions, standard library functions, recursive functions, Recursive solutions for Fibonacci series, Towers of Hanoi, header files, example c programs. Passing arrays & strings to functions.

Pointers

Concepts, initialization of pointer variables, pointers and function arguments, passing by address, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays.

Unit-IV

(8 Hours)

Structures & Unions

Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields, program

Unit-V

(8 Hours)

Files and Dynamic Memory Allocation

Input and output : Concept of a file, text files and binary files, Formatted I/o, file I/o operations, example programs.
Dynamic memory allocation, malloc, calloc, realloc ,free. Concepts of linked lists, Sample programs

Unit-VI

(8 Hours)

Graphics & Multimedia

Introduction to Computer Graphics

Overview of Computer Graphics, Computer Graphics Application, Description of graphics devices, Input Devices for Operator Interaction

Introduction to Multimedia

History, elements of multimedia – text, audio, video, image, animation, Multimedia applications different areas

Text Books

1. Programming in ANSI C – E Balagurusamy (5th Edition-TMH)
2. Computer Graphics: Principles and Practices in C – Andrea Von Dam, Steven K Fiener, F Hughes John [2nd Edition- Pearson]

Reference Books

1. Let Us C- YashwantKanitkar
2. D. Hearn, M. Baker, "Computer Graphics - C Version", 2nd Edition, Pearson Education, 2002, ISBN 81 - 7808 - 794 – 4
3. Ralf Steinmetz, KlaraNahrstedt, "Multimedia: Computing, Communication and Applications"
4. Judith Jeffcoate, " Multimedia Technique"

Term work will consist of ten assignments based on C programming language.

List of Practicals

1. a. Write a C program to take user Input and print it on the screen.
   b. Write a C program to perform addition or subtraction of two numbers.
   c. Write a C program to find whether the number is Odd or Even.
2. a. Write a C program to find out Prime numbers.
   b. Write a C program to find out Fibonacci series.
3. Write C programs to print different patterns
4. a. Write a C program to do factorial using recursion.
   b. Write a C program to find out Armstrong number.
5. Write a C program to sort the array in Ascending & Descending order.
6. Write C programs to perform operations on 2-D arrays
7. Write a C program to perform different operations on strings.
8. Use of Pointers
   a. Write a C program to swap numbers using pointers
   b. Write a C program to show the use of pointers in arrays.
   c. Write a C program to use functions using pointers.
9. a. Write a C program to create student mark sheet using structures
   b. Write a C program to show the use of structure using pointers
10. Write a C program to perform different operations on Files.
11. Write a C program to create single Linked List.
12. Application of Graphics and Multimedia

Syllabus for Unit Tests

Unit Test I	Unit I ,II & III
Unit Test II	Unit IV, V &VI

RULES REGARDING ATKT, CONTINUOUS ASSESSMENT AND AWARD OF CLASS

Standards of Passing and ATKT Rules:

1. For all courses, both UE(University Evaluation) and IA(Internal Assesment) constitue separate heads-of-passing (HoP). In order to pass in such courses and to 'earn' the assigned credits.
   a) The learner must obtain a minimum grade point of 5.0(40 % marks) at UE and also a minimum grade point of 5.0 (40 % marks) at IA.

   OR

   b) If he/she fails in IA, the learner passes in the course provided he/she obtains a minimum of 25% in IA and GPA for course is atleast 6.0 (50 % of aggregate). The GPA for a course will be calculated only if the learner passes at the UE.
2. A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the HoP. Similarly, A student who fails in a course at IA has to reappear only at IA as backlog candidate and clear the HoP.

Rules of ATKT:

1. A student is allowed to carry backlog of courses prescribed for B. Tech. Sem - I, III , V , VII to B.Tech. Sem-II, IV , VI , VIII respectively.
2. A student is allowed to keep term of Sem-III , if he/she is failing in any number of subjects of Sem - I & II.
3. A student is allowed to keep term of Sem-V , if he/she is failing in any number of subjects of Sem - III & IV but passed in all subjects of Sem- I & II.
4. A student is allowed to keep term of Sem-VII , if he/she is failing in any number of subjects of Sem - V & VI but passed in all subjects of Sem-III & IV.

Award of Class for the Degree Considering CGPA:

Award of Honours:

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The Criteria for the Award of Honours at the End of the Programme are as given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks(%)
9.50 $\leq$ CGPA $\leq$ 10.00	O	Outstanding	80 $\leq$ Marks $\leq$ 100
9.00 $\leq$ CGPA $\leq$ 9.49	A+	Excellent	70 $\leq$ Marks $\leq$ 80
8.00 $\leq$ CGPA $\leq$ 8.99	A	Very Good	60 $\leq$ Marks $\leq$ 70
7.00 $\leq$ CGPA $\leq$ 7.99	B+	Good	55 $\leq$ Marks $\leq$ 60
6.00 $\leq$ CGPA $\leq$ 6.99	B	Average	50 $\leq$ Marks $\leq$ 55
5.00 $\leq$ CGPA $\leq$ 5.99	C	Satisfactory	40 $\leq$ Marks $\leq$ 50
CGPA Below 5.00	F	Fail	Marks Below 40

College Information

Bharati Vidyapeth University college of Engineering, Pune continued to take new strides towards evolving directions to further the growth and dissemination of scientific and technological knowledge.

The college established in 1983, is one of the oldest and largest Engineering Colleges in the state of Maharashtra. The college has well defined goals which are intensely practised and followed.

Their implementation encompass multi-faceted activities in the form of recruiting experienced faculty, organizing faculty development program, identifying socio- economically relevant areas emerging technologies. Constant review and upgradation of curricula, Upgradation of Laboratories, Library and communication facilities, Collaboration with industries and research and development organizations, Sharing of knowledge, infrastructure and resources, training extension, testing and consultancy services and promoting interdisciplinary research.

The college has been ranked as 'A' grade Engineering college by the Government of Maharashtra. Meeting quality standards in education such as is been a motto of this institute. As a pedagogical effect, out of ten under graduate programmes being conducted, seven programmes eligible for accreditation are accredited by National Board of Accreditation (NBA).

The DATAQUEST – CMR conducts and annual survey of technical schools of India and publishes the list of best 100 technical schools in India. In the surveys, for the past seven years, the college has been consistently ranked among top 50 technical schools.

Another feather in Institute's cap is its selection for the grant of Rs. 4.0 Crore under Technical Education Quality Improvement Programme – II (TEQIP-II) by Ministry of Human Resource Development (MHRD) of Government of India supported by World Bank.

This Institute has been ranked to 45th position at all India level and 5th at the Western Region of AICTE in 2012. The Institute has been very sensitive to the human resource development and continues initiating new academic programmes. Presently it offers 09 undergraduate programmes in the field of Civil Engineering, Chemical Engineering, Computer Engineering, Information Technology, Electrical Engineering, Electronics Engineering, Electronics and Telecommunication Engineering, Mechanical Engineering and Production Engineering.

The college offers 08 postgraduate programmes in the field of Civil Engineering, Chemical Engineering, Computer Engineering, Information Technology, Electrical Engineering, Electronics Engineering, Mechanical Engineering and NanoTechnology.

B.TECH (ELECTRONICS) SEM – III

Sr. No.	Name of the course	Teaching Scheme Hrs. / Week			Examination Scheme (Marks)						Total Marks	Credits		
		L	P	T	End Semester Exam	Continuous Assessment			TW & PR	TW & OR				
						Unit Test	Attendance	Assignments				Theory	TW	Total Credits
15	Engineering Mathematics-III	3	0	1	60	20	10	10	-	-	100	4	-	4
16	Analog Electronics	4	2	0	60	20	10	10	50	-	150	4	1	5
17	Signals & Systems	3	0	1	60	20	10	10	-	50	150	3	1	4
18	Digital Logic Circuits	3	2	0	60	20	10	10	50	-	150	3	1	4
19	Circuit theory	3	2	0	60	20	10	10	50	-	150	3	1	4
20	Professional Skill Development-III	4	0	0	100	0	00	0	-	-	100	4	0	4
	Total	**20**	**6**	**2**	**400**	**100**	**50**	**50**	**150**	**50**	**800**	**21**	**04**	**25**

B.TECH (ELECTRONICS) SEM – IV

Sr. No.	Name of the course	Teaching Scheme Hrs. / Week			Examination Scheme (Marks)						Total Marks	Credits		
		L	P	T	End Semester Exam	Continuous Assessment			TW & PR	TW & OR				
						Unit Test	Attendance	Assignments				Theory	TW	Total Credits
21	Analog integrated circuits	3	2	0	60	20	10	10	50	-	150	3	1	4
22	Electronic Circuits and Applications	4	2	0	60	20	10	10	50	-	150	4	1	5
23	Instrumentation & Control System	3	2	1	60	20	10	10	-	25	125	4	1	5
24	Analog Communication	3	2	0	60	20	10	10	-	50	150	3	1	4
25	Data Structure & Files	2	2	0	60	20	10	10	-	25	125	2	1	3
26	Professional Skill Development-IV	4	0	0	100	-	--	-	-	-	100	4	0	4
	Total	**19**	**10**	**01**	**400**	**100**	**50**	**50**	**100**	**100**	**800**	**20**	**5**	**25**

Total Credits Sem – III : 25

Total Credits Sem – IV : 25

Grand total : 50

B.TECH (ELECTRONICS) SEM – III

SUBJECT: - ENGINEERING MATHEMATICS-III

Teaching Scheme	**Examination Scheme**
Lecture: 3 Hours/week	**End semester exam : 60 Marks**
Tutorial: 1 Hours/week	**Continuous Assessment : 40 Marks**
	Credits : 04

Course prerequisites

Students should have basic knowledge of:

- Differential calculus
- Integral calculus
- Complex numbers
- Vector algebra

Course objective

To develop ability to use the mathematical techniques, skills, and tools necessary for engineering practice.

Course Outcomes

On successful completion of this course, students will be able to

1. Form mathematical modeling of systems using differential equations and ability to solve linear differential equations with constant coefficient.
2. Apply basics of analytic functions and the basics in complex integration which is used to evaluate complicated real integrals.
3. Apply theorems to compute the Laplace transform, inverse Laplace transforms.
4. Solve difference equation by Z-transform.
5. Calculate the gradients and directional derivatives of functions of several variables.
6. Use Green's theorem to evaluate line integrals along simple closed contours on the plane.

Contents

Unit-I (06 Hours)

Linear Differential Equations (LDE)

Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's &Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE, Modeling of Electrical Circuits.

Unit-II (06 Hours)

Complex Variables

Functions of Complex Variables, Analytic Functions, C-R Equations, Conformal Mapping, Bilinear Transformation, Cauchy's Theorem, Cauchy's Integral Formula, Laurent's Series, Residue Theorem

Unit-III (06 Hours)

Transforms

Fourier Transform (FT): Complex Exponential Form of Fourier Series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.

Unit-IV (06 Hours)

Laplace Transform (LT)

Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz., Periodic, Unit Step, Unit Impulse, ramp, jump, . Problems on finding LT & inverse LT. Applications of LT and Inverse LT for solving ordinary differential equations.

Unit -V (06 Hours)

Vector Differential Calculus

Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities.

Unit-VI (06 Hours)

Vector Integral Calculus

Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem, Applications to Problems in Electro-Magnetic Fields.

Assignments

1. Solve the problem based on Linear Differential Equations
2. Solve the problem based on Complex Variables
3. Solve the problem based on Fourier and Z -Transforms
4. Solve the problem based on Laplace Transform
5. Solve the problem based on Vector Differential Calculus
6. Solve the problem based on Vector Integral Calculus

Content Delivery Methods

Chalk & talk, Power point presentation

Assessment Methods

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books

1. Advanced Engineering Mathematics by Peter V. O'Neil (Cengage Learning).
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).

Reference Books

1. Engineering Mathematics by B.V. Raman (Tata McGraw-Hill).
2. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
3. Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)
4. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
5. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune).

SUBJECT: - ANALOG ELECTRONICS

Teaching Scheme:	**Examination Scheme**
Lecture: 4 Hours/week	**End Semester Exam : 60 Marks**
Practical: 2 Hours/week	**Continuous Assessment : 40 Marks**
	TW & PR. : 50 Marks
	Credits : 05

Course prerequisites

- Knowledge of Electronic Components
- Fundamentals of P-N diode.
- Knowledge of BJT and its configuration

Course objective

1. To make student understand working of bipolar junction transistor and field effect transistor with different biasing techniques
2. To make student understand a practical approach of design and analysis of waveshaping circuits using diode and multivibrator using transistors
3. To make student understand working of FET and MOSFET and its applications
4. To make student understand working of optoelectronic devices and its applications.
5. To make student understand the fabrication process of PCB

Course Outcomes

On successful completion of this course, students will be able to

1. Demonstrate knowledge of working and applications of diode.
2. Demonstrate knowledge of working of BJT with different biasing techniques.
3. Analyze applications of BJT as an amplifier and multivibrator.

4. Explain working of FET and MOSFET and its applications.
5. Demonstrate knowledge of working of optoelectronic devices.
6. Design, built and test any small electronic circuit on PCB.

Contents

Unit-I (08 Hours)

Transistor Biasing

Need of biasing, DC load line analysis, operating point, Thermal runaway. Requirements of a biasing circuit, Different biasing circuits: fixed bias, collector to base bias & voltage divider bias. Stability factor, General expression for stability factor, stability factor for all biasing circuits, Design of biasing circuits, Transistor as an amplifier.

Unit-II (08 Hours)

BJT Amplifiers

Two port device and Hybrid model , transistor Hybrid model, h- parameters, Simplified CE Hybrid Model, Analysis of amplifiers using Approximate Model(CE, CC, CB), BJT Single Stage Amplifiers, Small Signal Analysis of Single Stage BJT Amplifiers, Distortion in Amplifiers.

Unit-III (08 Hours)

Field Effect Transistor (FET)

Types of FET viz. JFET,MOSFET, JFET -construction, VI characteristics, transfer characteristics, Characteristics Parameters of JFET, FET Biasing(Self Bias, Fixed Bias, Current Source Bias), JFET amplifiers-CS,CD and CG amplifiers, Application of FET.

Unit-IV (08 Hours)

MOSFETs

Types of MOSFET viz. D-MOSFET, E-MOSFET, n-MOS, p-MOS and CMOS devices, DMOSFET and EMOSFET characteristics and parameters,non-ideal V-I characteristics viz. finite output resistance, body effect, subthreshold conduction ,breakdown effects and temperature effects, MOSFET as VLSI device

Unit -V (08 Hours)

Wave shaping and Multivibrator Circuits

Diode as clipper- series and parallel forms of clipper circuits, biased clipper, their operations, Diode as a clamper, voltage multiplier circuits-voltage doubler, tripler and quadrupler configuration, Multivibrator circuits-astable and monostable multivibrator circuit using BJT.

Unit-VI (08 Hours)

Optoelectronic devices and PCB design

Construction ,V-I characteristics and applications of LED, LDR, Photodiode, Phototransistor, Photoconductive cell, Photovoltaic cell, optcoupler.

PCB: types of PCB, PCB design rules, layout design, artwork design, fabrication process of single sided PCB, different copper clad laminates, composition of solder metal.

List of Experiments

1. Biasing techniques of BJT- to find stability factor of self bias, collector to base bias, fixed bias
2. To plot frequency response of single stage CE amplifier and find its bandwidth
3. To plot frequency response of single stage FET amplifier (CS/CD configuration) and find its bandwidth.
4. To study different types of Clipper circuits
5. To study different types Clamper circuits
6. To plot transfer characteristics of Optocoupler
7. To plot V-I and optical characteristics of LED and LDR
8. To plot V-I and optical characteristics of Photodiode and phototransistor

Assignments

1. Simulation of BJT amplifier using Multisim.
2. Define h-parameters for CE, CB, CC configuration and describe how these parameters are determined from BJT characteristics.
3. Describe fabrication process of MOSFET and any two real time applications of MOSFETs
4. Real time applications of optoelectronics devices such as LED, Optoisolator
5. To design, built and test given electronic circuits (Group activity)
6. Obtain industry exposure based on product design industry and prepare report for the same.

Content Delivery Methods

Chalk & talk, Power point presentation

Assessment Methods

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books

1. "Electronic Devices and Circuits" by S. salivahanan,Suresh kumar-Mc Graw Hill Publication
2. "Integrated Electronics", by Millman J and Halkias .C., TMH publication
3. "Electronic Devices and Circuits " by Millman ,Halkies,TMH publication

Reference Books

1. "Electronic Devices and Circuits" by Allen Mottershed- PHI Publication
2. "Electronic Devices and Circuits" by J.B. Gupta-Katson educational series
3. "Microelectronics "by Jacob Millman, Arvin Garbel- Mc Graw Hill Publication
4. "Printed Circuits Handbook " by Clyde F. Coombs - McGraw Hill Handbooks
5. "Microelectronic Circuits Theory and applications "by Adel S. Sedra , Kenneth C. Smith- Oxford

SUBJECT: - SIGNALS AND SYSTEMS

Teaching Scheme:	**Examination Scheme**
Lecture: 3 Hours/week	**End Semester Exam : 60 Marks**
Tutorial: 1Hour/week	**Continuous Assessment : 40 Marks**
	TW & OR. : 50 Marks
	Credits : 04

Course prerequisites

Before proceeding with this tutorial, you must have a basic understanding of differential and integral calculus, limits and adequate knowledge of mathematics.

Course objective

The course aims to develop good understanding about signals, systems and their classification and analysis tools in the time and frequency domain. It also provides knowledge of correlation function and sampling.

Course Outcomes

On successful completion of this course, students will be able to

1. Represent & classify signals, Systems & identify LTI systems
2. Analyze the systems in time domain using convolution.
3. Apply Fourier transform, Laplace transform and Z-Transform for analysis of LTI systems.
4. Conceptualize the effects of sampling on signal and describe the auto correlation and cross correlation between signals.

Contents

Unit-I (06 Hours)

Introduction to signals

Definition of signals, classification of signals: continuous time signals & discrete time signals, even & odd signals, periodic & non-periodic, deterministic & non-deterministic, energy & power, elementary signals: unit impulse, unit step, unit ramp, exponential & sinusoidal, basic operations on signals.

Unit-II (06 Hours)

Classification of Discrete time systems

Definition ,Classification of System, System Interconnections, state space analysis, Linear & non -linear ,Time-Invariant & Time variant, causal & non-causal, static & dynamic, stable & unstable systems, stability & impulse response of systems to standard signals.

LTI system Analysis: Introduction to LTI systems. Block Diagram, Linear Convolution-Convolution Integral, Impulse response, Methods of Convolution. Properties of convolution

Unit-III (06 Hours)

Continuous Time system Analysis

Response of LTI Systems to exponential signals, periodic signals. Fourier series, Fourier Transforms, properties, applications of Fourier series & Fourier transforms to the system analysis.

Unit-IV (06 Hours)

System Analysis in Laplace Transform

Laplace Transform: Definition and its properties, ROC and pole zero concept. Applications of Laplace transforms to the LTI system analysis. Inversion using duality, numerical based on properties.

Unit-V (06 Hours)

System Analysis in Z-Transform

Z-Transform: Definition and its properties, Region of Convergence for the Z-Transform, the Inverse z-Transform, Applications of Z-Transform to the LTI system analysis

Unit VI (06 Hours)

Correlation and Spectral Density

Definition of Correlation and Spectral Density, correlogram, analogy between correlation, covariance and convolution, conceptual basis, auto-correlation, cross correlation, energy/power spectral density, properties of correlation and spectral density, inter relation between correlation and spectral density, Sampling theorem & its proof, aliasing, reconstruction of sampled signals, interpolation.

Assignments

Perform the following assignments using MATLAB (any three) and Virtual Lab (any three)

1. Generation of Signals
2. Linear convolution of any two signals
3. Fourier transform of given signal
4. Laplace Transform of given signal
5. Z-transform of given signal
6. Sampling Theorem & aliasing effect.

Content Delivery Methods

Chalk & talk, Power point presentation, Quiz

Assessment Methods

1. Continuous Assessment (Attendance, Assignments/Tutorials, Unit Test)
2. End term Examination

Text Books

1. Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab, "Signals and Systems" Pearson Education Asia / PHI, 2nd edition, 1997. Indian Reprint 2002
2. Simon Haykins and Barry Van Veen, Signals and Systems John Wiley & sons , Inc,2004.

Reference Books

1. B. P. Lathi, "Linear Systems and Signals", Oxford University Press, 2005
2. H. P Hsu, R. Ranjan, "Signals and Systems", Scham's outlines, McGraw Hill,2006
3. S.Salivahanan, A. Vallavaraj, C. Gnanapriya, Digital Signal Processing, McGraw Hill International/TMH, 2007

B.TECH (ELECTRONICS) SEM – III

SUBJECT: - DIGITAL LOGIC CIRCUITS

Teaching Scheme:	**Examination Scheme**
Lecture: 3 Hours/week	**End Semester Exam : 60 Marks**
Practical: 2 Hours/week	**Continuous Assessment : 40 Marks**
	TW & PR. : 50 Marks
	Credits : 04

<u>Course Prerequisite</u>

1. Fundamentals of Number Systems.

<u>Course Objective</u>

1. To understand principles, characteristics & operations of combinational & sequential logic circuits.
2. To design combinational circuits by using logic gates, MSI circuits, PLDs.
3. To design, implement analyze, asynchronous & synchronous sequential circuits using flip flops.

<u>Course Outcomes</u>

On successful completion of this course, students will be able to

1. Demonstrate the knowledge of Boolean algebra including simplification techniques.
2. Describe the characteristics of Logic families TTL, CMOS, ECL & explain the fundamentals of semiconductor memories.
3. Analyze & design digital combinational circuits such as of multiplexers, Demultiplexer, encoder, decoder and arithmetic circuits.
4. Demonstrate the knowledge of operations of basic types of flip-flops, registers, counters & the design of Finite State Machine.
5. Describe the characteristics of PLDs, Semiconductor memories and their applications.

Contents

Unit –I (6 Hours)

Number Systems, Codes & reduction techniques

Review of Binary number system: Binary addition and subtraction using 1's, 2'scomplement method, sign magnitude representation. BCD codes, 8421, Excess –3, Grey code, codes with more than four bits, ASCII code.

Fundamental theorems of Boolean algebra, Canonical and standard forms (SOP and POS), minimization of logic functions, Karnaugh maps up to 4 variables, Don't care conditions, Quine Mc-Cluskey method.

Unit-II (6 Hours)

Combinational Logic Modules and their Applications

Adder, subtractor, carry look ahead adder, BCD adder, magnitude comparator, Excess-3 Adder, series and parallel adder, ALU.

Code conversion, Multiplexer, Demultiplexer, Encoder, Decoder and their applications. Parity generator and checker.

Unit-III (6 Hours)

Logic Families

Parameter definitions - Noise margin, power dissipation, voltage and current parameters, propagation delay. Typical values for TTL, CMOS & ECL. Two input TTL NAND gate, TTL logic families standard, Totem – pole, open collector, tri-state (concept & application). TTL-CMOS/CMOS-TTL interfacing, comparison of TTL & CMOS ECL.

Unit-IV (6 Hours)

Sequential Logic Modules

Basic sequential circuits-latches and flip-flops: SR-latch, D-latch, D flip-flop, JK flip-flop, MS J-K flip flop, T flip-flop.

Definition of state machines, Moore and Mealy machine, Design of state machines: state table, state assignment, transition/excitation table, excitation maps and equations, logic realization.

Unit-V (6 Hours)

Shift Registers & Counters

Registers, Shift registers, Counters (ring counters, twisted ring counters), Sequence Generators, ripple counters, up/down counters, synchronous counters, lock out, Clock Skew, Clock jitter.

Unit-VI (6 Hours)

PLDs & Memories

Study of PROM, PAL, PLAs. Designing combinational circuits using PLDs.

Classification and characteristics of memory, different types of RAMs, ROMs and their applications, Double Data Rate RAMs.

List of Experiments

1. Implementation of Boolean functions using logic gates
2. Study of characteristics of typical 74 TTL / 74 CMOS family like: fan in, fan out standard load , noise margin & interfacing with other families
3. Half, Full Adder and subtractor using gates and IC's
4. Code conversion using digital IC's
5. 1 & 2 bit digital comparator and ALU verification
6. Function implementation using Multiplexer and Demultiplexer
7. Sequence generator using MSJK flip flop IC's
8. Study of counters : Ripple , Synchronous , Ring , Johnson , Up-down counter and its application
9. Study of shift registers : Shift left , Shift right , parallel loading and Pulse Train generator
10. BCD Adder/Subtractor with Decoder driver and 7 segment display

Assignments

1. Implement a multiplexer using Virtual laboratory
2. Design example based on combinational circuit
3. Design for e.g. digital clock, digital event counter,timers,and various multi-vibrator circuits, small processor ports or scrolling display

4. Implementation of combinational logic using PLAs
5. Design a pulse train generator using shift register
6. Design example based on state machine

Content Delivery Methods

Chalk & talk, Power point presentation

Assessment Methods

1. Continuous Assessment (Attendance, Assignments/Tutorials, Unit Test)
2. End term Examination

Text Books

1. R.P. Jain , "Modern digital electronics" , 3rdedition , 12th reprint TMH Publication, 2007.
2. Anand Kumar 'Fundamentals of Digital Circuits'--. PHI
3. Tocci R.J., Neal S. Widmer, Digital Systems: Principles and Applications, Pearson Education Asia, Second Indian Reprint 2002

Reference Books

1. J.F.Wakerly "Digital Design: Principles and Practices", 3rd edition, 4th reprint, Pearson Education, 2004.
2. A.P. Malvino, D.P. Leach 'Digital Principles & Applications'' –Vith Edition-Tata Mc Graw Hill, Publication.
3. Morris Mano 'Digital Design'-- (Third Edition),.PHI
4. Thomas L Floyd & R.P Jain, digital Fundamentals (Eight editions), Pearson

SUBJECT: - CIRCUIT THEORY

Teaching Scheme:	**Examination Scheme**		
Lecture: 3 Hours/week	**End Semester Exam**	:	**60 Marks**
Practical: 2 Hours/week	**Continuous Assessment**	:	**40 Marks**
	TW & PR.	:	**50 Marks**
	Credits	:	**04**

Course prerequisites

- Knowledge of KCL and KVL Laws from Basic Electrical Engineering
- Knowledge of Linear Differential Equations and Systems of Linear Equations from Engineering Mathematics - I and II.

Course objective

The objective of the course is to enable the student to perform any of the network analysis task required in the subsequent courses. The student is exposed to some concepts in graph theory for providing a good foundation for the methods of Mesh Analysis and Node Analysis. The transient analysis using Laplace Transforms is also included. The series and parallel resonance circuits which occur quite frequently in electronics are analyzed. The topic of constant K filter is included as it finds many applications in electronic design. The two port network parameters which are of fundamental importance in many courses on electronic devices are included in the last unit.

Course Outcomes

On successful completion of this course, students will be able to:

1. To find voltages and currents in a given network using Mesh Analysis or Node Analysis or Network Theorems.
2. To find voltages and currents in a given network by formulating network equilibrium equations from graph theory.
3. To find the transient response in a given network consisting of

series or a parallel combination of resistance, capacitance and inductance.

4. To find all the parameters relating to a given series or a parallel resonant circuit.
5. To design a constant K prototype low pass, high pass, band pass or a band stop passive filter
6. To find any of the two port parameters of a given two port network.

Contents

<u>Unit I</u> (6 Hours)

Fundamentals Of Network

KCL, KVL, Source Transformation, Source Shifting, Mesh Analysis, Node Analysis, Super Mesh, Super Node, Mesh and Node Analysis in Sinusoidal Steady State

Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem.

<u>Unit II</u> (6 Hours)

Application Of Graph Theory

Network Graph, tree, cotree & loops, Incidence Matrix, tie set matrix, cut-set matrix, Formulation of equilibrium equations in matrix form, Solution of resistive networks, Principle of Duality

<u>Unit III</u> (6 Hours)

Transient Analysis

Initial Conditions in networks. A procedure for evaluating initial conditions. Solution of step response in RC, RL, RLC circuits using classical method, Analogous equivalence of mechanical system.

Unit IV (6 Hours)

Resonance

Resonant condition, Definition of Quality factor. Finding resonant frequency, impedance at resonance, voltage and current variation with frequency, bandwidth, selectivity, magnification factor for series and parallel resonant circuits. General case of resistance present in both branches of parallel resonant circuit. Comparison of series and parallel resonant circuits, Applications of resonant circuits

Unit V (6 Hours)

Passive Filters

Filter Fundamentals, Image impedance, Characteristic impedance, Propagation constant. Constant K prototype for LPF, HPF, BPF and BSF, m-derived LPF, HPF, Terminating half sections, Composite filters

Unit VI (6 Hours)

Two Port Networks

Network Functions, Two port network parameters, Z, Y, H, ABCD and other parameters, Relationships between two-port network parameters, Interconnections of two-ports, Reciprocity and Symmetry conditions

List of Experiments

1. To verify Thevenin's and Norton's Theorem.
2. To verify Superposition and Reciprocity Theorem.
3. To find resonant frequencies of series and parallel circuit.
4. To plot frequency response of frequency selective network (Twin T or Wein Bridge).
5. To plot frequency response & cut-off frequency of constant-k LPF and HPF.
6. To plot frequency response & cut-off frequency of constant-k BPF and BSF.
7. To find Z and Y parameters of given two port network.
8. To find H and ABCD parameters of given two port network.

Assignments

1. Analyze the circuit using mesh and node analysis.
2. Apply graph theory for circuit.
3. Describe any two real time applications of passive filters.
4. Simulation of series and parallel resonance circuit using Multisim.
5. Transient response of RC, RL and RLC circuit using Multisim.
6. Obtain industry exposure based on product design industry and prepare report for the same.

Content Delivery Methods

Chalk & talk, Power point presentation

Assessment Methods

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books

1. D. Roy Choudhury, 'Network and Systems', New Age International Publishers, Second Edition.
2. Franklin F. Kuo, 'Network Analysis and Synthesis', John Wiley & Sons (Second Edition)

References Books

1. M. E. Van Valkenburg, 'Network Analysis', PHI (3rd Edition)
2. John D. Ryder, 'Networks, Lines and Fields', PHI Learning Pvt. Ltd., Second Edition

SUBJECT: PROFESSIONAL SKILLS DEVELOPMENT

TEACHING SCHEME : Theory : 4 Hours / Week
EXAMINATION SCHEME : End Semester Examination: 50 Marks
CREDITS ALLOTED : 2

Course Pre-requisites

The Students should have knowledge of

1. Basic math's and reasoning, the rules of English and comprehensive ability
2. Basic awareness of phrasal verbs used in spoken communication and knowledge of verbs and other words used in professional life.
3. Basic writing techniques taught to them in the first semester.
4. The strengths and achievements analyzed during self awareness session taught in the second semester. They should also be able to identify their long term and short term goals.
5. Basic knowledge and idea about leaders and leadership qualities.
6. Basic awareness of PowerPoint presentation and paper presentation and also should be fluent in English.

Course Objectives

The Professional Skills Development course which is a combination of aptitude and soft skills aims to augment students to face the campus recruitment test and train them on applying short techniques/ tricks to solve questions of Maths, reasoning and English in very less amount of time. The English and soft skills section focuses on the higher aspects of soft skills such as grooming them on leadership, presentation, business communication which would enable them to project themselves as professionals in the corporate sector and/or otherwise.

Course Outcomes

The student should be able to

1. Solve the aptitude test in the recruitment exam and competitive exam by applying short techniques and solve the question in less

amount of time. They would be able to handle around 15-20 topics of math's and reasoning and 50 rules of parts of speech.

2. Present themselves with finesse by using around 25-20 idioms and phrases relevant to corporate communication as well as spoken English. They will also learn 50-60 words and other words that are specifically used in meetings, group discussions, presentation and other corporate events.
3. Process their ideas and thoughts (verbal communication) into written communication in an effective, coherent and logical manner within a stipulated time and specific word limit of 500-750 words for essay writing along with limited words for technical writing and report writing.
4. Identify themselves in terms of their strengths. Weaknesses and opportunities available to them for the career growth. They would also learn to overcome their weakness and convert into strengths and also make utilization of the opportunity vis-à-vis their strength. They would also learn to set realistic short/long term goals relevant to them through the SMART goal mnemonic.
5. Differentiate between the different types of leaders and groom themselves to be potential leaders. Based on their qualities and strengths they would learn 5 types of leadership styles and mould themselves according to that. They would also learn 10-15 leadership traits.
6. Prepare PowerPoint presentation and paper presentation effectively by focusing on body language, tone of communication and audiences' needs. They would also learn to handle the questions in an effective and smart way.

<u>Unit I</u> (18 Hours)

Aptitude (Maths, Logical Reasoning, English)

- **Maths**

  i) Enjoy maths + Number system

ii) Number system

iii) Percentage, profit and loss

- **Logical Reasoning**

  i) Coding, Decoding, Number series,

  ii) Blood relation Directions, cubes & dices

- **English**

  i) Vocabulary-1

  ii) Confusing words-1(Homonyms)

Unit II (6 Hours)

Essential Grammar - III

- Idioms and phrases
- Usage of Idioms & phrases in daily conversation
- Activities
- Academic word list- Words to be used in business communication

Unit III (4 Hours)

Written Communication- II

- Essay writing
- Mnemonics to develop ideas and write essays
- Structure of essays
- Technical writing
- Report writing

Unit IV (6 Hours)

SWOT Analysis

- Introduction to SWOT
- Importance to SWOT

- Individual & Organizational SWOT Analysis
- Identifying strengths, weaknesses, threats & opportunities
- Short term goals& Long term goals, Career planning

Unit V (4 Hours)

Interpersonal Skills - III

- Introduction to leadership skills
- Importance of leadership skills
- Types of leadership skills
- Are leaders born or made?

Unit VI (4 Hours)

Presentation Skills

- Introduction to PowerPoint presentation
- Structure & flow of presentation
- Importance of body language
- Presentation by students-evaluation& feedback by trainers

Text Books

1. APAART: Verbal Ability
2. APAART: Logical Reasoning
3. APAART: Quantitative Aptitude
4. APAART: Speak Well 1 (English Language and Communication)
5. APAART: Speak Well 2 (Soft Skills)

SUBJECT: - ANALOG INTEGRATED CIRCUITS

Teaching Scheme:	**Examination Scheme**
Lecture: 3 Hours/week	**End Semester Exam : 60 Marks**
Practical: 2 Hours/week	**Continuous Assessment : 40 Marks**
	TW & PR. : 50 Marks
	Credits : 04

Course prerequisites

- Knowledge of KCL and KVL Law
- Basic knowledge of Op-Amp and its configurations

Course objective

This course provides in depth knowledge on the Op-Amp. Also it introduces the design of PLL, Waveform generators, Timer IC's and Converters.

Course Outcomes

On successful completion of this course, students will be able to

1. Design linear and nonlinear applications of Op-Amp.
2. Design of first and second order active filters.
3. Analyze and design Waveform Generators.
4. Demonstrate knowledge of Phase Locked Loop IC 565 and Converters.
5. Design of multivibrators using Timer IC 555

Contents

Unit-I (06 hours)

Fundamentals of Operational Amplifier

Block diagram representation of a typical op-amp, Schematic symbol for op-amp ,Definition of integrated circuits ,Types of Integrated Circuits ,Manufacturers ,Designation for IC ,IC package types ,PIN identification & temp ranges , Ordering information, Characteristics of an op-amp, Internal &external offset voltage compensation, Frequency Response of an op-amp.

Unit-II (06 hours)

Operational Amplifier – Linear circuits

Inverting amplifier, Non-inverting amplifier, Voltage Follower, Adder, Subtractor, Scaling averaging amplifier, Integrator, Differentiator, Instrumentation amplifier using 1, 2 and 3 op-amps, Instrumentation amplifier using transducer bridge, Peaking amplifier

Unit-III (06 hours)

Operational Amplifier - Non-linear circuits

Precision half wave rectifier & full wave rectifier, comparator, Schmitt trigger, window detector, log-antilog amplifier and its temperature compensation techniques, log ratio, sample and hold circuit.

Unit-IV (06 hours)

Active filters and waveform generators

First and second order low pass Butterworth filters, first and second order high pass Butterworth filter, Band pass filter, Band reject filter, All-pass filter, notch filter, Square wave, Triangular wave, Sawtooth wave generator and study of function general or IC 8038

Unit-V (06 hours)

Special function IC's

IC 555- as Monostable and Astable Multivibrators and its applications.

IC 565- operating principle of Phase Locked Loop IC 565, Applications like Frequency multiplier, FSK and FM detector

Unit-VI (06 hours)

Interfacing circuits

V to I & I to V converter, D to A converter- Binary weighted resistors and R & 2R resistors, A to D Converter- Counter-ramp type, Successive approximation and Dual Slope.

List of Experiments

1. To design and build Integrator and draw frequency response
2. To design and build Differentiator and draw frequency response
3. To design and build precision rectifier
4. To design and build schmitt trigger and find threshold levels
5. To design and build first order Butterworth low pass filter
6. To design and build first order Butterworth high pass filter
7. To design and build triangular waveform generator using IC 741
8. To design and build Function generator using IC 8038
9. To design and build Astable multivibrator using timer IC 555.

Assignments

1. Find out any three ICs of op-amp other than IC 741 and compare the characteristics with IC 741.
2. List out any two linear applications of op-amp which are not specified in syllabus and explain the working along with circuit diagrams.
3. List out any two non-linear applications of op-amp which are not specified in syllabus and explain the working along with circuit diagrams.
4. Design sinusoidal generators using op-amp for a given frequency.
5. Real time applications of IC555/ IC565.
6. Obtain industry exposure based on product design and prepare report for the same.

Content Delivery Methods

Chalk & talk, Power point presentation

Assessment Methods

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books

1. Ramakant A.Gayakwad, OP-AMP and Linear ICs, Prentice Hall of India, 4th Edition, 2010.
2. K. R. Botkar, Integrated Circuits, khanna Publishers, 10th edition, 2010

References Books

1. David A. Bell, "Operational Amplifiers and Linear ICs", Oxford publication,3rd edition,2011
2. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", Tata McGraw Hill, 3rd edition, 2008
3. D.Roy Choudhry, Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd., 4th edition, 2010.

SUBJECT: - ELECTRONIC CIRCUITS AND APPLICATIONS

Teaching Scheme:	**Examination Scheme**		
Lecture: 4 Hours/week	**End Semester Exam**	**:**	**60 Marks**
Practical: 2 Hours/week	**Continuous Assessment**	**:**	**40 Marks**
	TW & PR.	**:**	**50 Marks**
	Credits	**:**	**05**

Course prerequisites

- Knowledge of linear circuit theory
- Basic concept of BJT

Course objective

1. To make student understand analysis of multistage transistor amplifier.
2. To make student understand a practical approach of design and analysis of feedback amplifiers ,power amplifiers and oscillators
3. To make student understand analysis and design of voltage regulators.
4. To make student understand the behavior of high frequency BJT amplifiers

Course Outcomes

On successful completion of this course, students will be able to

1. Analyze multistage amplifier.
2. Analyze and design feedback amplifier and power amplifier and oscillators
3. Analyze and design voltage regulators.
4. Characterize behavior of high frequency BJT amplifiers.

Contents

Unit-I (08 hours)

Multistage amplifiers

Need of Multistage amplifiers, Parameter evaluation such as Ri, Ro, Av, Ai & Bandwidth for general multi stage amplifier, Analysis & design at low frequency & mid frequency of direct coupled, RC coupled, transformer coupled (Two stage) amplifier, Darlington amplifier, cascode amplifier

Unit-II (08 hours)

Feedback amplifiers

Concept of feedback, classification of amplifiers, Negative feedback topologies with their block diagram representation, Effect of negative feedback on Input impedance, Output impedance, Gain and Bandwidth with derivation, method of analysis of feedback amplifier, analysis of all feedback topologies.

Unit-III (08 hours)

Power amplifiers

classification of power amplifiers - Class A, Class B, Class C, and Class AB. Operation of - Class A with resistive load; Transformer coupled class A Amplifier; Class B Push – pull amplifier ; Class B Complementary symmetry amplifier. Efficiency analysis for Class A transformer coupled amplifier and Class B push – pull amplifier, cross over distortion in power amplifiers, harmonic analysis

Unit-IV (08 hours)

Oscillators

Positive feedback, Barkhausen criterion, Classification of oscillators, derivation and analysis of RC oscillators, Wien bridge Oscillators, LC Oscillators for frequency of oscillation, Tuned collector oscillator, Piezo-electric effect in crystals and Crystal Oscillator

Unit- V (08 hours)

Regulators

Block schematic of linear regulators, Performance parameters – Load and Line regulations, Ripple rejection, Output resistance Emitter follower regulator, Transistor series regulator, shunt regulator Study and design of regulators using IC's :78XX,79XX,723,LM317, Method of boosting output current using external series pass transistor. Protection circuits – Reverse polarity protection, over circuit, fold back current limiting, over voltage protection.

Unit-VI (08 hours)

High frequency amplifiers

High frequency T model. Common base short circuit current frequency response ,alpha cut-off frequency ,CE short circuit current frequency response, high frequency hybrid π CE model, Amplifier response taking into account source and load resistances.

List of Experiments

1. Study of CE two-stage amplifier with capacitive coupling
2. Study of Voltage series and current series feedback amplifiers
3. Study of Voltage shunt and current shunt feedback amplifiers
4. Study of Class B/AB push – pull/ Complementary Symmetry power amplifier.
5. Study of RC Oscillators - phase shift and wien bridge oscillators
6. Study of LC oscillators – Hartley, Colpitt oscillators
7. Study of Linear voltage regulators – series regulator using series pass transistor, shunt regulator using zener diode
8. Study of Fold back current limiting using IC 723

Assignments

1. Analyze given feedback amplifier.
2. Describe any two real time applications of power amplifier.
3. Simulation of oscillator using Multisim.
4. Describe any two real time applications of regulator.
5. To design, built and test given electronic circuits(Group activity)
6. Obtain industry exposure based on electronic product design and prepare report for the same.

Content Delivery Methods

Chalk & talk, Power point presentation

Assessment Methods

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books

1. "Electronic devices and circuits" by S. Salivahanan, Suresh Kumar Vallavaraj, Mc Graw Hill Publication
2. "Electronic devices and circuits "by Millaman Halkies ,TMH publication
3. "Integrated Electronics", by Millman J and Halkias .C., TMH publication

Reference Books

1. "Electronic Devices and Circuits "by Allen Mottershed- PHI Publication
2. "Electronic Devices and Circuits "by J.B. Gupta- KATSON educational series books
3. " Microelectronic Circuits Theory and applications "by Adel S. Sedra, Kenneth C. Smith- Oxford
4. "Microelectronics "by Jacob Millman, Arvin Garbel- Mc Graw Hill Publication
5. "Electronic Principles "by Albert Malvino and David J Bates, 7 edition, Tata McGrawHill
6. "Basic Electronics" by Zbar, Malvino and Miller, 7 edition, Tata McGraw Hill

SUBJECT: - INSTRUMENTATION & CONTROL SYSTEM

Teaching Scheme:	**Examination Scheme**
Lecture: 3 Hours/week	**End Semester Exam : 60 Marks**
Practical: 2 Hours/week	**Continuous Assessment : 40 Marks**
Tutorial: 1 Hour/week	**TW & OR. : 25 Marks**
	Credits : 05

Course prerequisites

- Basic knowledge of signals.
- Basic mathematical tools like Laplace transform.
- Basic knowledge of software like MATLAB.

Course objective

This course provides in depth knowledge of the various control systems. Also it introduces the stability of system, transducers, controllers etc.

Course Outcomes

On successful completion of this course, students will be able to

1. Identify various control systems and determine the 'Transfer Function' of a system using block diagram reduction technique and signal flow graph.
2. Measure various Non-electric quantities such as displacement, temperature, angular speed, acceleration etc using suitable transducer.
3. Determine the error in various control systems.
4. Evaluate the stability of a system using Routh's Stability Criterion, root locus and different graphical methods like Bode plot and polar plot.
5. Compare various control actions such as Proportional (P), Integral (I), Derivative (D), PI, PID.

Contents

Unit I (06 Hours)

Control System

Introduction to Control System, control problems, Feedback and Non-feedback Systems, Transfer Function, Analysis of T.F. using Block diagram and signal flow graph.

Unit II (06 Hours)

Transducers and Controller Components

Classification of Transducers and its Characteristics. RTD, Thermocouple, Thermister, capacitive transducer, LVDT, strain gauge and Electromagnetic flow-meter. Linear Approximation of Nonlinear Systems, synchros, dc and ac servomotors, tacho-generators, electro hydraulic valves, electro pneumatic valves.

Unit III (06 Hours)

Time Response Analysis

Standard Test Signals, Time Response of First order system and second order system, steady state error (ess) and error constants (Kp, Kv, Ka), performance indices.

Unit IV (06 Hours)

Stability

Concept of stability, necessary conditions for stability, Hurwitz and Routh stability criteria, stability of system modeled in state variable form, root locus technique.

Unit V (06 Hours)

Frequency Response Analysis

Relationship between time & frequency response, Polar plots, Bode plot, stability in frequency domain, Nyquist stability criterion.

Unit VI (06 Hours)

Controllers

Control actions – On/Off, P, PI, PD, PID. PLC Architecture, Introduction to Ladder Diagram

List of Practicals

1. Unit Step and Impulse response of the Transfer function using MATLAB.
2. To draw Root Locus theoretically and verify it using MATLAB.
3. To draw Bode plot theoretically and verify it using MATLAB.
4. Magnitude and phase plot of Lead network.
5. Magnitude and phase plot of Lag network.
6. To Study characteristics of temperature transducer.
7. To Study characteristics of LVDT for displacement measurement.
8. Study of Strain gauge.

Assignments

1. Transfer function of closed loop system.
2. Transient response specifications of second order system.
3. Describe characteristics of temperature transducers..
4. Effect of addition of poles and zeros.
5. Describe architecture of PLC.
6. Simulation of Controller using Virtual Lab and LabVIEW.

Content Delivery Methods

Chalk & talk, Power point presentation

Assessment Methods

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books /Reference Books

1. I. J. Nagrath & M. Gopal, "Modern Control Engineering", New Age International, New Delhi (Fifth Ediion) 2007.
2. Ogata, K., "Modern Control Engineering", Prentice Hall, second edition, 1991
3. A K Sawhney, Electrical and Electronic Measurements and Instrumentation, Dhanpt Rai and Co. Ltd.
4. H S Kalsi, Electronic Instrumentation, Tata McGraw-Hill.
5. Gopal. M., "Control Systems: Principles and Design", Tata McGraw-Hill.

SUBJECT: - ANALOG COMMUNICATION

Teaching Scheme:	Examination Scheme	
Lecture: 3 Hours/week	End Semester Exam	: 60 Marks
Practical: 2 Hours/week	Continuous Assessment	: 40 Marks
	TW & OR.	: 50 Marks
	Credits	: 04

Course prerequisites

- Basic knowledge of signals and systems.
- Basic mathematical tools like fourier series & transform

Course objective

1. To introduce to student essential components of communication system and emphasize need of modulation.
2. To make student recognize concept of noise and its effects.
3. To make student understand amplitude & frequency modulation and demodulation and its mathematical background.
4. To make student understand working of radio receivers.

Course Outcomes

On successful completion of this course, students will be able to

1. Describes basic components of communication system and explains need of modulation.
2. Describes concept of noise and also recognizes its effects.
3. Describes amplitude and frequency modulation and demodulation and can do analysis in time and frequency domain.
4. Describes components of communication receiver system.

Contents

Unit-I (6 Hours)

Introduction to Communication Systems

Review of signals and systems, Frequency domain of signals, Block schematic of communication system, types of communication channels, base band signals, RF bands, Necessity of modulation.

Unit-II (6 Hours)

Noise

Types of noise, External noise, Internal Noise, Noise calculations, signal to noise ratio, noise figure, and noise temperature.

Unit-III (6 Hours)

Amplitude Modulation

Amplitude Modulation, low level and high level transmitters,Frequency spectrum of AM wave, Representation of AM, power relations in AM, Generation of AM,DSB suppressed carrier (DSBSC)-modulator, Single Side Band (SSB):-Principle, Filter method, phase shift method and third method, Independent sideband (ISB) and Vestigial Side Band (VSB) principles and transmitters, Diode detector, practical diode detector, and square law detector. Demodulation of DSBSC, Demodulation of SSBSC.

Unit-IV (6 Hours)

Angle Modulation

Basic concept, mathematical analysis, frequency spectrum of FM wave, sensitivity, phase deviation and modulation index, frequency deviation and percent modulated waves, bandwidth requirement, deviation ratio, Narrow Band FM, and Wide Band FM. Varactor diode modulator, FET reactance modulator, stabilized reactance modulator- AFC, Direct FM transmitter, indirect FM Transmitter, pre-emphasis and de-emphasis.Amplitude limiting, FM demodulators

Unit-V (6 Hours)

Radio Receivers

Block diagram of AM and FM Receivers, TRF receiver, Super heterodyne Receiver, Performance characteristics:Sensitivity, Selectivity, Fidelity, Image Frequency Rejection. IF Amplifiers. Tracking, AGC, Mixers.

Unit -VI (6 Hours)

Pulse Analog Modulation

Pulse modulation. Sampling process, Sampling Theorem for low pass and band pass signals, Nyquist criteria ,

Sampling techniques, aliasing error, and aperture effect. PAM, PWM, PPM generation and detection. TDM and FDM.

List of Experiments (Minimum 08)

1. Study of Amplitude Modulation and Demodulation.
2. Study of Frequency Modulation and Demodulation
3. Study of SSB Modulation & Demodulation.
4. Analysis of standard signals (square and triangular)and Modulated signals(all types of AM, FM) using spectrum analyzer.
5. Sampling And Reconstruction.
6. Study of Pulse Amplitude Modulation (PAM.)
7. Study of Pulse Width Modulation.(PWM)
8. Study of Pulse Position Modulation.(PPM)
9. Study of PAM-TDM.
10. Study of Super heterodyne (AM) Receiver.

Assignments

1. Design of circuit for noise and noise figure analysis using Multisim.
2. Simulation of AM modulation and demodulation using MATLAB.
3. Simulation of FM modulation and demodulation using MATLAB.

4. Design and simulation of AM Receiver using MATLAB. Simulink.
5. Design of PWM modulator using Multisim.

Content Delivery Methods

Chalk & talk, Power point presentation.

Assessment Methods

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Book

B.P.Lathi 'Modern Digital and analog Communication System' Oxford University press.

Reference Books

1. George Kennedy 'Electronics Communication System'- IV th Edition- Tata McGraw Hill Publication.
2. Taub & Schilling: Principles of Communication Systems, Tata McGraw-Hill.

SUBJECT: - DATA STRUCTURES AND FILES

Teaching Scheme:	**Examination Scheme**		
Lecture: 2 Hours/week	**End Semester Exam**	**:**	**60 Marks**
Practical: 2 Hours/week	**Continuous Assessment**	**:**	**40 Marks**
	TW & OR.	**:**	**25 Marks**
	Credits	**:**	**03**

Course prerequisites

- Basic Knowledge of C language.

Course objective

This course provides in depth knowledge of the various types of data structures and various algorithms. Also it introduces the concept of linked list, stack, queues, graph and tree.

Course Outcomes

On successful completion of this course, students will be able to

1. Write a program involving pointers and structures.
2. Write a program involving search and sorting techniques.
3. Write a program using linked and double linked lists.
4. Implement stacks and queues involving linked list.
5. Perform operations on a tree using linked lists.
6. Find the shortest path in a given graph.

Contents

Unit-I (5 Hours)

C Programming Revision

Pointers, Arrays, Single and Multi-Dimensional arrays, Row major and Column Major, Arrays and polynomials, Structures , Call by Value ,Call by Reference , Passing arrays Passing a function to function, Pointer to function ,Pointers.

Unit-II (4 Hours)

Data Structure and Analysis of algorithms.

Introduction to data structure, Data representation, Abstract Data types, Primitive data types, Data structure and data types, Differences between data types. Algorithms and different approaches to designing an algorithm, Complexity, Big O notation, algorithm analysis .Recursion. Sorting: Bubble sort, Selection sort, Quick sort, Merge sort, Insertion sort.

Unit-III (4 Hours)

Linked Lists

Definition, operations on linked list, Reversing the links, Merging of linked lists, Circular Linked list, Recursive operation on linked list, Doubly linked list, Linked list and Polynomials,

Unit-IV (3 Hours)

Stack and Queues

Operation on stacks, Stack as an array, Stack as a linked list, Application of stack, Infix to prefix conversion, Infix to postfix conversion, Postfix to prefix conversion, Postfix to infix conversion.

Representation of Queue as an array, Queue as an linked list, Circular Queue, Priority queue

Unit-V (3 Hours)

Tree

Binary tree, Linked and array representation of Binary tree, Binary search tree, Operation: Searching of a Node in a Binary tree, Insertion of a node in binary tree, deletion from a binary tree. Threaded binary tree. AVL trees

Unit-VI (3 hours)

Graphs

Definition ,Adjacent vertices and Incident edges, graph representation, depth first search ,breadth first search, Spanning tree, Kruskal.s Algorithm, Shortest path algorithm, Dijkstra.s algorithm.

List of Experiments

1. Program to create & manipulate database using structure.
2. Program to add two polynomial using array of structure.
3. Program to implement primitive operation on Sequential file.
4. Program to search for record from a given list of records stored in array using
   - i) Linear search
   - ii) Binary search
5. Program to sort an array of names using
   - i) Bubble sort
   - ii) Insertion sort
   - iii) Quick sort
6. (a) Program to implement following operation on singly linked list:
   - i) Create
   - ii) Delete
   - iii) Insert
   - iv) Display
   - v) Search

   (b) Program to add two polynomials using linked list.
7. (a) Program to implement stack using:
   - i) Array
   - ii) Linked list

   (b) Program to convert an infix expression to postfix expression & evaluate the resultant expression.
8. Program to Implement Queue using:
   - i) Array
   - ii) linked list
9. Program to create a Binary search tree & Perform following primitive operation on it:
   - i) Search
   - ii) Delete

iii) Traversals (inorder, pre-order, post-order -recursive)

iv) Non-recursive in order traversal

10. Program to create a graph using adjacency list & traverse it using BFS & DPS methods

Assignments

1. State various types of data types and create a database of students in a class using structures.
2. Write a C code to create a digital clock, rainbow etc.
3. Case study on any real time application.

   Example

   i. Whatsapp, Hike, Wechat, Line social communication software

   ii. Cars lined up at a car wash.

   iii. Customers at a grocery store check out.

   iv. Airplane taking off and landing on a runway, etc
4. Comparison between various types of programming languages.
5. Write a c program to construct tower of Hanoi.
6. Write a c program to sort structures on the basis of structure elements.

Content Delivery Methods

Chalk & talk, Power point presentation

Assessment Methods

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books

1. "Data structure using C" ISRD group,TMH.
2. "Data Structure through C" ,Yashwant kanetkar,BPB Puplication.

Reference Books

1. “Data structure using C” AM Tanenbaum, Y Langsam and MJ Augustein, Prentice Hall India.
2. “Data structure and Algorithm Analysis in C” Weiss, Mark Allen Addison Wesley.
3. “Data structure – A Pseudocode Approach with C”, Richard F Gilberg Behrouz A. Forouzan, Thomson
4. “Let us C” ,Yashwant Kanetkar,BPB Publication.

SUBJECT: PROFESSIONAL SKILLS DEVELOPMENT

TEACHING SCHEME	:	**Theory : 4 Hours / Week**
EXAMINATION SCHEME	:	**End Semester Examination: 100 Marks**
CREDITS ALLOTED	:	**4**

Course Pre-requisites

The Students should have knowledge of

1. Basic concepts of Maths, Logical reasoning and English Grammar taught in the last semester.
2. An overall idea about the difference in personal and professional communication in terms of vocabulary used.
3. Knowledge of writing skills, importance of professionalism in emails and letters.
4. They should be aware of concepts of self esteem, self-assessment and its importance in setting long term and short term goals.
5. Awareness of the interpersonal skills like team work and introduction to Leadership taught during the last semester.
6. Body language and importance of non verbal communication to maintain professionalism.

Course Objectives

The Professional Skills Development 4 is an extension of PSD- 3 with focus on the remaining topics of Maths and Logical reasoning. The further complex concepts of Aptitude and Grammat aims to acquaint them with the level of complexity presented in recruitment tests and also provide them techniques to solve such question with tricks/methods in a very short period. The English communication and soft skills section of PSD-4 focuses on the higher aspects of soft skills such as grooming them on corporate etiquettes and various formats of email/ letter writing so that can present themselves as professionals further both in oral and written communication.

Course Outcomes

The student should be able to

1. Learn further concepts of Maths, Logical reasoning and English grammar and apply short cuts/ tricks to solve questions in less time. Learn remaining 25-30 rules of grammar relevant from the recruitment point of view.
2. Use appropriate words in the right context both academically and professionally. Students would have approximately around 80-100 words from the academic word list prescribed in the syllabus.
3. Understand the importance of email etiquettes and distinguish between the format of formal and informal emails/letters. They would be able to draft professional mails and letters like job application letters, cover letters, and apology emails with proper structure and words which are necessary in the corporate life.
4. Apply various strategies of conflict resolution through amicable way to settle team conflicts/disputes. They would learn to handle criticism and feedback in a positive way as an individual as well as a team.
5. Understand the major concepts of leadership like coaching, mentoring. They would learn effective time management strategies- Pareto principle (the 80-20 rule of time management) and apply them in the corporate life.
6. Understand the importance of grooming, body language and etiquettes in the corporate sector. They would be able to conduct themselves in a professional and impressive way by conducting themselves according to situations in the professional sector. They would also learn various strategies and conversational techniques to handle telephonic interviews confidently.

Unit I (18 Hours)

Aptitude (Maths, Logical Reasoning, English)

- **Maths**
  i) Simple Interest and Compound Interest
  ii) Ratio, Proportion and Average

iii) Mixture and Allegation

- **Logical Reasoning**
  i) Data Interpretation
  ii) Data Sufficiency
- **English**
  i) Grammar I
  ii) Vocabulary - Analogies

<u>Unit II</u> (4 Hours)

Essential Grammar - IV

- Vocabulary – Academic word List

<u>Unit III</u> (6 Hours)

Written Communication- III

- Email writing and etiquettes – formal and informal email writing, format of various types of email, do's and don'ts of email writing
- Letter writing – formal letters, job application letter, cover letter.
- Essay writing – mnemonics top develop ideas and write essays, structure of essays

<u>Unit IV</u> (4 Hours)

Self Awareness and Conflict Resolution

- Self-assessment & Perception & attitudes.
- Analyzing skills & weaknesses and habits.
- Developing positive attitude & handling criticism positively
- Handling conflicts in the personal and corporate sector
- Causes of conflicts in work scenario.
- Ways and methods for conflict resolution

Unit V (6 Hours)

Interpersonal Skills - III

- Mentoring, Difference between Leadership and Management
- Leading with examples
- Time management -The Time Management Matrix, Pareto Principle

Unit VI (4 Hours)

Corporate Etiquettes and Grooming

- Introduction to grooming & etiquettes
- Ways of handling telephonic interviews

Text Books

1. APAART: Verbal Ability
2. APAART: Logical Reasoning
3. APAART: Quantitative Aptitude
4. APAART: Speak Well 1 (English Language and Communication)
5. APAART: Speak Well 2 (Soft Skills)

RULES REGARDING ATKT, CONTINUOUS ASSESSMENT AND AWARD OF CLASS

Standars of Passing and ATKT Rules

1. For all courses, both UE (Universtiy Evaluation) and IA (Internal Assessment) constitue separate heads - of - passing (HoP). In ordar to pass in such courses and to 'earn' the assigned credits.
   a) The learner must obtain a minimum grade point of 5.0 (40 % Marks) at UE and also a minimum grade point of 5.0 (40 % Marks) at IA.

OR

   b) If he/she fails in IA, the learner passes in the course provided he/she obtains a minimum of 25% in IA and GPA for course is atleast 6.0 (50 % Aggregate). The GPA for a course will be calculated only if the learner passes at the UE.
2. A student who fail at UE in a course has to reappear only at UE as a backlog candidate and clear the HoP. Similarly, A student who fails in a course at IA has to reappear only at IA as backlog candidate and clear the HoP.

Rules of ATKT

1. A student is allowed to carry backlog of courses prescribed for B.Tech Sem - I, III, V, VII to B.Tech Sem - II, IV, VI, VIII respectively.
2. A student is allowed to keep term of Sem - III, if he/she is failing in any number of subjects of Sem I & II.
3. A student is allowed to keep term of Sem - V, if he/she is failing in any number of subjects of Sem - III & IV but passed in all subjects of Sem - I & II.
4. A student is allowed to keep term of Sem - VII, if he/she is failing in any number of subjects of Sem - V & VI but passed in all subjects of Sem - III & IV.

Award of Class for the Degree Considering CGPA

Award of Honours

A student who has completed the minimum credits specified for the programme shall be decleared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The Criteria for the Award of Honours at the End of the Programme are as given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
9.50 ≤ CGPA ≤ 10.00	0	Outstanding	80 ≤ Marks ≤ 100
9.00 ≤ CGPA ≤ 9.49	A+	Excellent	70 ≤ Marks ≤ 80
8.00 ≤ CGPA ≤ 8.99	A	Very Good	60 ≤ Marks ≤ 70
7.00 ≤ CGPA ≤ 7.99	B+	Good	55 ≤ Marks ≤ 60
6.00 ≤ CGPA ≤ 6.99	B	Average	50 ≤ Marks ≤ 55
5.00 ≤ CGPA ≤ 5.99	C	Satisfactory	40 ≤ Marks ≤ 50
CGPA Below 5.00	F	Fail	Marks Below 40

College Information

Bharati Vidyapeth University college of Engineering, Pune continued to take new strides towards evolving directions to further the growth and dissemination of scientific and technological knowledge.

The college established in 1983, is one of the oldest and largest Engineering Colleges in the state of Maharashtra. The college has well defined goals which are intensely practised and followed.

Their implementation encompass multi-faceted activities in the form of recruiting experienced faculty, organizing faculty development program, identifying socio- economically relevant areas emerging technologies. Constant review and upgradation of curricula, Upgradation of Laboratories, Library and communication facilities, Collaboration with industries and research and development organizations, Sharing of knowledge, infrastructure and resources, training extension, testing and consultancy services and promoting interdisciplinary research.

The college has been ranked as 'A' grade Engineering college by the Government of Maharashtra. Meeting quality standards in education such as is been a motto of this institute. As a pedagogical effect, out of ten under graduate programmes being conducted, seven programmes eligible for accreditation are accredited by National Board of Accreditation (NBA).

The DATAQUEST – CMR conducts and annual survey of technical schools of India and publishes the list of best 100 technical schools in India. In the surveys, for the past seven years, the college has been consistently ranked among top 50 technical schools.

Another feather in Institute's cap is its selection for the grant of Rs. 4.0 Crore under Technical Education Quality Improvement Programme – II (TEQIP-II) by Ministry of Human Resource Development (MHRD) of Government of India supported by World Bank.

This Institute has been ranked to 45th position at all India level and 5th at the Western Region of AICTE in 2012. The Institute has been very sensitive to the human resource development and continues initiating new academic programmes. Presently it offers 09 undergraduate programmes in the field of Civil Engineering, Chemical Engineering, Computer Engineering, Information Technology, Electrical Engineering, Electronics Engineering, Electronics and Telecommunication Engineering, Mechanical Engineering and Production Engineering.

The college offers 08 postgraduate programmes in the field of Civil Engineering, Chemical Engineering, Computer Engineering, Information Technology, Electrical Engineering, Electronics Engineering, Mechanical Engineering and NanoTechnology.

B.TECH (ELECTRONICS) SEM – V

Sr. No.	Name of the Course	Teaching Scheme (Hrs/week)			Examination Scheme (Marks)						Total Marks	Credits		
		L	P	T	End Semester Exam	Continuous Assessment			TW & PR	TW & OR		Theory	TW	Total Credits
						Unit Test	Attendance	Assignments						
27	Microprocessors and Microcontrollers	4	2	0	60	20	10	10	50	-	150	4	1	5
28	Electronic Instruments & Measurement System	3	2	0	60	20	10	10	-	50	150	3	1	4
29	Digital Communication	3	2	0	60	20	10	10	-	50	150	3	1	4
30	Power Devices & Machines	3	2	0	60	20	10	10	-	50	150	3	1	4
31	Electromagnetic Engineering	3	0	1	60	20	10	10	-	-	100	4	-	4
32	Professional Skill Development-V	4	0	0	100	0	-	-	-	-	100	4	-	4
	Total	**20**	**08**	**01**	**400**	**100**	**50**	**50**	**50**	**150**	**800**	**21**	**4**	**25**

Optional Subject

Sr. No.	Name of Course	Teaching Scheme			Examination Scheme							Credits		
		L	P	T	ESE	Continuous Assessment			Practical		Total	Theory	TW	Total
						Unit Test	Attendance	Assignment	TW PR	TW OR				
	Engineering Mathematics IV	4	--	--	60	20	10	10	--	--	100	4	--	4

B.TECH (ELECTRONICS) SEM – VI

Sr. No.	Name of the Course	Teaching Scheme (Hrs/week)			Examination Scheme (Marks)						Total Marks	Credits		
					End Semester Exam	Continuous Assessment			TW & PR	TW & OR				
		L	P	T		Unit test	Attend ance	Assign ments				Theor y	TW	Total Credit s
33	Digital Signal Processing	4	2	0	60	20	10	10	-	50	150	4	1	5
34	Embedded Systems	3	2	0	60	20	10	10	-	50	150	3	1	4
35	VLSI Design	3	2	0	60	20	10	10	50	-	150	3	1	4
36	Project Management & Finance	3	0	0	60	20	10	10	-	-	100	3	-	3
37	Electronic Circuit Design	4	2	0	60	20	10	10	-	50	150	4	1	5
38	Professional Skill Development-VI	4	0	0	100	0	-	-	-	-	100	4	-	4
	Total	**21**	**8**	**0**	**400**	**100**	**50**	**50**	**50**	**150**	**800**	**21**	**4**	**25**

Total Credits Sem – V : 25
Total Credits Sem – VI : 25
Grand total : 50

SUBJECT: - MICROPROCESSORS & MICROCONTROLLERS

Teaching Scheme	Examination Scheme	
Lecture: 4 hours/week	End semester exam	: 60 Marks
Practical: 2 Hours/week	Continuous Assessment	: 40 Marks
	TW & PR	: 50 Marks
	Credits	: 05

Course Prerequisites

Students should have basic knowledge of

Hexadecimal Number System

Concept of Encoder Decoder & Multiplexer Demultiplexer

Course Objectives

1. To understand the architecture, instruction sets and various techniques to interface them with different real world I/O devices to accomplish certain tasks.
2. To study the architecture of microcontrollers like 8051 and PIC and the instruction set and programming concepts.
3. To know the techniques of interfacing them to the real world peripheral devices.
4. To impart practical knowledge of 8051, and PIC Microcontroller.

Course Outcomes

On successful completion of this course, students will be able to

1. Identify the different block of microprocessor and microcontroller
2. Study the architecture and instruction set of 8051 and PIC microcontrollers.
3. Use the knowledge of instruction set to perform practical for 8051 and PIC Microcontrollers.
4. Interface peripheral devices with 8051 microcontroller for different applications.

Contents

Unit I (08 Hours)

Introduction to Microprocessors

Evolution of Microprocessors, comparison of Microprocessor & Micro controller. Difference between RISC & CISC microcontrollers, Harvard & Von Neumann Architectures Internal architecture of 8 bit Microprocessor 8085, concept of fetch –decode and execute, Stack and Subroutines, concept of Memory mapped I/O, I/O mapped I/O

Unit-II (08 Hours)

8051 Micro Controllers

Architecture, Pin configuration, 8051 timers, counter and related SFR's, Internal RAM structure, 8051 addressing modes. 8051 Interrupts Interrupt Priority in the 8051 concept of RESET. Introduction to 8051 assembly language programming: JUMP, LOOP and CALL instructions, Arithmetic instructions, Logic and Compare instructions, and I/O PORT Single bit instruction programming, single bit operations with CY.

Unit-III (08 Hours)

8051 Serial Communication & Interfacing of 8051

Serial Communication of 8051: Basics, SBUF register, SCON and PCON registers, Modes of operation Simple program of serial communication.

Interfacing of 8051 with devices: LED, LCD, keyboard, LM35 temperature sensor & A/D converter

Unit-IV (08 Hours)

Communication Protocols

Use of communication protocols, need of communication interface in embedded system

Serial communication protocols: I2C, CAN, USB, UART, Serial peripheral interface(SPI),synchronous serial protocol(SSP).

Parallel communication protocol: PCI,PCI-X

RS232C, RS485/422.

Unit -V (08 Hours)

PIC18F Family

PIC18F programming model, instruction set Data copy, arithmetic, branch, logical, bit manipulation and multiply-divide operations, Stacks, subroutines and macros, Role of Assembler.

Unit-VI (08 Hours)

Interrupts, Timers & Serial I/0 in PIC18F

Concepts of Interrupts and Timers, Interrupts and their implementation in PIC18, The PIC18 timers, Use of Interrupts in applications. Concept of serial I/O, SPI protocol

List of Experiments

Any 8 experiments should be conducted

1. Study of 8051µc using Keil software:
   (a) Block transfer without memory overlapping
   (b) Block transfer without memory overlapping
2. (a) To convert BCD no. to Hex no.
   (b) To convert Hex no. to BCD no.
3. To perform:
   (a) BCD up Counter
   (b) BCD down Counter
4. To generate a square wave of 5ms delay
5. To interface stepper motor with 8051µc
6. To interface LED with 8051µc
7. To interface Keyboard with 8051µc
8. To interface ADC/DAC with 8051µc
9. To perform 8/16-bit addition & subtraction using PIC microcontroller.
10. Serial communication by PIC microcontroller

List of Assignments

1. Explain a Boolean processor of microcontroller 8051with two examples
2. Mention a real time application of microcontroller 8051.
3. Mention a real time application of PIC microcontroller.
4. Design a microcontroller (8051) based interfacing system with memory.
5. What is memory address decoding? Explain the different types of decoding.
6. An overview on PIC families.

Content Delivery Methods

Chalk & talk, Power point presentation

Assessment Methods

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books

1. Muhammad Ali Mazidi, Janice Gillespie Mazidi, “The 8051 Microcontroller and Embedded System” Pearson Education.
2. Muhammad Ali Mazidi, Rolin D. McKinlay, Danny Causey,” PIC Microcontroller and Embedded Systems” 3rd Edition ,Pearson Education
3. Ramesh Gaonkar “Fundamentals of Microcontrollers and Applications in Embedded Systems” (with the PIC18 Microcontroller Family) 2007 Edition,Penram international

Reference Books

1. John B Peatman “Designing with PIC Microcontrollers” 2004 Pearson Education.
2. Ajay V. Deshmukh, “Micro-controllers - Theory and Applications”, Tata McGraw Hill.
3. Kenneth J. Ayala, “The 8051 Micro-controller – Architecture, Programming & Applications”, Second Edition Penram International & Thomson Asia,

SUBJECT: - ELECTRONIC INSTRUMENTS AND MEASUREMENT SYSTEM

Teaching Scheme
Lecture: 3hours/week
Practical: 2 Hours/week

Examination Scheme

End semester exam	**: 60 Marks**
Continuous Assessment	**: 40 Marks**
TW & OR	**: 50 Marks**
Credits	**: 04**

Course Prerequisites

1. Knowledge of process instrumentation.
2. Knowledge of Integrated circuits.

Course Objectives

1. To help the students to have knowledge of the basic of instrumentation.
2. To study the principles of working of various signal generators and wave analyzers
3. To study the principle of working of CRO is specifications, applications in detail and study the working of various advanced CRO's and their applications.

Course Outcomes

On successful completion of this course, students will be able to:

1. Describe specifications, features and capabilities of electronic instruments
2. Use the electronic instruments like signal generators, wave analyzers, and various oscilloscopes by knowing their specifications for electronic measurements.
3. Make the required measurement using various instruments

Contents

Unit-I (06 Hours)

Fundamentals of Instrumentation & Measurement

Necessity of Electronic Measurements, Block diagram of electronic measuring system, Concepts of Accuracy, Precision, Linearity, Sensitivity, Resolution, Hysteresis, Calibration etc. Measurement Errors, Voltage, Current, Resistance measurement using DMM- 4 ½ & 6 ½, Auto zeroing, Auto ranging.

Unit-II (06 Hours)

Measuring Instruments

Voltage, current and impedance measurement, VTVM, TVM, DVMs, AC voltmeters true RMS meters, vector voltmeter, vector impedance meter, direct current probes, alternating current probes, LCR-Q meter.

Unit-III (06 Hours)

Signal Generators & counters

standard signal generators, swept frequency generator, random noise generator, Audio frequency signal generation, RF generator, Pulse generator (block diagram), Function generator Time, Frequency, Ratio, Time interval, Period & Multiple Period averaging using digital universal frequency counter.

Unit-IV (06 Hours)

Oscilloscopes

Overview of analog CRO, dual/ Multi-trace CRO, Various CRO probes &its applications. Digital Storage Oscilloscope - Sampling speed & Memory depth of DSO, Design considerations, Attachments to DSO for enhancing the functionality, Measurements such as FFT, Math Functions, Curve Tracer, and Power scope.

Unit-V (06 Hours)

Communication Measurements

Communication measurements, Measurements on transmitter and receiver: sensitivity, selectivity, phase jitter, S/N ratio, co-channel interference, SINAD test etc. Network analyzer- system elements, measurement accuracy, scalar network analyzer, vector network analyzer, S-parameter measurement using network analyzer, EMI/EMC standards.

Unit-VI (06 Hours)

Signal Analyzers & computer aided measurements

Harmonic and Wave analyzer, Distortion factor meter, Spectrum analyzer - FFT analyzer, tracking generator, Logic analyzer, logic timing analyzer, logic state analyzer, FFT analyzer, Mixed signal oscilloscope, IEEE 488, VXI based instruments, Introduction of Lab view software.

Content Delivery Methods

Chalk & talk, Power point presentation

Assessment Methods

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

List of Experiments

1. Peak, average and r.m.s. measurement using rectifier circuit.
2. Measurement using spectrum analyzer and tracking generator. Observing spectrum of AM and FM waveforms for different modulation indices
3. Measurements on DSO:
   i) FFT analysis of LF signal
   ii) Capturing transients
   iii) Storing and retrieving number of different signals
   iv) Study of various operations like add, subtract, integrate, differentiate.
4. Measurement and timing analysis of digital signals using Logic Analyzer.
5. Measurement of Total harmonic distortion using distortion factor meter.

6. Measurements on L-C-R Q meter.
7. Measurements with Universal counter (Frequency, Period, frequency ratio, Period Averaging and Time interval).
8. Study of characteristics of Diode, Transistors using Curve Tracer.

List of Assignments

1. Calibration of DVM for any one range: e.g. 200V dc, 200Vac, 200mA dc, using standard calibrator or standard 6½ DMM.
2. Presentation on LCR-Q meter.
3. Describe any one real time applications of random noise generator.
4. Mathematical operations using Lab view software.
5. Seminar on network analyzer.
6. Describe any one real time applications of power scope.

Text Books

1. Oliver-Cage, “Electronic Measurements and Instrumentation”, TATA McGraw Hill, 1975.
2. M.M.S. Anand, “Electronics Instruments and Instrumentation Technology”, Prentice Hall India, New Delhi, 2009.
3. Albert D. Helfrick and William D. Cooper,”Modern Electronic Instrumentation and Measurement Techniques”, Prentice Hall of India, 2010.

Reference Books

1. Coombs, Clyde F. Jr., “Electronic Instrument Handbook”, McGraw Hill, 2000.
2. J.J. Carr, “Elements of Electronic Instrumentation and Measurement”, Pearson Education India, New Delhi, 2011.
3. A. J. Bouwens, “Digital Instrumentation”, TATA McGraw Hill, 1997.
4. H.S. Kalsi, “Electronic Instrumentation”, Tata McGraw Hill, New Delhi, 2010

B.TECH (ELECTRONICS) SEM – V

SUBJECT :- DIGITAL COMMUNICATION

Teaching Scheme	Examination Scheme	
Lecture: 3hours/week	End semester exam	: 60 Marks
Practical: 2 Hours/week	Continuous Assessment	: 40 Marks
	TW & OR	: 50 Marks
	Credits	: 04

Course Prerequisites

1. Understanding of continuous and discrete linear systems.
2. Knowledge of probabilities and random variables.
3. Understanding of Fourier Transform.

Course Objectives

1. To understand the building blocks of digital communication system.
2. To prepare mathematical background for communication signal analysis.
3. To understand the basics of baseband and pass band digital communication systems.
4. To analyze error performance of a digital communication systems.
5. To acquire the knowledge of spread spectrum communication systems.

Course Outcomes

At the end of the course, a student will be able to

1. Solve and analyze problems related to Probability theory & random processes.
2. Identify and describe different modulation & detection techniques in digital communication & compare their performance.
3. Characterize error-control coding techniques
4. Analyze Performance of spread spectrum communication systems.

Contents

Unit –I (06 Hours)

Overview of Probability Theory and Random Variables

Sample space, events, Conditional probability, Joint probability, Baye's rule, random variables. Continuous and discrete random variables, ,Cumulative distribution Function, probability distribution function, Statistical averages, Random Processes, Time average, Ergodicity.

Unit -II (06 Hours)

Digital transmission of analog signals

Introduction to Digital Communication System, Sampling Process, Quantization–Uniform, Non-Uniform , Companding, A-Law, μ Law, Pulse code modulation Delta Modulation, Adaptive Delta Modulation, Delta Sigma Modulation, Differential Pulse Code Modulation.

Unit –III (06 Hours)

Baseband Transmission and Reception

Line codes: Unipolar, Bipolar, NRZ, RZ, RZ-AMI, Manchester, Properties & their spectra, M-ary Signaling, ISI, scrambler, Unscramble. Optimum Receivers-Matched Filters, Correlation receivers.

Unit-IV (06 Hours)

Bandpass Modulation Techniques

ASK, PSK, FSK, Binary Phase shift keying, Differential Phase shift keying, Differential encoded PSK, Quadrature PSK, M-ary PSK, Quadrature Amplitude shift keying (QASK), Binary frequency shift keying, Minimum shift keying (MSK) , signal space representation, Performance evaluation of modulation techniques in terms of probability of error (No derivations)

Unit-V (06 Hours)

Error Control Coding

Types of Errors & codes, Linear block codes, error detection & correction, Hamming codes. Cyclic codes: Encoding and syndrome decoding. Convolutional codes, Introduction to turbo codes.

Unit-VI (06 Hours)

Spread Spectrum Techniques

Introduction, Generation of PN Sequences and its properties, Direct Sequence Spread Spectrum Signals, Frequency Hopped Spread Spectrum Signals, Introduction to Multiple Access Techniques: CDMA, TDMA, FDMA.

List of Experiments

Minimum 8 experiments should be conducted.

1. To verify the sampling theorem.
2. To study Pulse Code Modulation System (PCM) System.
3. To analyze a Delta modulation system and interpret the modulated and demodulated waveforms.
4. To perform ASK (Amplitude Shift Keying) System.
5. To study PSK (Phase Shift Keying) System.
6. To study FSK (Frequency Shift Keying) System.
7. To study of Quadrature Phase Shift Keying (QPSK).
8. To study of Spread Spectrum techniques.
9. To simulate any digital modulation scheme using MATLAB.
10. To perform different Data Formats
11. To study of Hamming codes.

List of Assignments

Any six assignments can be completed

1. Study of sampling theorem using Virtual Labs
2. Study of ASK/FSK/PSK system using Virtual Labs.
3. Study of hamming code.
4. Experiments on random signals using MATLAB
5. Simulation of communication system using MATLAB.
6. Study of Eye Diagram using oscilloscope
7. Presentation on any communications topic relevant to the course.
8. Industrial Visit

Content Delivery Methods

The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.

Assessment Methods

1. Unit Test
2. Assignments
3. Continuous Assessment
4. End term Examination

Text books

1. Sklar, Bernard, "Digital Communications, Fundamentals & Applications," Second Edition, Prentice-Hall Inc.,2001.
2. Leon W. Couch, “Digital and Analog Communication Systems”, Sixth Edition, Pearson Education, 2001.
3. Lathi B P, and Ding Z “Modern Digital and Analog Communication Systems,” Fourth Edition ,Oxford University Press.

Reference Books

1. Haykin Simon, “Digital Communication Systems,” Forth Edition,John Wiley and Sons, New Delhi.
2. Taub, D. Schlling, and G. Saha, “Principles of Communication Systems,” Third Edition, Tata McGraw Hill.
3. John G. Proakis , “Digital Communication” ,Fifth Edition, Pearson Education.

SUBJECT: - POWER DEVICES & MACHINES

Teaching Scheme	**Examination Scheme**
Lecture: 3hours/week	**End semester exam : 60 Marks**
Practical: 2 Hours/week	**Continuous Assessment : 40 Marks**
	TW & OR : 50 Marks
	Credits : 04

<u>Course Prerequisites</u>

1. Knowledge of the principals and applications of electronic devices including semiconductor diodes, bipolar-junction and field-effect transistors.
2. Understanding of transformers and magnetically coupled circuits

<u>Course Objectives</u>

1. To understand and acquire knowledge about various power semiconductor devices.
2. To understand the operation, characteristics and performance parameters of controlled rectifiers.

<u>Course Outcomes</u>

On successful completion of this course, students will be able to

1. Compare various power devices with their driver circuits & protection circuits
2. Comprehend the principle operation and models of different types of power electronic converters AC-DC, DC-AC and DC-DC converter systems.
3. Describe the basic principles of HVDC, UPS, motors, etc.

Contents

<u>UNIT I</u> (06 Hours)

Power devices

Power Diodes: Construction, Switching characteristics; Power BJT, PBJT: Construction, Operation, switching characteristics, Power MOSFET:

PMOSFET, Construction, Operation, Static characteristics, switching characteristics, safe Operating Area, IGBT: Construction, Operation, Switching characteristics, Safe operating area.

Thyristor

Construction, Operation, transistor analogy, static characteristics, switching characteristics, thyristor turn-on, thyristor turn-off. DIAC / TRIAC – construction and operating Principle, Applications. GTO: Construction, Operation, Turn off mechanism, Applications, driver, protection and snubber circuits for power devices

UNIT II (07 Hours)

Single phase AC-DC converters

Concept of line commutation, Single phase half controlled and fully controlled converters- Circuit diagram, operation and waveforms for resistive and highly inductive loads, Analysis of output voltage and supply current including following performance parameters: average and RMS output voltage, Fourier series expressions for supply current, power factor improvement, performance factors of line commuted converters, effect of source impedance.

UNIT III (05 Hours)

Three phase AC-DC converters

Three phase half controlled and fully controlled converters- Circuit diagram, operation and waveforms for resistive and highly inductive loads, Analysis of output voltage and supply current including following performance parameters: average and RMS output voltage.

UNIT IV (06 Hours)

Inverters

Single & Three-phase Inverters

Circuit diagram, operation & waveforms for single phase full bridge &Push pull inverters. Switching techniques for obtaining square, quasi-square & sinusoidal PWM o/p waveforms. Use of Pulse width modulated IC's for

Inverter control. Fourier analysis of quasi-square waveform & harmonic load currents for R& RL loads. Circuit diagram, operation & waveforms for three phase voltage source bridge inverters for 120 degree & 180 degree conduction for balanced star resistive load.

UNIT V (06 Hours)

Switched & resonant DC/DC converters

Control of DC/ DC converters. Circuit diagram, Waveforms & operation (o/p voltage calculation) of step down chopper (Buck converter), Step up chopper (Boost converter) & 2-quadrant type C chopper. Circuit diagram, waveforms, operation & design of Fly back converter (SMPS)

Need for resonant converters

Circuit diagram, waveforms & operation of SLR half bridge DC/DC converter in low frequency (discontinuous conduction) mode.

UNIT VI (06 Hours)

Introduction to Motors and Power converter applications

Motors: DC motors, AC Motors, Special Purpose Motors, Induction Motor, Universal Motor, Stepper Motor, Servomotors etc. (Qualitative analysis only)

Applications: UPS, HVDC transmission, electronic ballast

Content Delivery Methods

Chalk & talk, Power point presentation.

Assessment Methods

1. Unit Test
2. Continuous Assessment
3. End term Examination

List of Experiments

1. Study of characteristics of SCR
2. Study of Triggering circuits
3. Study of characteristics of IGBT
4. Study of characteristics of TRIAC
5. Study of single phase half controlled converter
6. Study of single phase fully controlled converter
7. Study of three phase half controlled converter
8. Study of TRIAC based AC motor control
9. Study of three phase VSI inverter
10. Study of first quadrant chopper
11. Study of UPS
12. Study of light dimmer

List of Assignments

1. Real life applications of inverters.
2. Real life applications of PV cells.
3. Applications of single phase converter.
4. Different types of cyclo converters.
5. Describe AC Voltage regulators.
6. Real life applications of power devices.

Text Books

1. M. H. Rashid, "Power Electronics Circuits, Devices And Applications", PHI, 3rd Edition, 2004, New Delhi
2. M D Singh & K B Khanchandani, "Power Electronics", TMH, New Delhi
3. P. C. Sen, "Modern Power Electronics", S. Chand & Co., New Delhi

Reference Books

1. S. Tamil Asgar, "Power Electronics", PHI, 2004, New Delhi
2. N. Mohan, T. M. Undeland & W. P. Robbins, "Power Electronics, Converters Applications And Design", John Willey and sons, 3rd edition, Singapore
3. V. R. Moorthi, "Power Electronics, Devices, Circuits & Industrial Applications", Oxford University Press, New Delhi, 2005.

SUBJECT: - ELECTROMAGNETIC ENGINEERING

Teaching Scheme	**Examination Scheme**
Lecture: 3hours/week	**End semester exam : 60 Marks**
Tutorial: 1 Hour/week	**Continuous Assessment : 40 Marks**
	Credits : 04

Course Prerequisites

Fundamentals of integration, differentiations, partial diffraction.

Course Objectives

1. Provide fundamentals of Static Electromagnetic Fields.
2. Explain basics of the vector Differential, Integral operators to Electromagnetic theory & Electrostatic & Electromagnetic fields.
3. Define and derive different laws in Electrostatic & Electromagnetic fields.
4. Explain Maxwell's equations and concepts of transmission lines.
5. Analyze techniques for formulating and solving problems in Electrostatic & Electromagnetic fields.
6. Develop mathematical skills related with differential, integral and vector calculus.

Course Outcomes

On successful completion of this course, students will be able to

1. Comprehend the fundamentals of Electrostatic and Electromagnetic fields..
2. Apply Gauss' law, Ampere's Law, Biot-Savart law, Faraday's law and laws related with steady magnetic field while solving problems in Electrostatic and Electromagnetic fields.
3. Develop field equations from understanding of Maxwell's Equations.

4. Extend the knowledge of basic properties of transmission lines to analyze electromagnetic wave propagation in generic transmission line geometries.
5. Demonstrate mathematical skills related with differential, integral and vector calculus.

Contents

Unit I (5 Hours)

Co-ordinate Systems

Vector Algebra, product of vectors, Co-ordinate systems, Curl, Divergence & Gradient, Stoke's Theorem, Poisson's and Laplace Equations, Coulomb's law, line, Surface & Volume Charge distribution.

Unit II (7 Hours)

Electrostatic Fields

Electric Field Intensity, Electric Field due to infinite line and surface charges, Electric Flux Density, Gauss law (differential and integral form) and its applications, Divergence Theorem, Electric Potential and gradient, Work done, Energy Density, Electric Dipole and moment. Polarization in Dielectrics, Boundary conditions for Dielectric and Dielectric, boundary conditions for Conductor and Dielectric, boundary conditions for Conductor and free space. Method of Images for point and line charge, Capacitance – parallel, co-axial and spherical, Continuity equation.

Unit III (6 Hours)

Magnetostatic Fields

Biot - Savart law, Magnetic Field Intensity due to infinite and finite line. Ampere's Circuital Law in integral and differential form, Applications of Amperes Circuital law, Magnetic flux density, vector magnetic potential, Magnetic Torque, moment and dipole, nature of magnetic material, magnetization, Magnetic boundary conditions

Unit IV (7 Hours)

Time Varying Fields & Wave Propagation

Faradays law of induced emf, displacement current, Maxwell's Equations in point form & Integral form for various fields, Wave equations, wave propagation through different medium, skin depth, Poynting theorem, wave polarization, Reflection of plane wave from conducting medium, perfect dielectric.

Unit V (6 Hours)

Transmission Lines

Physical Description of Transmission line propagation, Transmission Line equations, Characteristic equation of infinite Transmission Line, Complex analysis of sinusoidal waves, Transmission lines equations & their solutions in phasor form, Uniform terminated Transmission Line, Input impedance, Phase velocity and group velocity, Short circuited and open circuited line, Reflection coefficient VSWR, smith chart (Numerical expected) and applications.

Unit VI (5 Hours)

Waveguides & Electromagnetic radiation

Plane wave analysis of parallel-plate waveguide, rectangular waveguides, TE and TM modes, wave impedance, wave velocities, attenuation in waveguide, EMI/EMC concepts, basic radiation principles, Hertzian dipole, magnetic dipole, thin wire antennas, antenna specifications, antenna arrays.

Content Delivery Methods

Chalk & talk, Power point presentation.

Assessment Methods

1. Unit Test
2. Continuous Assessment
3. End term Examination

List of Assignments

1. Analyze Coulombs law, Gauss Law, Divergence theorem with different problems on Scilab / MATLAB (Refer www.scilab.in-resources/completd book and Hayt & Buck, Engineering Electromagnetics, 7th Edition Tata McGraw-Hill).
2. Analyze Maxwell's equations for different fields on Scilab / MATLAB
3. Experimental study on antenna trainer kit & study different antenna specifications.
4. Analyze experimentally waveguides on Microwave test bench.
5. Analyze uniform plane wave for different media on Scilab / MATLAB
6. Analytical problems on transmission lines.

List of Tutorials

The main objective of this tutorial is to focus on the outcomes defined in the theory syllabus by solving the following problems based on paper work.

1. Find the Electric field intensity and electric flux density at a given point due to following charge distributions. (In all coordinate systems)
   - Point charges
   - Line charges (finite and infinite)
   - Surface charges (finite and infinite)
   - Mixed charges (Point charge, Line charge, Surface charge)
2. Application of Gauss's law Given ρv (volume charge density) in a particular region, find $\bar{D}$ (electric flux density) using Law at the given location.

   Given ρS (surface charge density), find $\bar{D}$ (electric flux density) using Gauss's Law at the given location.

   Given $\bar{D}$ (electric flux density), find total charge enclosed by the surface (Q), ρv (volume charge density) using Gauss's Law.(In all coordinate systems).
3. Find the electrostatic fields (Tangential and Normal) at the boundary between, Free space and dielectric medium

- Free space and conductor
- Dielectric medium and conductor
- Two dielectric media.
- Two dielectric media when boundary is defined by a equation of plane.

4. Find $\bar{H}$ (Magnetic field intensity) and $\bar{B}$ (Magnetic flux density) at a given point due to,
   - Infinitely long current carrying conductor
   - Finite current carrying conductor
   - Infinite conducting surface
   - Finite conducting surface
   - Different current carrying configurations (i.e. thin conductor, surface all together)
5. For the following current carrying configurations, find the $\bar{H}$ (Magnetic field intensity) in a given region (or point) using Ampere's circuital law.
   - Infinitely long current carrying conductor
   - Infinite cylindrical surfaces of different radii all centered at the same axis.
   - Spherical surfaces of different radii all centered at a given point.
6. Given the (Magnetic field intensity) of a particular region, find current (I), current density (J), enclosed by the given surface. (In all coordinate systems).
7. Given $\bar{H}$ (or $\bar{E}$) and the region properties (like ε, μ, σ etc.), find $\bar{B}$, $\bar{D}$ and $\bar{E}$ (or $\bar{H}$) using Maxwell's equations. (In all coordinate systems).
8. Given the primary constants (R, L, G, C) along with the generator specifications and termination, find secondary constants (α, β, γ, Z0) and other parameters like Velocity, wavelength, received voltage, received power, reflection coefficient etc.
9. Problems on Transmission Line Analysis.
10. Problems on Impedance matching and design of stub matching using Smith Chart.

Text Books

1. A. Murthi," Electromagnetic fields", S. Chand.
2. Edminister J.A, "Electromagnetics", Tata McGraw-Hill.

Reference Books

1. Hayt & Buck, "Engineering Electromagnetics", 7th Edition, Tata McGraw-Hill.
3. Kraus,Fleisch, "Electromagnetics with applications", 5th Edition, McGraw Hill.
4. A. Das & S. K. Das, "Microwave Engineering", 2nd edition, McGraw Hill.
6. Jordan & Balmain, "Electromagnetic waves & radiating systems", 2nd edition, PHI.

B.TECH (ELECTRONICS) SEM – VI

SUBJECT: - DIGITAL SIGNAL PROCESSING

Teaching Scheme	Examination Scheme	
Lecture: 4hours/week	End semester exam	: 60 Marks
Practical: 2 Hours/week	Continuous Assessment	: 40 Marks
	TW& OR	: 50 Marks
	Credits	: 05

Course Prerequisites

1. Knowledge of mathematics
2. Knowledge of signals and systems

Course Objectives

1. To introduce the concept of discrete Fourier transform.
2. To learn the algorithm of fast computation.
3. To design the finite impulse response filter & infinite impulse response filter.
4. To learn the finite word length effect of filter.
5. To understand the architecture & programming of DSP processor.

Course Outcomes

On successful completion of this course, students will be able to

1. Compute the Discrete Fourier transform & Fast Fourier transform.
2. Design FIR and IIR filters.
3. Understand the finite word length effect in digital filters.
4. Implement the various applications on DSP processor.

Contents

Unit –I (07 Hours)

Discrete Fourier Transform

Definition, periodicity concept, relationship with Z transform and Fourier series, properties, circular convolution, applications like linear filtering, overlap save, overlap add method, frequency analysis etc.

Unit-II (09 Hours)

Fast Fourier Transform Algorithm

Direct computation of D.F.T., its computational complexity, FFT algorithms, their classification, radix 2 FFT algorithms, DIT – FFT, DIF –FFT, Inverse radix 2 algorithms, FFT algorithms for composite value of N, Goertzel algorithm, Chirp Z transform algorithm, Quantization effects, applications.

Unit-III (08 Hours)

Design of FIR Filters

Realization of FIR filters,Symmetric and anti symmetric FIR filters, design of linear phase FIR filters using different windows, frequency sampling method, FIR differentiators, Hilbert transformers, and Optimum equiripple linear FIR filters.

Unit-IV (08 Hours)

Design of IIR Filters

Realization of IIR filters, Butterworth and Chebyshev approximations, frequency transformations, design of IIR filters from analog filters using Approximation of derivatives, impulse invariance, Bilinear transform, design of IIR filters from pole zero plots.

Unit-V (08 Hours)

Finite Word Length Effects in Digital Filters

Number representation, fixed point, sign-magnitude, one's complement, two's complement forms, floating point numbers , Quantization, truncation, rounding, effects due to truncation and rounding, Input quantization error, Product quantization error, co-efficient quantization error, zero-input limit cycle oscillations, overflow limit cycle oscillations, scaling, Quantization in Floating Point realization IIR digital filters, finite word length effects in FIR digital filters, quantization effects in the computation of the DFT- quantization errors in FFT algorithms.

Unit-VI (08 Hours)

Introduction to DSP Processors

Introduction to fixed point and floating point DSP processor, multiplier and multiplier accumulator (MAC), modified bus structures and memory access schemes in DSPs, multiple access memory, multiport memory, VLIW architecture, pipelining, special addressing modes, on-chip peripherals .

Features of TMS 320C67xx DSP processor, architecture of TMS 320c67xx DSP processor, architecture features: computational units, bus architecture memory, data addressing, address generation unit, program control, program sequencer, pipelining, interrupts, features of external interfacing, Speech Processing: Speech analysis, digital processing of audio signals.

Content Delivery Methods

Chalk & talk, Power point presentation.

Assessment Methods

1. Unit Test
2. Continuous Assessment
3. End term Examination

List of Experiments

Minimum 10 experiments should be conducted using MATLAB & at least one using hardware.

1. To find DTFS for periodic and DTFT for non periodic signal.
2. To find DFT IDFT of DT signal.
3. To find the response of DT system using convolution.
4. To find the stability of DT system using the concept of convolution.
5. To perform convolution using overlap and add method.
6 To perform circular convolution.
7. To plot pole zero plot of Z-domain using transfer function.
8. To solve the difference equation and find the system response using Z transform.

9. To find the impulse invariance IIR digital filter to realize the first order analog Butterworth filter.
10. To design IIR filter for first order analog Butterworth approximation using bilinear transformation.
11. To find and plot the frequency response for the rectangular and Hamming window.
12. To Design FIR filter using frequency sampling method.
13. To plot spectrogram of speech signal.
14. To implement convolution sum using DSP processor.
15. To implement Speech processing applications using DSP processors.

List of Assignments

Assignments should be conducted using SCILAB

1. Linear and circular convolution
2. DFT and IDFT
3. FFT & IFFT
4. Realization of filters
5. Design of FIR filter
6. Design of IIR filter

Text Books

1. Proakis J., Manolakis D., "Digital Signal Processing", Pearson Education

References Books

1. Babu R., "Digital Signal Processing", 4th Edition, Scitech Publications.
2. Salivahanan, Ganpriya and Vallavraj,"Digital signal Processing" Tata McGraw-Hill.
3. Ifeachor, Jervis "Digital Signal Processing ", Pearson Education.
4. Texas Instruments, DSP Manual.
5. B. Venkata Ramani and M. Bhaskar, "Digital Signal Processors, Architecture, Programming and Applications", Tata McGraw Hill.

B.TECH (ELECTRONICS) SEM – VI

SUBJECT: - EMBEDDED SYSTEMS

Teaching Scheme
Lecture: 3hours/week
Practical: 2 Hours/week

Examination Scheme

End semester exam	**: 60 Marks**
Continuous Assessment	**: 40 Marks**
TW& OR	**: 50 Marks**
Credits	**: 04**

Course Prerequisites

Fundamentals of Computer, Digital Logic Circuits, Computer Organization and Architecture.

Course Objectives

1. To understand need and application of ARM Microcontroller in embedded system.
2. To study the architecture of ARM series microcontroller
3. To understand architecture and features of typical ARM7& ARM CORTEX-M3 Microcontroller.
4. To learn interfacing of real world input and output devices

Course Outcomes

On successful completion of this course, students will be able to

1. Develop Firmware Embedded Systems.
2. Interface the advanced peripherals to microcontrollers.
3. Design embedded system with available resources.

Contents

Unit 1 (4 Hours)

Introduction to Embedded Systems

Definition of Embedded System, Embedded Systems Vs General Computing Systems, Classification, Characteristics of Embedded Systems, Hardware and Software components of an Embedded System, Introduction to IDEs. Major Application Areas.

Unit 2 (8 Hours)

Introduction to embedded programming & RTOS

Introduction to embedded data types in embedded C, addressing memory & I/O, I/O functions of embedded C. Examples on Embedded C.

RTOS:Architecture of kernel, Task and Task scheduler, Interrupt service routines, Semaphores, Mutex, Mailboxes, Message queues, Event registers, Pipes, Signals, Timers, Memory management, Priority inversion problem.

Unit 3: (8 Hours)

ARM7 Based Microcontroller

Introduction to ARM processors and its versions: ARM7, ARM9 & ARM11 features, ARM7 data flow model, programmer's model, modes of Operations, Overview of Instruction set.

ARM7 Based Microcontroller LPC2148:

Features, Architecture (Block Diagram and Its Description), System Control Block (PLL and VPB divider) , Memory Map, GPIO, Pin Connect Block, timer.

Unit 4: (6 Hours)

Interfacing with ARM7

Interfacing the peripherals with LPC2148: LED, LCD, GLCD, KEYPAD, GSM and GPS using UART, on-chip ADC using interrupt (VIC), EEPROM using I2C, SDCARD using SPI, on-chip DAC for waveform generation.

Unit 5 (6 Hours)

ARM CORTEX Processors

Introduction to ARM CORTEX series, improvement over classical series. CORTEX A, CORTEX M, CORTEX R processors series, versions, features and applications.

ARM-CM3 Based Microcontroller LPC1768:

Features, Architecture (Block Diagram & Its Description), System Control, Clock & Power Control, GPIO and Pin Connect Block.

Unit 6: (4 Hours)

Interfacing with ARM CORTEX M3

Interfacing peripherals with LPC1768: RGB LED, Seven Segment, TFT Display, Motor control using PWM.

Content Delivery Methods

Chalk & talk, Power point presentation

Assessment Methods

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

List of Experiments

Minimum 8 experiments should be conducted.

1. Interfacing LPC2148 with LCD/GLCD
2. UART Interfacing LPC2148 in embedded system (GSM/GPS)
3. Interfacing LPC2148 for internal ADC on interrupt basis
4. Interfacing SD card with LPC2148
5. Interfacing EEPROM with LPC2148 using SPI protocol
6. SRAM interfacing with LPC2148/LPC1768.
7. Interfacing LPC1768 to Seven Segment / RGB LED
8. Generation of PWM signal for motor control using LPC1768
9. Interfacing TFT display to LPC1768
10. Implementing CAN protocol using LPC1768
11. Implementing ETHERNET protocol using LPC1768.
12. Semaphore as signaling and synchronizing in ARM7.
13. Mailbox implementation for message passing in ARM7.

List of Assignments

1. Case study of any one of the latest ARM processors and Power point presentation of the same in class.
2. Survey of CORTEX M3 based controllers, its features and comparison.

3. Design of Firmware Embedded system using LPC 2148 (Simulation only).
4. Design of Firmware Embedded system using LLPC1768 (Simulation only).
5. Case study of any one of the RTOS with examples.

Text Books:

1. Rajkamal, "Embedded system-Architecture, Programming and Design", TMH Publications, Edition 2003.
2. Andrew Sloss, Dominic Symes, Chris Wright, "ARM System Developers Guide –Designing and Optimizing System Software", ELSEVIER.
3. Joseph Yiu, "The Definitive Guide to the ARM Cortex-M", Newness, ELSEVIER.

Reference Books

1. LPC 214x User manual (UM10139) :- www.nxp.
2. LPC 17xx User manual (UM10360) :- www.nxp.com
3. ARM architecture reference manual : - www.arm.com
4. Trevor Martin, "An Engineer's Introduction to the LPC2100 series", Hitex (UK) Ltd.

B.TECH (ELECTRONICS) SEM – VI

SUBJECT: - VLSI DESIGN

Teaching Scheme	Examination Scheme	
Lecture: 3hours/week	End semester exam	: 60 Marks
Practical: 2 Hours/week	Continuous Assessment	: 40 Marks
	TW& PR	: 50 Marks
	Credits	: 04

Course Prerequisites

1. Analog Electronics
2. Digital Electronics

Course Objectives

1. To introduce the VLSI Design Flow and design styles
2. To introduce the VHDL Hardware Description Language (HDL) that shall help in describing a circuit to the tools for simulation and further processing of the same towards implementation.
3. To introduce MOSFET physics and CMOS logic gates.

Course Outcomes

On successful completion of this course, students will be able to

1. Design and simulate digital system using structural, Behavioral, dataflow or mixed style of Modeling.
2. Apply concepts of Finite State Machine On sequential circuits.
3. Realize digital hardware system utilizing PLDs.
4. Identify MOSFET Physics and CMOS structures.
5. Implement CMOS combinational logic Design.

Contents

UNIT I (07 Hours)

HDL Modeling and Design Flow

Introduction to VLSI design flow (with reference to an EDA tool), sequential, data flow and structural modeling, functions, procedures, attributes, test benches, synthesizable and non synthesizable statements, packages and configurations, VHDL modeling.

UNIT II (05 Hours)

FSM and sequential logic Principles

Sequential circuits, Meta stability synchronization, design of finite state machines and state minimization, Modeling of FSM-Mealy and Moore machines, FSM case studies- traffic light control, lift control, UART.

UNIT III (05 Hours)

Programmable logic devices

CPLD: Introduction, study of architecture. FPGA: Introduction, study of architecture, PLAs, PALs, function implementation using PLDs.

UNIT IV (07 Hours)

MOS Device Physics

MOSFET structure, MOS I/V characteristics, body effect, Scaling of MOS circuits, MOSFET capacitances, MOS small signal model, MOS amplifiers.

UNIT V (06 Hours)

CMOS VLSI

CMOS parasites, equivalent circuit, CMOS inverter characteristics, power dissipation, power delay product, Layout design rules, introduction to CMOS layout, CMOS logic structures, concept of regularity, modularity and locality.

UNIT VI (06 Hours)

CMOS Logic Circuits

CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using CMOS gates , W/L calculations of CMOS, CMOS transmission gates, Designing with Transmission gates.

Content Delivery Methods

Chalk & talk, Power point presentation.

Assessment Methods

1. Unit Test
2. Continuous Assessment
3. End term Examination

List of Experiments

1. To model 8:1mux, 1:8 demux, 3:8line decoder, 8:3 encoder using VHDL
2. To model adder and subtractor
3. To model synchronous and asynchronous D FF
4. To model 4- bit universal shift register
5. To model 4-bit counter
6. To model bidirectional buffer
7. To model parity generator and checker
8. Study of RAM/FIFO
9. Study of Temperature sensing using ADC
10. Study of real time moving generator chip CMOS

List of Assignments

1. Simulate TLC
2. Simulate UART
3. Simulate LIFT controller
4. Design Barrel shifter.
5. Design a Mealy and Moore Sequence Detector
6. Real life applications of FPGA/CPLD

Text Books

1. Neil IL E. Weste and Kamran Eshraghain,"Principles of CMOS VLSI Deign", Pearson Education Publication.
2. Wayne Wolf, “Modern VLSI Design", Prentice Hall Publication.
3. J.Bhaskar”A VHDL primer” Pearson Education Publication.
4. Behzad Razavi,“Design of Analog CMOS Integrated Circuits”, Tata McGraw Hill

Reference Books

1. John Walkerly,"Digital Design Principles and Practices",Prentice Hall Publication
2. Douglas Perry,"VHDL", Pearson Education Publication.
3. Charles Roth, "Digital System Design using VHDL", Tata McCraw Hill.
4. Wayne Wolf," FPCA Based System Design", Prentice Hall
5. Ken Martin, “Digital Integrated Circuit Design”, Oxford University Press, 2011.
6. Sung-Mo Kang, Yusuf Leblebici, “CMOS Digital Integrated Circuits Analysis and Design”, TMH, 3rd Ed., 2011.
7. Parth Pratim Sahu, “VLSI Design”, McCraw Hill Education Pvt. Ltd.

SUBJECT: - PROJECT MANAGEMENT & FINANCE

Teaching Scheme	**Examination Scheme**
Lecture: 3hours/week	**End semester exam : 60 Marks**
	Continuous Assessment : 40 Marks
	Credits : 03

Course Prerequisite

Understanding the various forms of Math, Economics and Statistics.

Course Objectives

1. To understand basic principles/concepts of project management and finance.
2. To describe the most well-known theories and perspectives on project managements.

Course Outcomes

At the end of the course, a student will be able to

1. Describes the Characteristics, objectives and Stages of Project management.
2. Explain importance of time and work estimation in Project management.
3. Analyze Management Concepts for Developing Project Plan.
4. Analyze and Understand Financial & Project Management.
5. Demonstrate Scope, Objectives and Importance of Financial Management.
6. Identify and understand the main responsibilities and tasks of Securities and Exchange Board of India (SEBI) in money market and capital Market.

Unit -I (06 Hours)

Introduction to Project management

Characteristics of projects, Definition and objectives of Project Management, Stages of Project Management, Project Planning Process, Establishing Project organization.

Unit –II (06 Hours)

Work Definition

Defining work content, Time Estimation Method, Project Cost Estimation and budgeting, Project Documentation Introduction to CMM, Project Risk Management, Project scheduling and Planning Tools: Work Breakdown structure, LRC, Gantt charts, ,CPM/PERT Networks

Unit-III (06 Hours)

Management Concepts

Developing Project Plan (Baseline) , Project cash flow analysis, Project scheduling with resource constraints: Resource Levelling and Resource Allocation. Time Cost Trade off: Crashing Heuristic.

Unit-IV (06 Hours)

Project Implementation

Project Monitoring and Control with PERT/Cost, Computers applications in Project Management, Contract Management, Project Procurement Management.

Unit-V (06 Hours)

Financial Management

Introduction of Finance, Types of Finance, Financial Management, Scope & Objectives of Financial Management, function of finance manager, Importance of Financial Management, Sources of finance, Security Finance.

Unit-VI (06 Hours)

Working Capital Management

Capital Structure, Fixed & working capital, Role of Securities and Exchange Board of India (SEBI), function of money market and capital Market, sources of finance. Introduction to capital budgeting, Techniques of capital budgeting. Break even analysis - assumptions, importance, Cost-Benefit analysis, CVP graph.

List of Assignments

1. Explain the nature and purpose of financial management
2. Discuss the relationship between financial objectives, corporate objectives and corporate strategy.
3. Identify the nature and role of money and capital markets, both nationally and internationally.
4. Write in brief on Concepts & Importance of organization.
5. Critically evaluate various approaches to the financial management
6. Explain the functions of a stock market and a corporate bond market..

Content Delivery Methods

Chalk & talk, Power point presentation.

Assessment Methods

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books

1. Shtub, Bard and Globerson, "Project Management: Engineering, Technology, and Implementation", Prentice Hall, India
2. C. Paramasivan and T. Subramanian, "Financial Management", New age international publishers.
3. John M Nicholas, "Project Management for Business and Technology: Principles and Practice", Prentice Hall, India, 2002.
4. Cleland and King, "VNR Project Management Handbook".
5. Wiest and Levy, "Management guide to PERT/CPM", Prentice Hall. India.

Reference Books

1. Horald Kerzner, "Project Management: A Systemic Approach to Planning, Scheduling and Controlling", CBS Publishers, 2002.
2. S. Choudhury, " Project Scheduling and Monitoring in Practice".
3. P. K. Joy, "Total Project Management: The Indian Context", Macmillan India Ltd.

SUBJECT: - ELECTRONICS CIRCUIT DESIGN

Teaching Scheme	**Examination Scheme**	
Lecture: 4hours/week	**End semester exam**	**: 60 Marks**
Practical: 2 Hours/week	**Continuous Assessment**	**: 40 Marks**
	TW& OR	**: 50 Marks**
	Credits	**: 05**

Course Prerequisites

1. Knowledge of basic electronics components and its functions.
2. Knowledge of rectifiers, amplifiers, filters etc.
3. Knowledge of basic Data acquisition systems.

Course Objectives

1. To introduce the basic concepts needed for Circuit design.
2. To introduce the techniques such as signal amplification, filtering, audio power amplification etc
3. To emphasize the understanding and practical implementations of the electronics circuits.

Course Outcomes

At the end of the course, a student will be able to

1. Choose proper electronic component for designing circuits.
2. Design basic electronics circuits like rectifiers, filters, voltage regulators, amplifiers, etc.
3. Distinguish between linear power supply and SMPS.
4. Implement Data Acquisition Systems.

Contents

Unit-I (08 Hours)

Electronic Components Selection

Passive and active components, types of resistors, capacitors and Inductors. Transformers types: power transformer, audio frequency transformer and intermediate frequency transformer. Integrated Circuits (ICs), wire/cable selection, shielding and grounding techniques.

Unit-II (08 Hours)

Design of Analog Filter

Low pass filter and high pass filter. Design of Inductor Filter, Capacitor filter, LC- filter, RC- Filter and π section Filter.

Unit-III (08 Hours)

Design of Linear power supply

Block Schematic, Types of voltage regulators, Design of Zener diode shunt regulator , Transistor shunt regulator and transistor series voltage regulator. Short circuit protection, fold back current limiting. Discrete components & IC based design for linear power supply e.g. Three terminal regulators (LM317, LM78XX).

Unit-IV (08 Hours)

Switched Mode Power Supply

Topology of SMPS. Comparison between Linear Power Supply and SMPS. IC based design for switch mode power supply with latest SMPS ICs.

Unit-V (08 Hours)

Design of Data Acquisition System

Circuit level design of DAS, Design should include signal sensing, isolation, and signal conditioning ADC storage & display systems.

Unit-VI (08 Hours)

Audio Power Amplifier

Design of Audio Power Amplifier: Design using ICs like TBA810, Design of signal conditioner, Design of pre amplifier, Design should include various controls, Parameters optimization & protection circuits.

Content Delivery Methods

Chalk & talk, Power point presentation.

Assessment Methods

1. Unit Test
2. Continuous Assessment
3. End term Examination.

Mini Project & Assignments

Mini-project should be from small systems required in laboratory or real life, project to be designed, tested on bread board, fabricated on manual or CAD based PCBs with due consideration to mechanical aspects for enclosure & control panel design. Complete documentation in the form of project report is to be submitted. Due consideration should be given to Mini Project while assessing students for term work.

Five assignments must be completed. Out of five assignments four should be corresponding to complete design of analog and digital system. Fifth assignment should be corresponding to the software simulation of system.

Use of softwares like MULTISIM / PROTEUS is expected.

List of Assignments

1. Design of low pass filter.
2. Design of linear power supply using discrete components.
3. SMPS Topology.
4. Data acquisition system.
5. Design of audio power amplifier.

Text Books

1. P.M.Chirlial, "Analysis & Design of Integrated Electronic Circuits", Wiley Eastern.
2. Hayt & Nudeck, "Electronic Circuit Analysis & Design ", Jaico Publishing House.
3. Horowitz Paul & Winfield Hill, "Art of Electronics", Cambridge University Press 2nd Edition 1989.
4. B.S.Sonde, "Introduction to system Design Using Integrated Circuits", Wiley Eastern-2nd Edition.
5. M.M.Shah, "Design of Electronic Circuits & Computer Aided Design", Wiley Eastern.

Reference Books

1. Sergio Franco, "Design with Operational amplifiers and analog Integrated circuits", 3rd edition, TMH.
2. Franklin P. Prosser, David E. Winkel, "The Art of Digital Design", PHI.

   Gotlib, "Power Supply Design", PHI

RULES REGARDING ATKT, CONTINUOUS ASSESSMENT AND AWARD OF CLASS

Standars of Passing and ATKT Rules

1. For all courses, both UE (Universtiy Evaluation) and IA (Internal Assessment) constitue separate heads - of - passing (HoP). In ordar to pass in such courses and to 'earn' the assigned credits.
   a) The learner must obtain a minimum grade point of 5.0 (40 % Marks) at UE and also a minimum grade point of 5.0 (40 % Marks) at IA.

   OR

   b) If he/she fails in IA, the learner passes in the course provided he/she obtains a minimum of 25% in IA and GPA for course is atleast 6.0 (50 % Aggregate). The GPA for a course will be calculated only if the learner passes at the UE.
2. A student who fail at UE in a course has to reappear only at UE as a backlog candidate and clear the HoP. Similarly, A student who fails in a course at IA has to reappear only at IA as backlog candidate and clear the HoP.

Rules of ATKT

1. A student is allowed to carry backlog of courses prescribed for B.Tech Sem - I, III, V, VII to B.Tech Sem - II, IV, VI, VIII respectively.
2. A student is allowed to keep term of Sem - III, if he/she is failing in any number of subjects of Sem I & II.
3. A student is allowed to keep term of Sem - V, if he/she is failing in any number of subjects of Sem - III & IV but passed in all subjects of Sem - I & II.
4. A student is allowed to keep term of Sem - VII, if he/she is failing in any number of subjects of Sem - V & VI but passed in all subjects of Sem - III & IV.

Award of Class for the Degree Considering CGPA

Award of Honours

A student who has completed the minimum credits specified for the programme shall be decleared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The Criteria for the Award of Honours at the End of the Programme are as given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
9.50 ≤ CGPA ≤ 10.00	0	Outstanding	80 ≤ Marks ≤ 100
9.00 ≤ CGPA ≤ 9.49	A+	Excellent	70 ≤ Marks ≤ 80
8.00 ≤ CGPA ≤ 8.99	A	Very Good	60 ≤ Marks ≤ 70
7.00 ≤ CGPA ≤ 7.99	B+	Good	55 ≤ Marks ≤ 60
6.00 ≤ CGPA ≤ 6.99	B	Average	50 ≤ Marks ≤ 55
5.00 ≤ CGPA ≤ 5.99	C	Satisfactory	40 ≤ Marks ≤ 50
CGPA Below 5.00	F	Fail	Marks Below 40

BHARATI VIDYAPEETH DEEMED UNIVERSITY
Pune.

Faculty of Engineering & Technology
Programme : B. Tech. (Electronics)

COURSE STRUCTURE AND SYLLABUS

(Choice Based Credit System - 2014 Course)

B. Tech. (Electronics) – Sem VII & VIII

Bharati Vidyapeeth Deemed University, Pune

Bharati Vidyapeeth, the parent organization of this University is one of the largest educational organizations in the country. It has 171 educational units under its umbrella including 67 Colleges and Institutes of conventional and professional education.

The Department of Human Resource Development, Government of India on the recommendations of the University Grants Commission accorded the status of "Deemed to be University" initially to a cluster of 12 units of Bharati Vidyapeeth. Subsequently, 17 additional colleges / institutes were brought within the ambit of Bharati Vidyapeeth Deemed University wide various notifications of the Government of India. Bharati Vidyapeeth Deemed University commenced its functioning on 26th April, 1996.

Constituent Units of Bharati Vidyapeeth Deemed University

1. BVDU Medical College, Pune.
2. BVDU Dental College & Hospital, Pune
3. BVDU College of Ayurved, Pune
4. BVDU Homoeopathic Medical College, Pune
5. BVDU College of Nursing, Pune
6. BVDU Yashwantrao Mohite College of Arts, Science & Commerce, Pune.
7. BVDU New Law College, Pune
8. BVDU Social Sciences Centre (M.S.W.), Pune
9. BVDU Yashwantrao Chavan Institute of Social Science Studies & Research, Pune.
10. BVDU Centre for Research & Development in Pharmaceutical Sciences & Applied Chemistry, Pune
11. BVDU College of Physical Education, Pune.
12. BVDU Institute of Environment Education & Research, Pune
13. BVDU Institute of Management & Entrepreneurship Development, Pune
14. BVDU Poona College of Pharmacy, Pune
15. BVDU College of Engineering, Pune
16. BVDU Interactive Research School in Health Affairs (IRSHA), Pune
17. BVDU Rajiv Gandhi Institute of Information Technology & Biotechnology, Pune
18. BVDU College of Architecture, Pune
19. BVDU Abhijit Kadam Institute of Management & Social Sciences, Solapur
20. BVDU Institute of Management, Kolhapur
21. BVDU Institute of Management & Rural Development administration, Sangli
22. BVDU Institute of Management & Research, New Delhi

23. BVDU Institute of Hotel Management & Catering Technology, Pune
24. BVDU Yashwantrao Mohite Institute of Management, Malakapur-Karad
25. BVDU Medical College & Hospital, Sangli
26. BVDU Dental College & Hospital, Mumbai
27. BVDU Dental College & Hospital, Sangli
28. BVDU College of Nursing, Sangli
29. BVDU College of Nursing, Navi Mumbai

The status of University was given to a cluster of these colleges and institutes in appreciation of the high level of their academic excellence and for their potential for further growth.

During the last 20 years or so, the University has achieved higher pinnacles of academic excellence and has established its reputation to such an extent that it attracts students not only from various parts of India but also from abroad. According to a survey conducted by Association of Indian Universities, this University is one among the top ten Universities in the country preferred by the overseas students for admissions. At present, there are more than 850 overseas students from 47 countries on the rolls of constituent units of this University.

During the last 20 years, there has been tremendous academic expansion of the University. It now conducts in all 305 courses in its constituent units, of them 108 are Post Graduate, 45 are Under Graduate and 55 Diploma level courses. 12 Fellowship and 5 certificate courses. All the professional courses which the University conducts such as those of Medicine, Dentistry, Engineering etc., have approval of the respective statutory councils, viz., Medical Council of India, Dental Council of India, All India Council for Technical Education etc.

The University is a throbbing center of research activities and has launched Ph.D. programmes in 77 subjects and M.Phil in 3 subjects. It has also introduced quite few innovative academic programmes such as Masters in Clinical Optometry, M.Tech. in Nano Technology etc.

The University's performance and achievements were assessed by the "National Assessment and Accreditation Council" and it was reaccredited with a prestigious "A" grade in 2011. Some programmes of the constituent units such as College of Engineering at Pune, Management Institute in Delhi and others have also been accredited by "National Board of Accreditation". Three constituent units of Bharati Vidyapeeth Deemed University are also the recipients of ISO 9001-2001 certifications.

Bharati Vidyapeeth Deemed University
College of Engineering, Pune

College Information :

Bharati Vidyapeeth University College of Engineering, Pune (BVUCOE) established in 1983, a constituent unit of BVU (University with 'A' Grade status by MHRD, accredited to Grade 'A' by NAAC in 2004 and 2011) and holds a place of pride and is amongst the most reputed institute. It has been ranked to 61st by National Institutional Ranking Framework (NIRF) with criteriawise ranking as 5th in Graduate Outcome (GO), 13th in Outreach and Inclusivity (OI), 44th in Teaching Learning Resources (TLR) and 62nd in Perception (PR). This also made institute to stand 4th in the State of Maharashtra. Further, DATAQUEST-CMR national survey also ranked this institute to 4th among private technical institutions of India, 29th by Times of India and 41st by OUTLOOK. This is the only institute selected by MHRD for its Technical Education Quality Improvement Programme (TEQIP-II – 1.1 Programme) for the grant of Rs. 4 Crores.

BVUCOE, Pune offers 09 graduate, 08 post graduates programmes and Doctoral programmes in 08 disciplines. All Programmes are accredited by National Board of Accreditation (NBA) twice and we have applied for third cycle of accreditation.

Institute has its own spacious well designed building measuring 26,286 sq. m. and it houses 101 labs, 43 class rooms, and 21 tutorial rooms. The library of the institute is a five storied building and houses periodical section, computer center, reading hall, reference section. It contents more than 60,000 books, 15,000 volumes, 80 national and 81 international journals subscription and digital library facility. Digital library of institute with 66,944 number of journals in e-form is one of the richest source of knowledge in e-form for students and faculty members. The Library, Laboratories, Equipments, Learning resources and Software constantly get upgraded and updated in tune with the changing time. An Investment of Rs.119.95 million is made in the last five years.

The structured faculty development programme has strengthened quality of Teaching - Learning Process in the institute. 35 faculty members with Ph. D. qualifications have been proved as resources for research, innovations and sound Teaching – Learning Process. As a part of quality improvement programme 04 number faculty members were deputed to International Universities, Institutions of national importance such as IIT, NIT etc. for qualification improvement. Team of 206 faculty members with average experience 11.7 years and average age 38.3 years indicates teachers with fine blend of experience and youth. Faculty members are well conversant and trained for use of latest softwares and latest equipments being purchased every year as policy of upgrading laboratories. In last five years college has invested Rs. 119.95 million in laboratory upgradation. Institute organized 138 number of continuing education programmes in last five years to keep sharpen skills of faculty members. Further, 1389 faculty members were deputed to attend various workshops and training programmes for sharing and enhancing their knowledge. Faculty members also play active role in curriculum development as Member of Board of Studies of various subjects and other statutory bodies of the University.

The research quality is indicative of the university penchant for quality. The research publications in reputed international and national refereed journals and conferences have shown a steady and significant rise over the years which is aptly reflected by 1091 Research papers publications in reputed national and international journals in last five years. Grant of Rs. 152.73 Lakhs from funding agencies such as UGC, DST, DRDO, AICTE etc. fetched by faculty members is strong indicator of research aptitude of faculty members. Seed money up to Rs. 3 lakhs under Institutionally Funded Research Programme (IFRP) nurtures research aptitude of faculty members. 575 number of publications in standard research databases such as SCOPUS, Web of Science, Google Scholar etc. in last five years throws light on quality of publications by faculty members of this institute. These publications by faculty members have received 137 number of citations in the same period. Institute has 02 patents to its credit and filed 05 patents.

The institute has collaboration with international universities such as North Carolina A & T State University, Greensboro, USA, Joint School of Nanoscience and Nanoengineering (JSNN), USA, The University of Tokushima, Japan, ARM University, USA and with industries such as TCS, SKF India Ltd. Every year one faculty member is deputed for Ph. D. programme in NCAT with scholarship. Students of M. Tech. (Nanotechnology) joins JSNN, USA to pursue their dissertation research work for six months with scholarship to the tune of $1000 per month. Further, NCAT, USA, The University of Tokushima, Japan contributes intellectually as well as financially to organize biannual international conference NANOCON. Three editions of NANOCON are conducted since 2010 with their association. In association with Eduvance & GAATsis, a " Center of Excellence in Embedded Systems" is established in the Institute with donation of Educational kits like ARM development boards from ARM University Program and PSoC kits by Cypress Semiconductors are used for developing projects in the sponsored laboratory. TCS supports students and faculty members for faculty enablement programmes and student development programme. Establishment of Lubricant Conditioning Monitoring Laboratory is outcome of collaboration with SKF India Ltd.

Being Deemed University college takes advantage of academic autonomy in making the curriculum industry oriented and enable students to make employable. In-plant training (45 days), courses such as Professional Skill Development introduced as integrated part of course structure. In-plant training enable students to interact within their associated industries for gaining practical field experience and professional exposure. Curriculum is Choice Based Credit System which makes students path of joining international universities for their higher studies smoother.

Today, qualitative soft skill development in students is more pertinent to a student's professional career. The institute regularly arranges training programme in the area of personality development, aptitude test, group discussion and personal interview. Through its Employment Enhancement Programme (EEP) designed for third year students which comprises of communication skill quantities analysis, corporate culture, IT Training and soft skills. This programme is conducted in association with professional institutes of national repute for effective execution and implementation. To enhance their professional experience and get them head start in the industry, an innovative programme is initiated on student mentoring "Saturday @ BV", wherein speakers are entrepreneurs and high ranked corporate who share their experiences, hardship and their corporate journey.

In it's long, multi-pronged, persistent and pain staking efforts for producing quality engineering professionals, institute has produced more than 1068 entrepreneurs.

PROGRAMME : ELECTRONICS ENGINEERING

Vision of Department:

To create technical manpower to suit global needs in Electronics and allied Engineering.

Mission of the Department:

1. To empower students with state of the art knowledge to meet the growing challenges in Electronics and allied field.
2. Establish a unique learning environment for creativity, innovation & professional activities in Electronics field for student and faculty to inculcate moral & ethical values.
3. To provide quality and value based education to excel in their profession to meet economic and social requirements of new era.

Programme Educational Objectives (PEOs):

1. To make students competent for professional career in Electronics & allied fields.
2. To equip students with effective communication & teamwork skills to acquire professional excellence in national & multinational organizations.
3. To nurture students to be sensitive to ethical, societal & environmental issues while conducting their professional work.
4. To build strong fundamental knowledge amongst student to pursue higher education and continue professional development in Electronics & other fields.

Programme Outcomes (POs):

1. Apply basic knowledge of mathematics, science and engineering.
2. Identify, formulate and solve engineering problems.
3. Build, analyze & interpret Electronics Systems.
4. Solve complex Engineering problems in Electronics & allied fields.
5. Use modern software tools in Electronics Engineering practice.
6. Understand effect of engineering solutions in global, economic, health, safety & societal context.
7. Understand the impact of engineering solutions on society & to be aware of contemporary issues.
8. Shoulder professional and ethical responsibilities for societal development.
9. Work as effective and efficient member of the team or leader.
10. Communicate effectively.
11. Manage projects in Electronics and multidisciplinary environment.
12. Engage in lifelong learning.

Bharati Vidyapeeth University, Pune

Faculty of Engineering & Technology

Programme: B.Tech (Electronics) Sem – VII (2014 Course)

Semester - VII

Contact Hours: 23 Hrs/week
Total Credits: 25
Total Marks: 750

Sr. No.	Subject	Teaching Scheme(Hrs) L	T	P	Examination Scheme (Marks) End Semester Exam	Continuous Assessment Unit Test	Tutorials / Assignments	Attendance	Tw & Pr	TW & OR	Total Marks	Credits TH	TW	Total
40	Computer Networks	3	0	2	60	20	10	10	-	50	150	3	1	4
41	Programmable Logic Controllers & Applications	3	0	2	60	20	10	10	50	-	150	3	1	4
42	Electronic System Design	3	0	0	60	20	10	10	-	-	100	3	-	3
43	Advanced Communication System	2	0	0	60	20	10	10	-	-	100	2	-	2
44	ELECTIVE -I	3	1	0	60	20	10	10	-	50	150	3	1	4
45	Project Stage -I	0	0	4	-	-	-	-	-	50	50	-	4	4
46	In -plant Training	0	0	0	-	-	-	-	-	50	50	-	4	4
	Total	**14**	**01**	**08**	**300**	**100**	**50**	**50**	**50**	**200**	**750**	**14**	**11**	**25**

Elective -I

1) Mobile & Broadband Communication
2) Digital I mage p rocessing
3) Advanced Digital Signal Processing
4) Advance d Computer Programming

Bharati Vidyapeeth University, Pune

Faculty of Engineering & Technology

Programme: B.Tech (Electronics) Sem – VIII (2014 Course)

Semester - VIII

Contact Hours: 28 Hrs/week
Total Credits: 25
Total Marks: 750

Sr. No.	Subject	Teaching Scheme(Hrs)			Examination Scheme (Marks)						Total Marks	Credits		
		L	T	P	End Semester Exam	Continuous Assessment			Tw & Pr	TW & OR		TH	TW	Total
						Unit Test	Tutorials / Assignments	Attendance						
47	Optical Fiber Communication	3	0	2	60	20	10	10	50	-	150	3	1	4
48	Biomedical Engineering	3	0	2	60	20	10	10	-	50	150	3	1	4
49	Wireless Network	3	1	0	60	20	10	10	-	-	100	4	-	4
50	Elective -II	3	1	0	60	20	10	10	-	50	150	3	1	4
51	Seminar	0	0	2	-	-	-	-	-	50	50	0	1	1
52	Project Stage -II	0	0	8	-	-	-	-	-	150	150	0	8	8
	Total	**12**	**02**	**14**	**240**	**80**	**40**	**40**	**50**	**300**	**750**	**13**	**12**	**25**

Elective -II

1) Agricultural Electronics
2) System on Chip (SOC)
3) Speech Processing
4) Fuzzy Logic & Neural Network

COMPUTER NETWORKS

Teaching Scheme
Lecture: 03 Hours/week
Practical: 02 Hours/week

Examination Scheme
End Semester Exam: 60 marks
Unit Test: 20 marks
Attendance: 10 marks
Assignment: 10 marks
TW& OR: 50 marks
Credits: 04

Course Pre-requisites

Analog communication, Digital communication systems.

Course Objectives:

1. To introduce various topologies and types of computer networks.
2. To introduce network hardware & OSI layers.
3. To know how of congestion control mechanism.
4. To familiarize the TCP/IP protocol.

Course Outcomes:

On successful completion of this course, students will be able to

1. Identify the types of computer networks and topologies.
2. Identify the functions of network connectors, Hubs, Switches, Routers, Bridges, NIC & network layers.
3. Implement various algorithms used in computer networks.
4. Use TCP/IP protocol.
5. Apply the various Network security techniques.

Unit I [06 Hours]

Introduction to computer networks

Networks definition & requirements, Networks topologies, Types of networks, network software issues, reference models- OSI TCP/IP and Hybrid.

Unit II [06 Hours]

Physical layer

Transmission media Guided media-twisted pair, coaxial cable, optical fiber, unguided media-RF allocation, terrestrial microwave, satellite communication, cellular telephone, EIA 232 D interface standard, modem-types, block schematic & standards network device: network connectors, Hubs, Switches, Routers, Bridges, NIC, Fast Ethernet, Gigabit Ethernet.

Unit III [06 Hours]

Data Link Layer

Design issues, error detection and correction, elementary data link protocols, sliding window protocols, HDLC-types of stations, modes of operation, HDLC frame formats, additional features, Medium access sub layer – channel allocation problem, multiple access protocols, IEEE 802 standards for LANS & WANS.

Unit IV [06 Hours]

Network Layer

Design issues, Routing algorithms – shortest path, distance vector routing, link state routing, flow based routing, routing for mobile hosts, Congestion control – congestion prevention policies-leaky bucket algorithm, token bucket algorithm, congestion control in virtual circuit subnet and choke packets, RSVP.

Unit V [06 Hours]

TCP/IP Protocol suit overview

TCP/IP and internet, IP protocol and it's header format, addressing, subnetting, other networks layer protocol – ARP, RARP, ICMP, IGMP, TCP, UDP, DHCP, Domain name system (DNS), Email, HTTP, IPV 6.

Unit VI [06 Hours]

Network security

Cryptography Algorithms and Trust Models, Ciphers vs Codes, Symmetric-key algorithms (DES, AES), Public- key algorithms – RSA, Digital signatures, IPSec, Firewall, Managements of publics keys, communications security, Authentication Protocols.

Content Delivery Methods :

Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

List of Experiments

1. Study of Networking.
2. Introductions to Network Simulation.
3. Study of LAN.
4. Study of Installation of Widows 2003 Server & introduction to DHCP.
5. i) Character transfer using Simplex method
   ii) Character transfer using Full-Duplex method
6. Simulation and implementation of bit stuffing
7. Simulation and implementation of CRC
8. Study of Medium Access sub layer protocols and simulate using MATLAB.
9. Simulation and implementation of
   i) Stop-and Wait protocol
   ii) Go-Back-N protocol
   iii) Selective repeat Protocol
10. Simulation and implementation of i) Distance Vector Routing Algorithm ii) Link State Routing algorithm
11. Study of Token Bucket Algorithm.
12. Study of TCP/IP Protocol Suite and Simulation Address resolution protocols.

List of Assignments:

1. Study of types of Networks and topologies.
2. Study of Network Hardware.
3. Study of TCP/IP Architecture
4. Study of Physical Layer

5. Study of Data Link Layer.
6. Describe the various Encoding techniques.
7. Study of Network Layer.
8. Study of Congestion control Mechanism.
9. Study of Session layer.
10. Study of Presentation layer.
11. Study of Application layer.
12. Study of Network security Mechanism.

Text Books

1. Andrew Tanenbaum, "Computer networks", Prentice Hall.
2. B. A. Forouzan, "Data Communications and Networking", Tata McGraw Hill, 4th Edition

References

1. S. Keshav, "An Engineering Approach to Computer Networking" , Pearson Education
2. J.F. Kurose and K. W. Ross, "Computer Networking – A top down approach featuring the Internet", Pearson Education, 5th Edition
3. D. Comer, "Computer Networks and Internet/TCP-IP", Prentice Hall
4. William Stallings, "Data and computer communications", Prentice Hall
5. L. Peterson and B. Davie, "Computer Networks – A Systems Approach" Elsevier Morgan Kaufmann Publisher, 5 th Edition.
6. T. Viswanathan, "Telecommunication Switching System and Networks", Prentice Hall

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV,V, VI

PROGRAMMABLE LOGIC CONTROLLERS AND APPLICATIONS

Teaching Scheme
Lecture: 03 Hours/week
Practical: 02 Hours/week

Examination Scheme
End semester Exam: 60 marks
Unit Test: 20marks
Attendance: 10 marks
Assignments: 10 marks
TW &Pr: 50 marks
Credits: 04

Course prerequisites:

Digital Electronics, Embedded systems, Power Electronics

Course objective:

1. To make the student aware of automation in industries.
2. To introduce the student to the programmable logic controllers.
3. To give the know-how of NC, CNC machines & their role in manufacturing industries.
4. To impart the knowledge of protocols & networking of PLCs

Course Outcomes:

On successful completion of this course, students will be able to

1. Write the ladder logic for applications using logical & mathematical instructions.
2. Write the ladder logic for applications using program & data flow instructions.
3. Interface digital & analog input/output to the PLC
4. Identify NC, CNC machines and networking of PLCs.
5. Identify the components of SCADA and HMI.

Unit I [06 Hours]

Process Control & Automation

Definition of Process control, PID Controller, Cascade control, Analog control, Digital control, Types of Automation, Advantages and limitations of Automation, controllers & actuators. Introduction to PLC, architecture, working of PLC, functions of PLC, selection of PLC, ladder programming

Unit II [06 Hours]

Transmitters and Signal Conditioning

Need of transmitters,2-Wire & 3-Wire transmitters, Standardization of signals, Current, Voltage and Pneumatic signal standards, Necessity of Analog input, output interface to PLC.

Analog and Digital signal conditioning for various parameters, Smart and Intelligent transmitters.

Unit III [06 Hours]

Input and Output modules

Various functions of PLC like mathematical, logical, dataflow, special functions. Interfacing of Input and Output devices with PLC. Sourcing & sinking, Classification of input & output modules,discrete & analog modules.

Unit IV [06 Hours]

PLC and Human Machine Interface (HMI)

PLC based automated systems. High frequency inputs. PLC programming standard IEC61131, Soft PLC techniques. IT Interfaces required: for ERP, MIS, MES. Supporting Applications interfaces: RFID, Barcode, Vision Systems. HMI: Block Diagram, Types, Advantages, Applications.

Unit V [06Hours]

SCADA & Distributed control system

Elements of SCADA, Features of SCADA, MTU- functions of MTU, RTU-Functions of RTU, Applications of SCADA, Communications in SCADA- types & methods used, Introduction to DCS, Architecture of DCS, Input and output modules, communication module, Specifications of DCS

Unit VI [06 Hours]

Automation and CNC (Computer Numeric Control) Machines

Introduction of NC and CNC Machines: Need of CNC machines, Applications of CNC machines in manufacturing, Advantages of CNC machines.

Networking of PLCs - Network topology, industrial network, bus network, Device bus network, Process bus network, Modbus protocol Device net, Controlnet, AS-I interface, Foundation field bus, Profibus

Content Delivery Methods:

Chalk & talk, Power point presentation

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

List of Practicals:

1. Application examples based on timers & counters.
2. Design & implement ON-OFF controller circuit
3. Application examples based on data flow instructions.
4. Application examples based on mathematical instructions.
5. Application examples using One shot rising instruction.
6. Application examples using advanced instructions.
7. Examples based on Industrial application s
8. Interfacing of analog inputs to PLC.

List of Assignments:

1. Conduct survey for different types of PLC programming.
2. Selection of PLC for a application with specifications.
3. Classify the timers & Counters with applications.
4. Design of signal conditioning circuit for any one analog application.
5. Identify sinking & sourcing PLC input output module.
6. Interface switch & sensor to PLC as input.
7. Communication between PLC HMI using Modbus protocol

8. Identify the applications of soft PLC.
9. Study of DCS in any industrial plant.
10. Practical examples where SCADA has played important role.
11. Identify different types of CNC machines (with applications) in industries.
12. Justify the need of networking of PLCs.

Text Books:

1. John W. Webb, Ronold A Reis, "Programmable Logic Controllers, Principles and Applications"; 5th Edition, Prentice Hall of India Pvt. Ltd
2. MadhuchhandaMitra, SamarjitSen Gupta, "Programmable Logic controllers and Industrial Automation"; Penram International Publishing India Pvt. Ltd

Reference Books:

1. Curtis Johnson, "Process Control Instrumentation Technology"; 8th Edition, PearsonEducation
2. Kilian, "Modern control technology: components & systems, Delmar 2nd edition.
3. Bela G Liptak, Process software and digital networks, 3rd edition, 2002.
4. Pollack. Herman, W & Robinson., T. "Computer Numerical Control", Prentice Hall. NJ.
5. Pabla, B.S. &Adithan, M. "CNC Machines", New Age Publishers, New Delhi
6. Stuart A. Boyer, SCADA supervisory control and data acquisition, ISA Publication Reference Books

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV,V, VI

ELECTRONIC SYSTEM DESIGN

Teaching Scheme
Lecture: 03 Hours/week
Practical: 00Hours/week

Examination Scheme
End semester Exam: 60 marks
Unit Test: 20 marks
Attendance: 10 marks
Assignments: 10 marks
Credits: 03

Course Pre-requisites:

Analog Electronics, Digital Electronics, Microprocessors & Microcontrollers, VLSI Design.

Course Objectives:

1. To introduce analog and digital interfacing techniques
2. To create awareness of EDA tools and techniques for testing and fault diagnosis
3. To imbibe the importance of international standards for electronic systems and packaging techniques
4. To enable the students to design electronic systems compliant with EMI specifications

Course Outcomes:

On successful completion of this course, students will be able to

1. Address interfacing issues in analog and digital circuits.
2. Use EDA tools and Laboratory Instruments for testing and fault diagnosis.
3. Identify various international standards, specifications for electronic systems.
4. Use grounding and shielding techniques for safety in electronic systems and PCB designing.

Unit I [06 Hours]

Hardware Design- Analog

Analog Signal Conditioning: Factors affecting choice of Op-Amps in signal conditioning, applications, Need for Instrumentation Amplifiers- Case study. Error budget analysis with Case study. ADCs: Interpretation of ADC specifications from design view point, considerations in selecting references (Vref for ADC). DACs: Interpretation of DAC specifications.

Unit II [06 Hours]

Hardware Design- Digital

Interface examples for LED, HB LED, LCD, Keyboard, Relays (Electromagnetic and Solid State). Microcontrollers: Comparative study of different Microcontroller architectures, Factors affecting choice of Microcontroller for different applications with case study. Introduction to buses and protocols used in Electronic products- I2C, SPI, CAN, Lin, Flexray.

Unit III [06 Hours]

EDA Tools and Standards

Different approaches to development of application software for Electronic Product. Debugging tools and techniques for software- Features of EDA, CAD, Simulators, Assemblers, ICE, and IDE. Documentation practices and templates for above software. Introduction to various international s standards like IEEE, FCC, IEC, BS & ISO standards.

Unit IV [06 Hours]

Testing and Fault Diagnosis

Analyses- DC/ Operating Point Analysis, AC (Frequency Response), Transient, Sensitivity, Monte Carlo. Debugging/ Fault finding- Features and limitations of Analog CRO, DSO, Logic Analyzer and Mixed Signal Oscilloscopes in finding hardware/software faults.

Unit V [06 Hours]

ESD and Packaging

Packaging & Enclosures of Electronic System: Need for Environmental Testing, Effect of environmental factors on electronic systems: Temperature, Humidity, Vibration and Shock tests, nature of environment and safety measures. Packaging's influence and its factors.Cooling in/of Electronic System: Heat transfer, approach to thermal management, mechanisms for cooling, operating range, basic thermal calculations, cooling choices, heat sink selection.

Unit VI [06 Hours]

PCB Design and EMC

PCB Design practices for Analog and Mixed signal circuits, High speed digital circuits, Precision circuits, Grounding of Electronic Systems: Safety grounds, signal grounds, single-point ground systems, multipoint-point ground systems, hybrid grounds, functional ground layout, practical low frequency grounding, hardware grounds, grounding of cable shields, ground loops, shield grounding at high frequencies.

Content Delivery Methods:

Chalk & talk, Power point presentation

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

List of Assignments:

1. State factors affecting choice of Op-Amps in signal conditioning.
2. State the need for Instrumentation Amplifier with an example.

3. State the need for signal conditioning circuits with an example
4. State selection criteria of Microcontroller for application with case study of one application.
5. Explain in details the I2C protocol for interfacing peripherals
6. Explain in details the SPI protocol for interfacing peripherals
7. Explain following International standards in detail
   a. IEEE standards.
   b. FCC standards.
   c. IEC standards.
   d. BS standards.
   e. ISO standards.
8. List the different Layout design & Tools available in market and write the specifications in detail.
9. State need for Environmental Testing. Temperature, Humidity, Vibration and Shock tests etc.
10. State the need of Cooling in an Electronic system.
11. Explain the PCB design practices for Analog and Mixed signal circuits, High speed digital circuits, Precision circuits.
12. State the need for Grounding of Electronic Systems.

Text Books

1. Bernhard E. Bürdek, "History, Theory and Practice of Product Design", SpringerScience, 2005
2. Paul Horowitz, "Art of Electronics", Cambridge University Press.

Reference Books

1. Howard Johnson, Martin Graham, "High-speed Digital design- A Handbook of Black Magic", Prentice Hall Publication.
2. G. Pahl and W. Beitz J. Feldhusen and K.-H. Grote, "Engineering Design – A Systematic Approach", Springer,2007.

3. Tim Williams, “EMC for Product Designers”, Elsevier, Fourth edition 2007.
4. Jerry C Whitaker, “The Electronics Handbook”, CRC Press, IEEE Press, ISBN 08493-8345-5.
5. David Bailey, “Practical Radio Engineering and Telemetry for Industry”, Elsevier ISBN 07506 58037.
6. Pressman, “Software Engineering - A Practitioner's Approach”.
7. W.Bosshart“Printed Circuit Boards - Design & Technology”, 1st edition, Tata McGraw Hill.
8. G. Pahl and W. Beitz J. Feldhusen and K.-H. Grote, “Engineering Design – A Systematic Approach”, Springer, 2007.
9. John G. Webster, “Measurement, Instrumentation, and Sensors Handbook”, CRC Press, 1999.
10. Peter Wilson, “The Circuit Designer’s Companion”, Elsevier Ltd, 2012

Syllabus for Unit Test:

Unit Test-IUnit- I, II, III

Unit Test-II Unit- IV,V, VI

ADVANCED COMMUNICATION SYSTEM

Teaching Scheme
Lectures: 02 Hours/week
Practical: 00Hours/week

Examination scheme
End Semester Exam:60 Marks
Unit Test: 20 marks
Attendance: 10 marks
Assignment: 10 marks
Credits: 02

Course Prerequisite:

Analog Communication, Digital Communication Systems

Course Objectives:

1. To introduce radar & satellite communication system with its working principle and implementation techniques.
2. To enable student to integrate communication technologies in multidisciplinary applications.
3. To make the student aware of advanced communication techniques.

Course Outcomes:

On successful completion of this course, students will be able to

1. Compare radio frequency and microwave frequency communication with respect to its working principle and its applications.
2. Describe satellite subsystem and analyze link budget for satellite.
3. Identify the fundamentals of orbital mechanics, the characteristics of common orbits used in satellite communications
4. Explore the concept of cognitive radio communication.
5. Apply different modulation techniques and access techniques for wireless communications.

Unit I [04 Hours]

Introduction to microwave techniques

Introduction to microwave fundamentals, microwave frequencies and microwave devices, microwave transmission lines- reflection coefficient and transmission coefficient, standing waves , wave guides, rectangular wave guides, TE mode wave, power transmission in wave guide, power losses, excitation of modes in wave guide

Unit II [04 Hours]

Satellite communication

Basic transmission theory, system noise temperature and G/T ratio, orbital mechanics, look angle determination, satellite subsystem.

Unit III [04 Hours]

Satellite link design

Design of downlink, link budget, design of uplink, modulation techniques, multiplex techniques, earth station, application overview-Radio and satellite navigation, GPS position location.

Unit IV [04 Hours]

Radar

Radar fundamentals, radar principle, radar range equation, types of radar pulsed radar system, MTI, radar beacons, FMCW radar, Doppler radar, phased array radar, plane array radar.

Unit V [04 Hours]

Cognitive radio

Cognitive Radio Architecture, Dynamic Access Spectrum, Spectrum Efficiency, Spectrum Efficiency gain in SDR and CR, Spectrum Usage, OFDM as PHY layer , OFDM Modulator, OFDM Demodulator

Unit VI [04 Hours]

Mobile Communication

Mobile telephone service, Transmission protocols, Introduction to GSM, GPRS, CDMA switching techniques, Quality of service (QOS).

Content Delivery Methods:

Chalk & talk, Power point presentation

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End semester Examination

List of Assignments:

1. Study of microwave components and equipments
2. Study of measurement of microwave frequency
3. Simulation of microwave building blocks
4. Study of Radar communication
5. Study of Satellite communication
6. Simulation of radar building blocks
7. Simulation of satellite communications building blocks
8. Visit to Mobile Telephone Switching Office (MTSO).
9. Compare GSM, GPRS and CDMA switching techniques.
10. Explain in detail the concept of cognitive radio
11. Analysis of 3G and 4G systems using any appropriate simulation tool.
12. Study of Transmission of Audio signal over satellite link.

Text books:

1. M.L. Sisodia , "Microwave and Radar Engineering" 1st Edition, New Age International Publisher.
2. Timothy Pratt, "Satellite Communication", 2nd Edition, Wiley India Pvt. Limited.

Reference Books:

1. Liao Samuel Y, “Microwave Devices and Circuits”, Prentice Hall Publisher.
2. Andreas Molisch, “Wireless Communications”, Wiley IEEE Press.
3. Mischa Schwartz, “Mobile Wireless Communications”, Cambridge University Press.
4. Peter A. Rizzi, “Fundamentals of Microwave Engineering”, Prentice hall of India.
5. Louis E. Frenzel , “Communication Electronics principle and application”, 3rd Edition; Tata McGraw Hill

Syllabus for Unit Test:

Unit Test-IUnit- I, II, III

Unit Test-II Unit- IV,V, VI

ELECTIVE-I MOBILE AND BROADBAND COMMUNICATION

Teaching Scheme	Examination scheme
Lecture: 3 Hours/week	End semester Exam: 60 Marks
Tutorial: 01 Hour/week	Unit Test: 20 marks
	Attendance: 10 marks
	Assignment: 10 marks
	TW & OR: 50 marks
	Credits: 04

Course Prerequisites:

Analog Communication, Digital Communication

Course Objectives:

1. To make students familiar with fundamentals of mobile communication systems
2. To make students familiar with GSM and CDMA technologies.
3. To make students familiar with B-ISDN, services of B-ISDN, ATM networks.

Course Outcomes:

On successful completion of this course, students will be able to

1. Develop mobile communication systems (cellular theory) and the characteristics of different multiple access techniques in mobile communication
2. Analyze the different inter-networking challenges and solutions in wireless mobile Networks and Transport Layers.
3. Develop applications that are mobile-device specific and demonstrate current practice in mobile communication contexts.

Unit I [05 Hours]

Mobile and Personal Communication

Past, Present, and Future, The Cellular Concept, Multiple Access Technologies for Cellular System, Cellular System Operation and Planning: General Principles, Initial Implementations of the Cellular Concept: Analog Cellular Systems

Unit II [07 Hours]

Digital Cellular Mobile Systems

GSM Standardization and Service Aspects, GSM Reference Architecture and Function Partitioning, GSM Radio Aspects, Security Aspects, GSM Protocol Model, IS-95: The North American CDMA Digital Cellular Standard, Introduction, Service Aspects, Network Reference Model and Security Aspects, 4G Systems: Introduction to OFDM and MC-CDMA

Unit III [06 Hours]

Mobile Network & Transport Layer

Mobile IP, DHCP (Dynamic Host Control Protocol), Mobile adhoc networks, Mobile Transport Layer, Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast and Selective retransmission and recovery, Transaction oriented TCP, TCP over 2.5/3G wireless networks, Support for Mobility, File systems, Wireless application protocol, i-mode, SyncML, WAP 2.0.

Unit IV [05 Hours]

ISDN

Switching Techniques, Principles of ISDN, Architecture, ISDN standards, I-series Recommendations, Transmission structure, User network interface, ISDN protocol architecture, ISDN connections, Addressing, Interworking,

Unit V [06 Hours]

B-ISDN architecture and standards, B-ISDN Services

Conversational, Messaging, Retrieval, Distribution, Business and Residential requirements, B-ISDN protocols, User plane, Control plane, Physical layer, Line coding, Transmission structure, SONET Requirement, Signal Hierarchy, System Hierarchy.

Unit VI

ATM [07 Hours]

Overview, Virtual channels, Virtual paths, VP and VC switching, ATM cells, Header format, Generic flow control, Header error control, Transmission of ATM cells, Adaptation layer, AAL services and protocols, ATM switching, ATM cell processing in a switch, Matrix type switch, Input, Output buffering, Central buffering, ATM Traffic and congestion Control, Requirements for ATM Traffic and Congestion Control, Cell-Delay Variation, ATM Service Categories.

Content Delivery Methods:

Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End semester Examination

List of Tutorials/Experiments:

1. Analyze Cellular Concept & cellular hierarchy.
2. Study of Cellular system operation & planning.
3. Analyze GSM architecture & GSM service aspects.
4. Study of CDMA Digital cellular standards.
5. Study of design principles of Mobile IP, mobile transport layer.
6. Analyze and study of architecture of ISDN standards and addressing.
7. Study of B-ISDN Protocols.
8. Analyze design principles of ATM cells, AAL services, protocols and ATM switching.

List of Assignments:

1. Visit mobile station/telephone switching & prepare visit report.
2. To carryout telephone signal switching system using EPBX trainer.

3. To carry out AT commands mobile communication using GSM trainer.
4. To transfer data between two computers using ISDN terminal adapter modem.
5. To understand CDMA trainer using DSSS technology.
6. Analyze digital & analog cellular systems.
7. To study Mobile IP & Mobile Transport Layer
8. Analyze ISDN protocol architecture, ISDN connections, Addressing, Interworking.
9. To study B-ISDN protocols, User plane, Control plane, Physical layer & Line coding.
10. Analyze handoff management in mobile communication by virtual lab.
11. To study AAL services and protocols and ATM switching.
12. Analyze ATM Traffic and congestion Control.

Text Books:

1. Jochen Schiller, Mobile Communications, Pearson Education,2nd Edition.
2. Raj Pandya, Mobile and personal communication Systems and Services, Prentice Hall of India.
3. William Stallings, ISDN and Broadband ISDN with Frame Relay and ATM, Prentice-Hall, 4th Edition.

Reference Books:

1. William C.Y. Lee, Mobile Cellular Telecommunications- Analog & Digital Systems, Mc.Graw Hill, 1995
2. Theodore S. Rappaport, Wireless Communications (principles and practices), Prentice Hall of India, 2nd Edition.
3. Balajikumar, Broadband Communications - Mc-Graw Hill.

Syllabus for Unit Test:

Unit Test-IUnit- I, II, III

Unit Test-II Unit- IV,V, VI

DIGITAL IMAGE PROCESSING

Teaching Scheme	Examination Scheme
Lecture: 3 Hours/week	End Semester Exam: 60 Marks
Tutorial: 01 Hour/week	Unit Test: 20 marks
	Attendance:10 marks
	Assignment: 10 marks
	TW & OR: 50 Marks
	Credits : 04

Course prerequisites:

Signals and Systems, Digital Signal Processing.

Course objective:

1 To introduce the image fundamentals and enhancement techniques.
2 To introduce the image segmentation and representation techniques.
3 To familiarize various morphological operations on image.
4 To introduce the concepts of image registration and image fusion.

Course Outcomes:

On successful completion of this course, students will be able to

1. Demonstrate the fundamentals of digital image processing.
2. Design the image enhancement filters.
3. Analyze morphological operations and its effects on image.
4. To perform various morphological operations on image.
5. Determine features of various images by using segmentation method.

Unit I [06 Hours]

Fundamentals Digital Image Processing

Introduction, Fundamental steps in digital image processing and components, Elements of visual perception, Image sensing and acquisition, sampling and quantization, An Introduction to the mathematical tools used in digital image processing, Digital image representation, Relationships between pixels, Color models, Noises in color images.

Unit II [06 Hours]

Image Enhancement

Spatial domain, Gray level transformations, Intensity transformation functions, Histogram processing, Basics of spatial filtering, Smoothing and sharpening spatial filtering, Frequency domain, Introduction to Fourier Transform, One-Dimensional Fourier Transform and Inverse of Fourier Transform, Smoothing and sharpening frequency domain filters, Ideal, Butterworth and Gaussian filters.

Unit III [06 Hours]

Multi Resolution Analysis and Compressions

Multi resolution analysis, Image pyramids, Multi resolution expansion, Wavelet Transforms, Image compression, Fundamentals Models, Elements of Information Theory, Error free Compression, Lossy Compression, Compression Standards.

Unit IV [06 Hours]

Morphological Operations in Image Processing

Dilation and erosion, Opening and Closing, Hit or Miss transformation, Morphological algorithms, Extensions to grey scale images, Image Watermarking.

Unit V [06 Hours]

Image Segmentation and Feature Extraction

Thresholding, Region based segmentation, Region growing, Region splitting and Merging, Segmentation by morphological watersheds, First and second order edge detection operators, Hough transform, Types of Hough transform, shape features, Boundary descriptors, Localized feature extraction detecting image curvature.

Unit VI [06 Hours]

Applications of Digital Image Processing

Image Classification, Image Recognition, Image Understanding, Working principle of Video Motion Analysis (GIF), Introduction to Iris Recognition, Difference between 2D and 3D image Sources of 3D Data sets, Image processing in 3D, Measurements on 3D images..

Content Delivery Methods:

Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit test
2. Continuous Assessment
3. End Semester Examination

List of Tutorials/Experiments:

1. Study of Reading and Displaying Image in different File Format.
2. Study of Simple Binary and Gray Level Transformation.
3. Study of Histogram and Histogram Equalization of Image
4. Study of Smoothing of Image in Special Domain using Averaging and Medium Method.
5. Study of Edge Detection of Image using First and Second Order.
6. Study of Morphological Operations.
7. Study of Segmentation using Thresholding.
8. Study of Image Compression using DCT.
9. Study of Hough transforms.
10. Study of Feature Detection and Feature Identification.
11. Study of Image Sources in 2D and 3D.
12. Study of Iris Recognition.

List of Assignments:

1. Discuss Digital image representation and Color Model.
2. Study of Fundamental steps in digital image processing and components.

3. Study of Spatial domain, Gray level transformations and Intensity transformation functions.
4. Discuss Histogram processing, Fourier Transform, Gaussian filters.
5. Perform various Morphological Operations on image.
6. Study of Dilation and erosion, Opening and Closing, Image Watermarking.
7. Analysis of resolutions of Image and color intensity.
8. Study Wavelet Transforms, Image compression and Compression.
9. Study image Segmentation and Thresholding, Hough transform.
10. Study of Boundary descriptors, Localized feature detection and extraction.
11. Discuss Video Motion Analysis.
12. Study of applications of Digital Image Processing in 2D and 3D.

Text Books:-

1. Gonzalez, Rafel C. and Woods, Richard E., "Digital Image Processing", Second Edition, Prentice Hall, 2006.
2. Jain, Anil K., "Fundamentals of Digital Image Processing", Prentice Hall of India, New Delhi.

Reference Books:-

1. Rosenfield, Azriel and Kak, Avinash C., "Digital Picture Processing", Academic Press Inc, New York, 1982.
2. Salomon, David, "Data Compression: The Complete Reference", Second Edition, Springer Verlag, New York, 2001.
3. Pratt, William K., "Digital Image Processing", John Wiley & Sons, New York, 2003.
4. Mark Nixon, Alberto Aguado, "Feature Extraction and Image Processing", Academic Press, 2008.
5. Ardeshir Goshtasby, "2D and 3D Image registration for Medical, Remote Sensing and Industrial Applications", John Wiley and Sons,2005.

Syllabus for Unit Test:

Unit Test-IUnit- I, II, III

Unit Test-II Unit- IV,V, VI

ELECTIVE-I ADVANCED DIGITAL SIGNAL PROCESSING

Teaching Scheme
Lecture: 3 Hours/week
Tutorial: 1 Hour/week

Examination Scheme
End semester exam: 60 Marks
Unit Test: 20 marks
Attendance: 10 marks
Assignment: 10 marks
TW & OR: 50 Marks
Credits: 04

Course Prerequisites:

Signals & systems, Digital Signal Processing

Course Objectives:

1. To make student familiar with basic principles of spectral estimation methods.
2. To introduce the advanced concepts and techniques of digital signal processing.
3. To create awareness about the practical applications in the field of Digital Signal Processing.
4. To introduce DSP processor architecture.

Course Outcomes:

On successful completion of this course, students will be able to

1. Apply parametric and non-parametric techniques for estimating the power spectral density.
2. Design and implement multistage sampling rate converter.
3. Design appropriate adaptive filter in communication applications.
4. Perform multi-resolution analysis using wavelet transform.
5. To implement the signal processing application using DSP processor.

Unit I [06 Hours]

DSP Processor Characteristics

Features of DSP Processors, Harvard and modified Harvard Architecture, Multiply-Accumulate operation, Single Cycle Execution, Multiple on chip buses, ALU, MAC, Shifter Processing Units, Address Generation units, Modulo addressing, Bit reversed addressing, Efficient Looping Mechanisms, Examples of DSP Processors, Applications of DSP Processors

Unit II [06 ours]

Linear Prediction

Random Processes, Stationary Random Process, Ergodic Random Process, , AR process, MA process and ARMA process, AR lattice and ARMA lattice Ladder Filters, Forward and backward linear prediction, Solution of Normal Equations, Levinson-Durbin Algorithm, Properties of Linear Prediction Error Filters.

Unit III [06 Hours]

Power Spectrum Estimation

Estimate definition, Nonparametric methods-Periodogram, modified periodogram, Bartlett's method, Blackman-Tukey Method, Performance Comparisons of nonparametric methods, Parametric methods, Methods for estimating parameters of AR, MA and ARMA models

Unit IV [06 Hours]

Multirate DSP fundamentals

Need for Multi-rate DSP, Decimation by factor D , Interpolation by factor I, Sampling rate conversion by rational factor I/D, software implementation of sampling rate converters (Decimators and Interpolators), sample rate conversion using poly-phase filter structures

Unit V [06 Hours]

Adaptive filters

FIR adaptive filters – the MMSE criterion and LMS and RLS algorithms, Adaptive Lattice-Ladder Filters - Recursive Least Squares Lattice Ladder Algorithms, Applications of Adaptive Filters

Unit-VI [06 Hours]

Time Frequency Representation of signals

Time Frequency description of signals, Concept of Instantaneous frequency and Complex signal, Uncertainty principle, need for joint time frequency representation, tiling diagrams. Short Time Fourier Transform, Wigner Ville distribution, Continuous Wavelet Transform, Discretization of STFT & CWT, Spectrogram.

Content Delivery Methods:

Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit test
2. Continuous Assessment
3. End Semester Examination

List of Tutorials/Experiments:

1. Study of various addressing modes of DSP.
2. Describe the power spectrum estimation using Blackman and Tukey method.
3. Describe the role of Adaptive filters in Communication.

4. A brief survey of DSP applications in speech processing.
5. Implementation of Multi-rate application in digital audio processing.
6. Implementation of sub band coding for speech signal.
7. Discuss in detail various applications of wavelet transforms.
8. Explain the process of digital FM stereo signal generation.
9. Demonstration of Hardware and Software utilities for DSP starter kits.

List of Assignments:

1. Present a comparative study of DSP processors based on their features and applications.
2. Plot the Periodogram of a Noisy Signal and estimate PSD using Periodogram and Modified Periodogram methods.
3. Estimation of PSD of two sinusoids plus noise using Welch method
4. Find linear prediction coefficients and reflection coefficients using Levinson Durbin Algorithm .
5. Implement program to convert CD data into DVD data
6. Implement LMS algorithm using MATLAB.
7. Record a speech file in your own voice. Find pitch period for a voiced part of the segment.
8. Perform continuous and discrete wavelet analysis of a signal.
9. Implementation of Linear / Circular convolution on DSP processor.
10. Implementation of FIR filter using DSP processor
11. Design an Adaptive filter using LMS algorithm.
12. Mini-project based on the Matlab/Scilab.

Text books:

1. John G. Proakis, Manolakis, “Digital Signal Processing, Principles, Algorithms and Applications”, Pearson education, Fourth Edition, 2007.
2. B. Venkataramani, M. Bhaskar, “Digital Signal Processors”, TMH

Reference Books:

1. E. C. Ifeachor and B. W. Jervis, "Digital Signal Processing- A Practical Approach", 2nd Edition, Pearson education. 2007.
2. Widrow, B. and Stearns, S.D., "Adaptive Signal Processing", Pearson Education. 1985
3. Manolakis, D.G., Ingle, V.K. and Kogon, M.S., "Statistical and Adaptive Signal Processing", Artech House. 2005.
4. Diniz, P.S.R., "Adaptive Filtering: Algorithms and Practical Implementation", Kluwer. 1997
5. S. D. Apte, "Advanced Digital Signal Processing," Wiley Publications, 2014.
6. Leon Cohen, "Time-Frequency Analysis", Prentice Hall,1995.
7. K.P Soman, K.I Ramchandran, N.G.Reshmi, "Insight into Wavelets- from theory to Practice," PHI Learning Private Limited, Third Edition, 2010.
8. Rao R M and A S Bopardikar, "Wavelet Transforms Introduction to theory and Applications", Pearson Education, Asia, 2000.

Syllabus for Unit Test:

Unit Test-IUnit- I, II, III

Unit Test-II Unit- IV,V, VI

ELECTIVE-II ADVANCED COMPUTER PROGRAMMING

Teaching scheme
Lecture: 03 Hours/week
Tutorial:01Hour/week

Examination scheme
End Semester Exam: 60 marks
Unit Test: 20marks
Attendance: 10 marks
Assignment: 10 marks
TW & Oral: 50 marks
Credits: 04

Course prerequisites:

Fundamentals of computing

Course objective:

1. To introduce object oriented programming concepts.
2. To develop programming ability by learning advanced coding techniques.

Course Outcomes:

On successful completion of this course, students will be able to

1. Demonstrate basic knowledge of object oriented programming concepts.
2. Write simple programs in Java.
3. Apply Java for HTML and Applet applications.
4. Use SQL for database manipulation

Unit I [06 Hours]

Object Oriented Programming:

Programming fundamentals, Basic Concepts, Different Programming Paradigms, Evolution of Different Programming Languages and their Characteristics, Object-Oriented Paradigm, Objects and Classes, Data Abstraction and Encapsulation, Inheritance, Polymorphism, DynamicBinding, Message Communication, Benefits of OOP, Applications of OOP, Java Language as an OOP Language.

Unit II 06 Hours]

Introduction to Java:

Introduction to Java, Different Characteristics of Java, C++ and Java:Feature Comparisons, Improvements, Detailed Overview, Constants,Variables and Data Types, Operators and Expressions, Decision Making and Branching and Decision Making and Looping, Classes Objects and Methods, Arrays, Strings and Vectors, Interfaces.

Unit III [06 Hours]

Threads:

Packages in Java, Multithreaded Programming concepts and applications, Managing Errors and Exceptions, Managing Input/Output Files in JAVA.

Unit IV [06 Hours]

HTML and Java Applets:

History, W3C Standards, Standard HTML Tags for Image and TextFormatting, Tables, Lists, Frames. Introduction to dynamic HTML. JavaApplets: History, Introduction, HTML and Java Applet. Basic Applet programming, Applets on Web. Applet applications for Web.

Unit V [06 Hours]

SQL and Java:

Introduction to databases, Data Models, Concepts, Schema, RelationalQuery. Detailed Overview of SQL Language, Basic SELECT Query, WHERE Clause, ORDER BY Clause, Merging Data from MultipleTables: INNER JOIN, INSERT Statement, UPDATE Statement, DELETEStatement, and Installation of MySQL or PL SQL. Setting MySQL / PL SQLUser Account.

Unit VI [06 Hours]

Database Connectivity:

Introduction to JDBC, JDBC Architecture, Types of JDBC drivers, ResultSet, Metadata, Stored Procedure, Callable Procedure, Connection Procedure.

Content Delivery Methods:

Chalk & talk, Power point presentation

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End semester Examination

List of Tutorials/Experiments:

1. Write a Java program to implement Class and Inheritance Concept.
2. Write a Java program to differentiate between method overloading and method overriding.
3. Write a Java program to understand the use of String class and string buffer class
4. Write a Java program to implement the concept of Package.
5. Write a Java program to implement concept of Exception Handling.
6. Write a program to implement Frame and different graphics objects.
7. Write a program to implement Java Applet.
8. Write a SQL Program for implementation of DDL, DML, and DCL.

List of Assignments:

1. Write a C++ or Java Program to demonstrate the use of OOP features.
2. Write a Java Program to display pattern (Triangle, Pyramid) using different loops.
3. Implementation of different string functions by using switch case.
4. Write a Java Program implement multiple inheritances by using Interface.
5. Write a Java Program to perform different file operations.
6. Write a program to implement multithreading.
7. Design a College website containing detailed information using HTML Tags.
8. Write a program to implement a Java Applet.
9. Write a Java program to demonstrate JDBC connectivity.
10. Comparison of different database
11. Justify the role of SQL for database manipulation
12. A mini project on Java and SQL.

Text Books:

1. Programming with Java: A Primer, 3E by E Balagurusamy, Tata McGraw Hill Publishing Company.
2. Database System Concepts, Sixth Edition by Henry Korth, McGraw Hill Publishing Company
3. Java Complete Reference, Herbert Schildt, McGraw Hill Publishing Company
4. Java: How to Program by Deitel and Deitel

Reference Books:

1. Ivan Bayross, "Web Enabled Commercial Applications Development Using HTML, DHTML, JavaScript, Perl – CGI", BPB Publication.
2. Korth, "Database System Concepts", MGH Publication.
3. Ivan Bayross, "Programming with SQL", Sybase Publication.

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV,V, VI

PROJECT STAGE - I

Teaching scheme	Examination scheme
Lecture: 00 Hours/week	TW & Oral: 50 marks
Practical: 04 Hours/week	Total Credits: 04

Course objective:

1. To familiarize the students with the product development cycle
2. To impart the importance of working as a team.
3. To introduce the student to literature survey and documentation process.
4. To encourage the students to visualize and formulate a viable solution to practical engineering problems.

Course Outcomes:

On successful completion of this course, students will be able to

1. Identify the problem for practical Engineering application
2. Formulate and design appropriate solution
3. Write specifications and identify constraints
4. Work as an effective team member
5. Effectively plan the financial budget for the project.

Project Stage –I includes various steps such as:

1. Problem Identification
2. Information gathering
3. Feasibility study
4. Synopsis
5. System analysis
6. Requirement analysis

IN-PLANT TRAINING

Teaching scheme	Examination scheme
Lectures: 00 Hours/week	TW& OR: 50 marks
	Credits: 01

Course Objectives:

1. To familiarize the students to industrial work processes.
2. To work as an effective team member.
3. To develop the communication and presentation skills.
4. To introduce the student to work ethics in industry.

Course Outcomes:

On successful completion of this course, students will be able to

1. Work effectively in an industrial environment.
2. Effectively communicate and present himself/herself.
3. Indentify the various sections in the industry.
4. Work in a team.

In-plant Training:

Every student has to undergo training on site or in office of some company in June & July for one and half month to get the exposure and practical experience. He has to submit the detailed report of training, on the basis of which the term work and oral marks should be awarded.

Note: - Student should complete in-plant industrial training after semester-VI for a period of six weeks. Evaluation will be done in semester-VII.

OPTICAL FIBER COMMUNICATION

Teaching Scheme	Examination Scheme
Lecture: 03 Hours/week	End Semester Exam: 60 marks
Practical: 02 Hours/week	Unit Test: 20marks
	Attendance: 10 marks
	Assignments: 10 marks
	TW & PR: 50 marks
	Total credits: 04

Course prerequisites:

Analog Electronics, Analog Communication

Course objective:

1. To lay down the foundation for optical communication engineering.
2. To introduce the working of optical transmitter and receiver.
3. To familiarize the students to optical devices and concepts of various modulation techniques.
4. To introduce the students to Optical Fiber measurement techniques.

Course Outcomes:

On successful completion of this course, students will be able to

1. Demonstrate the advantages and applications of optical fiber communication.
2. Identify different optical Sources/detectors with their operating principle.
3. Choose the multiplexing technique and optical amplifier for optical communication.
4. Select the connectors /couplers in Optical fiber link and explain measurement technique for the optical fiber losses.

Unit I [06 Hours]

Introduction:

Advantages of optical fiber communication over other communication systems, Ray theory transmission, Electromagnetic mode theory for optical propagation, types of fibers, transmission characteristics of optical fibers-attenuation, scattering losses, fiber bend loss, dispersion, polarization, preparation of optical fibers.

Unit II [06 Hours]

Optical transmitter

Optical sources: Basic Concepts, Light Emitting Diodes, Semiconductor Laser, Laser Diodes, Line Coding, Laser Characteristics. Different modulation schemes. Optical transmitters: LED drive circuits for digital and analog transmission.

Unit III [06 Hours]

Optical Receivers and Optical links:

Optical receiver: Detector responsivity, Rise time and Bandwidth, P-N Photo Diode, P-I-N Photo Diode, Avalanche Photo Diode, Receiver Noise, Receiver Sensitivity.

Point to point Links: System design considerations, Link Power budget, Rise Time budget, Multichannel transmission techniques.

Unit IV [06 Hours]

WDM concept and Optical Amplifier:

WDM Concept, WDM Light wave Systems, WDM Components, System Performance Issues, Time Division Multiplexing, Sub Carrier Multiplexing, Code Division Multiplexing. Types of Optical Amplifier and its applications, Amplifier Noise, Optical SNR, Raman Amplifier.

Unit V [06 Hours]

Optical Components and Optical Networks:

Power launching & Coupling: Fiber optic splices, connectors & couplers & Coupling losses. Optical couplers, Isolators and Circulators. Network Concepts, network Topology, SONET/SDH.

Unit VI [06 Hours]

Optical Fiber measurements and application.

Fiber attenuation measurements, Fiber dispersion measurements, fiber numerical aperture measurement, reflectance and return loss measurements. OTDR. Application in military, industrial applications and applications in local area network.

Content Delivery Methods:

Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

List of practicals:

1. Optical Source Characteristics: Aim: To plot the electrical and optical characteristics of different light sources.
2. Numerical Aperture of fiber: Aim: To estimate the numerical aperture of given fiber.
3. To measure the attenuation of given MMSI and SMSI fibers.
4. To measure the attenuation variation in length of optical cable.
5. To measure the attenuation due to bending of optical fiber.
6. Optical Detector Characteristics: Aim: To plot the frequency response of detectors with different values of load resistor.
7. Fiber Bandwidth/Data rate: Aim: To estimate the bandwidth of given fiber.
8. Transmission of analog signal using a simple fiber optic link.
9. Transmission of Digital signal using a simple fiber optic link.
10. To perform Frequency modulation using optical fiber.
11. To perform PWM using optical fiber
12. To find the optical power using “Optical Power Meter”.
13. To find the optical response using “OTDR”.
14. Determination of input, output and transfer characteristics of Optocoulper.

List of Assignments:

1. Explain different types of optical fibers.
2. Study of Electromagnetic mode theory of optical propagation.
3. Classify the types of optical connectors and couplers.
4. Study of the fiber optic analog and digital lab using Virtual Lab.
5. Study of the fiber optic bidirectional communication using Virtual Lab
6. Study of bending losses in optical fiber using virtual lab.
7. Study of LED and Detector characteristics using Virtual Lab
8. Study of attenuation loss in optical fiber using Virtual Lab
9. Numerical based on acceptance angle, N.A. and Number of guided modes.
10. To find power efficiency, optical power in LEDs.
11. Calculation of optical power budget.
12. Measurement of attenuation in optical fiber.

Text Books

1. Gerd Keiser, "Optical Fiber Communications", Tata McGraw Hill, Fourth Edition.
2. John M. Senior, Optical Fiber Communications-Principles and Practice, Prentice Hall of India, second Editio

References

1. Jasprit Singh, "Opto Electronics – As Introduction to materials and devices", Tata Mc Graw-Hill International Edition, 1998.
2. Djafar K.Mynbaev and Lowell L.Scheiner " Fiber optic communication Technology" Pearson education, 2001.
3. Eric Udd, Fiber Optic Sensors, John Wiley, New York, 1991.
4. J.H. Franz and V. K. Jain, " Optical Communication - Components and systems", Narosa Publishing house, 2000.
5. Bhattacharya "Semiconductor Opto Electronic Devices", PHI Learning, New Delhi, 1995

Syllabus for Unit Test:

Unit Test-I Unit- I, II, III

Unit Test-II Unit- IV,V, VI

BIOMEDICAL ENGINEERING

Teaching Scheme
Lecture: 3 Hours/week
Practical: 2 Hours/week

Examination Scheme
End Semester Exam: 60 marks
Unit Test: 20marks
Attendance: 10 marks
Assignments: 10 marks
TW & OR: 50 marks
Credits: 04

Course prerequisites:

Analog Electronics, Instrumentation and control system.

Course objectives:

1. To introduce various biopotentials, their measurements, and interpretations associated with human body.
2. To familiarize the student with medical equipments.
3. To expose the students to clinical laboratory equipments.
4. To imbibe the importance of patient's safety.

Course Outcomes:

On successful completion of this course, students will be able to

1. Classify systems in a human body and Identify bio-potentials
2. To acquire and analyze ECG, EMG, EEG signals.
3. Correlate the parameters like B.P., ECG and PCG with the functioning of heart.
4. Categorize life saving equipments such as cardiac and respiratory equipments according to their applications.
5. Identify the equipments present in ICU/NICU and clinical laboratory.
6. Recognize physiotherapy equipments used for pain relief and describe various electrodes and techniques used for surgery.

Unit I [06 Hours]

Human body & Origin of Bio-potentials

Human body: cell structure, overview of different systems in the body: cardiovascular system, respiratory system, nervous system, musculoskeletal system, gastrointestinal system, endocrine system and lymphatic system, Origin of Bio-potentials: action potential and muscle Contraction, bio-potentials such as ECG, EEG, EMG.

Unit II [06 Hours]

Electrocardiograph, Phonocardiograph and Blood pressure measurements

Electrocardiography: ECG lead system, typical set up for ECG, electrodes used for ECG, Phonocardiograph: heart sounds and heart murmurs, microphones used in Phonocardiograph (PCG), recording set up of PCG, Blood pressure measurement techniques: direct and indirect methods, relationship between ECG, PCG and Blood pressure as a function of time.

Unit III [06 Hours]

Cardiac and Respiratory Equipments

Types of defibrillator, defibrillator electrodes, types of pacemaker, pacemaker leads and batteries, ventilator and Modes of ventilator.

Unit IV [06 Hours]

ICU and NICU-Architecture and monitoring systems

Architecture of ICU and NICU, patient monitoring system, central monitoring system, ambulatory monitoring system, Baby incubator and Phototherapy unit

Unit V [06 Hours]

Clinical Laboratory Instruments

Colorimeter, spectrophotometer, flame-photometer, blood cell counter, auto analyzer and pH/blood gas monitoring.

Unit VI [06 Hours]

Physiotherapy & surgical diathermy instruments and Patient Safety

Short wave diathermy machine, microwave diathermy machine, surgical diathermy unit, types of electrodes used for electro-surgery, Patient safety: grounding, shielding and effect of electrical current on human body.

Content Delivery Methods:

Chalk & talk, Power point presentation

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End semester Examination

List of Experiments:

1. Study of Blood Pressure measuring techniques (Analog & Digital).
2. Study of ECG waveform & Heart Rate measurement using ECG system.
3. Study of Phonocardiograph.
4. Detection of Apnea and Tachyapnea using respiration rate monitor and Respiration Simulator.
5. Study of DC Defibrillator.
6. Study of External Pacemaker.
7. Study of Spectrophotometer.
8. Study of Surgical Diathermy Unit.

List of Assignments:

1. State in your own words: Human body systems and their functions.
2. Choose any two Bio-potentials and state the vital role with the help of diagrammatic representation.
3. Differentiate between heart sounds and heart murmurs. Where and why they originate?
4. Association between ECG and B. P as a function of time.
5. Elaborate concepts of cardiac equipments.
6. Importance of Ventilator as a life supporting instrument.
7. Sketch ICU and NICU Architecture. Categorize and locate ICU and NICU equipments and their significance.
8. Describe central monitoring system for 8 bedded ICU.
9. Categorize blood tests and give importance of various clinical laboratory equipments.

10. By applying acquired knowledge select appropriate physiotherapy equipment for pain relief and explain.
11. Identify the equipment used for surgery in O.T. and describe.
12. Visit to the hospital/industry to understand the concepts of biomedical instruments.

Text Books

1. R. S. Khandpur, "Hand book of Biomedical Instrumentation", Tata McGraw Hill Publishing Company limited, New Delhi.
2. Leslie Cromwell, Fred J. Weibel, Erich A. Pfeiffer, "Biomedical Instrumentation and Measurements", Second Edition, PHI.

Reference Books:

1. Joseph J. Carr & John M. Brown, "Introduction to Biomedical Equipment Technology", Forth Edition, PHI.
2. John G. Webster, "Medical Instrumentation- Application and Design", Third Edition, John Wiely and Sons Inc., New York.
3. Richard Aston, "Principles of Biomedical Instrumentation and Measurement", Merrill Macmillan Publishing Company, New York.
4. Dr. M. Arumugam, "Biomedical Instrumentation", Anuradha Agencies.

Syllabus for Unit Test:

Unit Test-IUnit- I, II, III

Unit Test-II Unit- IV,V, VI

WIRELESS NETWORKS

Teaching Scheme
Lecture: 03Hours/week
Tutorial: 01 Hour/week

Examination Scheme
End Semester Exam: 60 Marks
Unit Test: 20marks
Attendance: 10 marks
Assignments: 10 marks
Credits: 04

Course Prerequisites:

Digital Communication

Course Objectives:

1. To familiarize the students with fundamentals of wireless communication systems
2. To introduce the concepts and techniques associated with Wireless Cellular Communication systems.
3. To familiarize with state of art standards used in wireless cellular systems.
4. To introduce new technologies in wireless systems

Course Outcomes:

On successful completion of this course, students will be able to

1. Identify the types of wireless communication systems.
2. Analyze the radio channel characteristics.
3. Analyze improved data services in cellular communication.
4. Work with GSM/CDMA/UWB technologies.

Unit I [06 Hours]

Introduction

Wireless network generations, evolution of next-generation networks,Systems and Design Fundamentals, Propagation Models Description of cellular system, Frequency Reuse, Co channel and Adjacent channel interference, Propagation Models for Wireless Networks, Multipath Effects in Mobile Communication, Models for Multipath Reception.

Unit II [06 Hours]

Cellular Communications

Introduction to Cellular Communications, cellular terminology, cell structure and cluster, Frequency reuse, Multiple Access Technologies, Cellular Processes-Call Setup, Handover etc, Teletraffic Theory, Capacity Building, Blocking Probability

Unit III[06 Hours]

GSM

GSM: Architecture and Protocols - Air Interface, GSM Multiple Access Scheme, GSM Channel Organization, Traffic Channel multiframe, Control (Signaling) Channel Multiframe, Frames, Multi- frames, Super-frames and Hyper-frames, GSM Call Set up Procedure, GSM Protocols and Signaling, Location Update Procedure, Routing of a call to a Mobile Subscriber.

Unit IV

CDMA [06 Hours]

Introduction to CDMA, Spread spectrum, CDMA call processing, Walsh codes, Variable tree OVSF, PN Sequences, Multipath diversity, RAKE Receiver, CDMA Receiver Synchronization, power control in CDMA.

Unit V [06 Hours]

3G and 4G Wireless Standards/UWB

GPRS, EDGE technology, IMT-2000 standards, UMTS technology, WCDMA, LTE, 4G Technologies, Multicarrier Modulation, OFDM-MIMO Systems, WiMAX, UWB Definition and Features, UWB Wireless Channels, Bit-Error Rate Performance of UWB.

Unit VI [06 Hours]

Emerging Wireless Network Technologies

WLAN technology, HIPERLAN, WPAN, WMAN, Mobile Ad-hoc network(MANET), Mobile IP and mobility management, Mobile TCP, Wireless sensor networks, RFID technology, WATM, Wireless application protocol, Home RF.

Content Delivery Methods:

Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

List of Tutorials/Experiments:

1. Comparison of different wireless network generations.
2. Study of design principles of propagation models of cellular system.
3. Analyze the concept of frequency reuse, interference and multipath effects.
4. Study of design principles of cellular structure.
5. Study of multiple access technologies.
6. Analyze different methods of capacity expansion in cellular system.
7. Study of GSM architecture, channels and call setup procedure.
8. Study of CDMA calls processing.
9. Study of LTE & 4G network design issues.
10. Study of HIPERLAN standards& MANET.
11. Study of wireless sensor networks and WATM.
12. Study of WAP standards & Home RF.

List of Assignments:

1. Visit mobile station/telephone switching & prepare visit report.
2. To carry out AT commands mobile communication using GSM trainer.
3. To understand CDMA trainer using DSSS technology.
4. Analyze Radio Propagation and Propagation Path Loss Models on Scilab.
5. Analyze principles of cellular communication on Scilab (Refer Wireless Communications by T. L. Singal).
6. Analyze capacity of CDMA, calculate processing gain, number of users per cell, bandwidth efficiency, open loop power control in CDMA on Scilab. (Refer Scilab Textbook Companion for Wireless Communications and Networking by V. Garg)
7. Prepare Ad-hoc network at your premises using mobile terminals/ laptops etc and analyze parameters like capacity, flexibility, complexity etc.

8. Comparison of HIPERLAN, WATM .
9. Understand about Wi-Fi network and its' different standards, protocols and requirements for connecting a Wi-Fi network on Virtual LAB. (Refer VLAB IIT Kharagpur, Advanced network Technologies Lab)
10. Simulating WiMAX network on Virtual LAB.(Refer VLAB IIT Kharagpur, Advanced network Technologies Lab)
11. Study the basics of Mobile and Adhoc network, various standards and different routing protocols including proactive and reactive on virtual lab.
12. Analyze Wireless Sensor Network Data Acquisition, Transmission, and Aggregation on virtual lab.

Text Books:

1. T L Singal, Wireless Communications, McGraw Hill Education India, 2014.
2. Kaveh Pahlavan, Prashant Krishnamurthy, Principles of Wireless Networks, Pearson Education Publication.

Reference Books:

1. William C.Y. Lee, Mobile Cellular Telecommunications- Analog & Digital Systems, Mc.Graw Hill, 1995
2. Wireless Communications (principles and practices) -(2nd Edition)- Theodore S. Rappaport (Prentice Hall of India).
3. Vijay Garg, Wireless Communication & Networking, Morgan Kaufmann Series

Syllabus for Unit Test:

Unit Test-IUnit- I, II, III

Unit Test-II Unit- IV,V, VI

AGRICULTURAL ELECTRONICS

Teaching Scheme	Examination Scheme
Lecture: 3 Hours/week	End Semester Exam: 60 marks
Tutorial: 1Hours/Week	Unit Test: 20marks
	Attendance: 10 marks
	Assignment: 10 marks
	TW& OR: 50 marks
	Credits: 04

Course Prerequisites:

Basic Electronics, Instrumentation & control systems.

Course Objectives:

1. To inculcate the ability to recognize environmental problems and to provide solutions to agricultural sector.
2. To give overview of technology of advanced topics like DAS, SCADA and Virtual Instrumentation.
3. To enable students to select practices needed to develop and implement the Engineering Automation for Agricultural sector.
4. To introduce Greenhouse Technology & Role of Electronics Governance.

Course Outcomes:

After successfully completing the course students will be able to

1. Describe the role of computers & virtual instrumentation.
2. Provide communication solution for interpreting environmental parameters with Electronics systems.
3. Describe Instrument technology used in agriculture & apply knowledge of Electronics in Agriculture.
4. Describe Greenhouse Technology & Role of Electronics Governance

Unit I [06Hours]

Review of computers & Virtual instrumentation

Data loggers, Data acquisitions systems (DAS), Supervisory control and data acquisition (SCADA), Basics of PLC, Functional block diagram of computer control system, alarms, interrupts. Virtual Instrumentation: Historical Perspective, advantages, Block diagram and architecture of virtual instrument, data flow techniques, graphical programming in data flow, comparison with conventional programming.

Unit II [06Hours]

Communication Systems

Use of field buses, functions, international standards, field bus advantages and disadvantages, Instrumentation network: sensor networks, Open networks-advantages and limitations, HART Network, Foundation field bus network. Profibus PA: Basics, architecture, model, network design. Foundation field bus segments: General consideration, network design

Unit III [06Hours]

Instrument technology for agriculture]

Instrument for measurement of pH, Electrical conductivity, gas analysis, humidity, leaf area, chlorophyll content, and soil moisture & temperature.

Unit IV [06Hours]

Precision Farming

An introduction to precision farming. GIS/GPS positioning system for precision farming, Yield monitoring and mapping, soil sampling and analysis. Computers and Geographic information systems. Precision farming- Issues and conditions. Role of electronics in farm machinery for precision farming.

Unit V [06Hours]

Electronics in Agriculture

Instrument for crop monitoring – moisture measurement – capacitive, infrared reflectance and resistance. Monitoring soil and weather – measurement of soil properties and meteorological parameters – irrigation control systems. Instruments for crop establishment monitoring. Crop spraying – selective crop spraying – flow control. Yield monitoring. Technology for precision farming. Instruments for protected cultivation – green house environment control – transducers and control system. Instruments and systems for crop handling processing and storage.

Unit VI [06Hours]

Applications & Electronics Governance

Greenhouse: History of modeling and control of Greenhouse, Identification of control and manipulation variables for Greenhouse. Crop Preservation : Importance of Preservation of various commodities and parts of plants, Drying process for preservation, Variable identification for drying process, Electronic control system for grape drying process. Agriculture & Electronics Governance: Governance products & services in agriculture sector, Role of Electronics Governance in Agricultural sector.

Content Delivery Methods:

Chalk & talk, Power point presentation NPTEL videos.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

List of Tutorials/Experiments

1. Case study of PLC.
2. Case study of Latest irrigation system.
3. Study of Profibus.
4. Role of GIS/GPS positioning system for precision farming.
5. Study of Computers and Geographic information systems for precision farming.
6. Concept of Crop preservation.

List of Assignments:

1. Study of Data Acquisition Systems (DAS).
2. Study of Data logger.
3. Study of basics of PLC and applications in Agriculture electronics.
4. Study of Communication systems used in Agriculture electronics.
5. Study of Transducers and control systems.
6. Study of electronics systems for PH, gas, humidity, conductivity and temperature measurement.
7. Study of selective crop spraying, flow control, yield monitoring, green house environment control.
8. Study of Electronics Governance in Agricultural sector.
9. Describe GIS/GPS positioning system for precision farming.
10. Describe advantages and disadvantages of field bus and Open networks.
11. Write a note on HART Network.
12. Write a note on Greenhouse.

Text Books

1. Curtis Johnson, "Process Control Instrumentation Technology"; 8th Edition, Pearson Education
2. Stuart A. Boyer, SCADA supervisory control and data acquisition, ISA Publication

Reference Books

1. De Mess M. N. Fundamental of Geographic Information System. John Willy & sons, New York, Datta S.K.1987.
2. K. Krishna Swamy, "Process Control"; New Age International Publishers
3. Kuhar, John. E. 1977. The precision farming guide for agriculturalist. Lori J. Dhabalt, USA
4. Manual of Soil & Water conservation Engineering. Oxford

Syllabus for Unit Test:

Unit Test-IUnit- I, II, III

Unit Test-II Unit- IV,V, VI

ELECTIVE-II SYSTEM ON CHIP

Teaching Scheme
Lecture: 3 Hours/week
Tutorial: 1 Hour/week

Examination Scheme
End Semester Exam: 60 Marks
Unit Test : 20 marks
Attendance: 10 marks
Assignment: 10 marks
TW & OR: 50 Marks
Credits:4

Course Prerequisites:

Digital Electronics, VLSI Design

Course objective:

1) To make students familiar with fundamentals of SOC design methodology.
2) To categorize requirements of SOC design.
3) To recognize essentials of SOC design.
4) To comprehend applications of SOC.

Course Outcomes:

On successful completion of this course, students will be able to

1) Conceptualize SOC design methodology
2) Understand SOC design flow
3) Design complex SOC
4) Intellectualize future trends in SOC design

UNIT-1 (06 Hours)

SOC Design Methodology

The age of Megagate SOCs, The fundamental trends of SOC design, An improved design methodology for SOC design.

UNIT -2 (06 Hours)

SOC Design

Hardware System Structure, Software trends, Current SOC Design Flow, Six Major Issues in SOC Design.

UNIT -3 (06 Hours)

SOC Architecture

The basics of Processor-Centric SOC architecture, Accelerating Processors for Traditional Software Tasks, System Design with Multiple Processors, New Essentials of SOC Design Methodology

UNIT -4 (06 Hours)

System-Level Design of Complex SOCs

Complex SOC System Architecture Opportunities, Major Decisions in Processor-Centric SOC Organization, Communication Design = Software Mode + Hardware Interconnect, Hardware Interconnect Mechanisms, The SOC Design Flow

UNIT -5 (06 Hours)

Advanced Topics in SOC Design

Pipelining for Processor Performance, Inside Processor Pipeline Stalls, Optimizing Processors to Match Hardware, Multiple Processor Debug and Trace, Issues in Memory Systems

UNIT -6 (06 Hours)

Scope of SOC

The designer's dilemma in SOC design, The SOC design transition, future of SOC design, Future applications of complex SOC.

List of Tutorials/Experiments:

1) Study of SOC Components
2) Study of Integration Technology in SOC with standard CMOS process.
3) Study of Technology challenges in SOC design.
4) Study of SOC design requirements

5) Study of SOC architecture
6) Study of SOC test methodology
7) Application of SOC in Communication
8) Application of SOC in Computer
9) Application of SOC in Consumer
10) Case study: Complex SOC

List of Assignments:

1) What are the challenges in SOC design? Describe in brief.
2) List various design elements, tools and methodologies playing an important role in SOC Design.
3) Using diagram, explain SOC design flow.
4) Which are the important issues in SOC design? Explain in detail.
5) Discuss the basics of processor -centric SOC design.
6) Write essentials of SOC design methodology.
7) Define complex SOC system architecture opportunities.
8) Explain major decisions in processor-centric SOC organizations.
9) Discuss pipelining and exceptions.
10) Explain issues in memory system.
11) Describe designer's dilemma wrt SOC.
12) List future applications of complex SOC.

Content Delivery Methods:

Chalk & talk, Power point presentation NPTEL videos.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

Text book:

1. Chris Rowen, Engineering the Complex SOC, Prentice Hall, 2004.

Reference books:

1. Rainer Leupers, Olivier Temam, Processor and System-on-Chip Simulation, Springer, 2010
2. Michael J. Flynn, Wayne Luk, Computer System Design System on Chip, Wiley, 2011
3. Bashir M. Al-Hashimi, System-on-Chip: Next Generation Electronics, IET, 2006
4. Steve Furber, ARM System on Chip Architecture, Pearson India, 2000
5. Wayne Wolf, Ahmed Amine Jerraya, Multiprocessor Systems-on-Chips, Elsevier, 2005
6. SudeepPasricha and NikilDutt, On-Chip Communication Architectures System on Chip
7. Interconnect, Elsevier, 2008

ELECTIVE-II SPEECH PROCESSING

Teaching scheme
Lecture: 3 Hours/Week
Tutorial: 1 Hour/Week

Examination scheme
End Semester Exam: 60 marks
Unit Test: 20marks
Attendance: 10 marks
Assignments: 10 marks
TW& Oral: 50 Marks
Credits : 04

Course Prerequisite:

Engineering Mathematics-III, Signals and Systems, Digital Signal processing

Course Objective:

1. To introduce acoustic theory and time domain models for speech processing.
2. To give overview of sampling, quantization and different modulation techniques.
3. To enable students to apply STFT analysis and speech synthesis
4. To introduce linear predictive coding a well as different techniques to enhance speech Quality

Course Outcomes :

At the end of the course, a student will be able to

1. Describe the mechanisms of human speech production and articulation mode of different classes of speech sounds determiner their acoustic characteristics.
2. Represent the speech signal in time domain and frequency domain.
3. Describe and implement methods & systems for efficient quantization and coding of speech signals.
4. Analyze and synthesize speech using different methods.
5. Distinguish between different speech recognition modes.

Unit I [06 Hours]

Speech Production and Hearing

Anatomy & physiology of speech organs,articulatory,acoustic phonetics.acostic theory of speech production,prosody,Anatomy & physiology of ear, sound perception, speech perception, vowel perception, consonant perception.

Unit II [06 Hours]

Speech Analysis

Short time speech analysis, time domain parameters, frequency domain parameters, LPC analysis, cepstral analysis, pitches estimation.

Unit III [06 Hours]

Coding of Speech Signals

Quantization, redundancies, Time domain, waveform coding Linear delta modulation, Adaptive delta modulation, adaptive differential pulse code modulation, Linear prediction based vocoders, phase vocoders channel vocoders and cepstral vocoders.

Unit IV [06 Hours]

Speech Synthesis

Principles of speech synthesis, synthesis methods, text to speech synthesis, Synthesis by rule, applications.

Unit V [06 Hours]

Speech Enhancement

Introduction, nature of interfering sounds speech enhancement techniques spectral subtraction & filtering, harmonic filtering, spectral subtraction, Adaptive noise cancellation.

Unit VI [06 Hours]

Automatic Speech Recognition

Parametric representation of speech, evaluation of similarity of speech patterns, various modes of speech recognition like MFCC, DTW, HMM Application.

Content Delivery Methods:

Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination.

List Tutorials/Experiments:

1. To study spectral analysis of a noisy signal using MATLAB.
2. To obtain LPC coefficients.
3. To study the spectrogram of an audio signal using MATLAB.
4. To study VQ for speech.
5. To perform text to speech synthesis using MATLAB.
6. Estimation of fundamental frequency using Cepstrum.
7. To find Cepstral pitch period using method of autocorrelation.
8. To plot Welch power spectral density estimates for vowels ‘a’ ‘e’.
9. To find Cepstral coefficients of voiced signal.
10. Speech classification on basis of frequency.

List of Assignments:

1. List out different speech processing applications.
2. Implement a Non-stationary nature of speech signal using Virtual laboratory.
3. Write a MATLAB program to find the envelope of the sound for the flute (Bansuri).
4. Describe any two speech recognition models.
5. Discuss different speech features like LPC, Cepstrum, MFCC, and Pitch.
6. Classify the different coders on the basis of waveform, parametric & transform domain coding of speech.
7. List out different applications of speech synthesis.
8. Different classifiers used in speech recognition.
9. Mention a real time application of speech technology.
10. Describe different types of software’s used for speech processing.
11. Discuss different speech enhancement techniques.
12. Classify the different Audio File formats.

Text Books

1. Doulgas O Shaughnessy "Speech Communication". Human and Machines Second Edition University Press.
2. Dr.Shaila D. Apte "Speech and Audio Processing," Wiley.

References

1. Lawrence Rabiner & Biing-Hwang Juang "Fundamentals of Speech Recognition Englewood Cliffs NJ:" PTR Prentice Hall (Signal Processing Series), c1993, ISBN 0-13-015157-2
2. L.R. Rabiner and R.W. Schafer "Digital Processing of Speech Signals" Prentice Hall.
3. Sadoaki Furui. "Digital Speech Processing: Synthesis and Recognition" CRC Press.

Syllabus for Unit Test:

Unit Test-IUnit- I, II, III

Unit Test-II Unit- IV,V, VI

ELECTIVE-II FUZZY LOGIC & NEURAL NETWORK

Teaching Scheme
Lecture: 03 Hours/week
Tutorial: 01 Hour/week

Examination Scheme
End semester exam: 60 Marks
Unit Test: 20marks
Attendance: 10 marks
Assignments: 10 marks
TW & Oral: 50 Marks
Credits: 04

Course Prerequisites:

Engineering Mathematics-II, Engineering Mathematics-III, Signals & Systems.

Course Objectives:

1. Introduce a relatively new computing paradigm for creating intelligent machines useful for solving complex real world problems.
2. Insight into the tools that make up the soft computing technique: fuzzy logic, artificial neural networks and hybrid systems Techniques.
3. To create awareness of the application areas of neural network technique
4. Provide alternative solutions to the conventional problem solving techniques in image / signal processing, pattern recognition / classification, control system.

Course Outcomes:

On successful completion of this course, students will be able to

1. Design fuzzy system for Electronics applications.
2. Describe the fundamentals of Crisp sets, Fuzzy sets, Fuzzy Relations and Fuzzy Logic Controller.
3. Describe the various architectures of building an ANN and its applications.
4. Design and implement neural network systems to solve real-world problems
5. Develop models for different applications using fuzzy system.

Unit I

Fuzzy Logic -I [05 Hours]

Concept of Fuzzy number, fuzzy set theory (continuous, discrete), Operations on fuzzy sets, Fuzzy membership functions (core, boundary, support), primary and composite linguistic terms, Concept of fuzzy relation, composition operation (T-norm, T-conorm), Fuzzy if-then rules.

Unit II [07 Hours]

Fuzzy Logic -II

Fuzzification, Membership Value Assignment techniques, De-fuzzification (Max membership principle, Centroid method, Weighted average method), Concept of fuzzy inference, Implication rules- Dienes-Rescher Implication, Mamdani Implication, Zadeh Implication, Fuzzy Inference systems -Mamdani fuzzy model, Sugeno fuzzy model, Tsukamoto fuzzy model, Implementation of a simple two-input single output FIS employing Mamdani model Computing.

Unit III [06 Hours]

Fuzzy Control Systems

Assumptions in a Fuzzy Control System Design, Fuzzy Logic Controllers, Comparison with traditional PID control, advantages of FLC, Architecture of a FLC: Mamdani Type, Example Aircraft landing control problem, washing machine and vacuum cleaner.

Unit IV [05 Hours]

Artificial Neural Network -I

Biological neuron, Artificial neuron model, concept of bias and threshold , Mc Culloch-Pits Neuron Model, implementation of logical AND, OR, XOR functions Soft Topologies of neural networks, learning paradigms: supervised, unsupervised, reinforcement, Linear neuron model : concept of error energy , gradient descent algorithm and application of linear neuron for linear regression, Activation functions : binary , bipolar (linear, signup, log sigmoid, tan-sigmoid) Learning mechanisms: Hebbian, Delta Rule o Perceptron and its limitations Draft.

Unit V [07 Hours]

Artificial Neural Network -II

Multilayer perceptron (MLP) and back propagation algorithm, Application of MLP for classification and regression, Self-organizing Feature Maps, k-means clustering, Learning vector quantization Radial Basis Function networks: Cover's theorem, mapping functions (Gaussian, Multiquadrics, Inverse multi quadrics), Application of RBFN for classification and regression, Hopfield network, associative memories.

Unit VI [06 Hours]

Adaptive Neuro-Fuzzy Inference Systems (ANFIS)

ANFIS architecture, Hybrid Learning Algorithm, Advantages and Limitations of ANFIS Application of ANFIS/CANFIS for regression

Content Delivery Methods:

Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination.

List of Tutorials/Experiments:

1. Study of Fuzzy sets and operations.
2. Study of concepts of fuzzy sets core, support, alpha cuts..
3. Study of fuzzy relation, Max-min composition.
4. Analyze t-norms and t-conorms.
5. Analyze Fuzzy Inference systems -Mamdani fuzzy model, Sugeno fuzzy model, Tsukamoto fuzzy model.
6. Analyze architecture of a FLC: Mamdani Type with Example Aircraft landing control problem, washing machine and vacuum cleaner.
7. Study of learning mechanisms, approaches and activation functions in ANN.
8. Study of Multilayer perceptron (MLP) and back propagation algorithm.
9. Study of Radial Basis Function networks.
10. Study of ANFIS architecture and Hybrid Learning Algorithm.

List of Assignments:

1. Implement simple logic network using MP neuron model
2. Implement a simple linear regressor with a single neuron model.
3. Implement and test MLP trained with backpropagation algorithm
4. Implement and test RBF network.
5. Implement SOFM for character recognition.
6. Perform fuzzy sets operations.
7. Implement fuzzy membership functions (triangular, trapezoidal, gbell, PI, Gamma, Gaussian).
8. Implement defuzzyfication (Max-membership principle, Centroid method, Weighted average method)
9. Implement FIS with Mamdani inferencing mechanism.
10. Implement Simulink model for Vacuum cleaner, washing machine using Fuzzy Logic tools
11. Implement Fuzzy Logic Controller.
12. Implement perceptron learning, multilayer feed forward neural networks.

Text Books:

1. Fundamentals of Neural Networks: Architectures, Algorithms and Applications, Laurene Fausett, Pearson Education, Inc, 2008.
2. Fuzzy Logic with Engineering Applications, Third Edition Thomas, Timothy Ross, John Wiley & Sons,2010.
3. Neuro- Fuzzy and Soft Computing, J.S. Jang, C.T. Sun, E. Mizutani, PHI Learning Private Limited.
4. Principles of Soft Computing , S. N. Sivanandam, S. N. Deepa, John Wiley & Sons, 2007

Reference Books:

1. Introduction to the theory of neural computation, John Hertz, Anders Krogh, Richard Palmer, Addison –Wesley Publishing Company, 1991

2. Neural Networks A comprehensive foundation,, Simon Haykin,Prentice Hall International Inc- 1999.
3. Neural and Adaptive Systems: Fundamentals through Simulations, José C. Principe Neil R. Euliano , W. Curt Lefebvre, John-Wiley & Sons, 2000
4. Pattern Classification, Peter E. Hart, David G. Stork Richard O.Duda,Second Edition,2000
5. Pattern Recognition, SergiosTheodoridis , Konstantinos Koutroumbas, Fourth Edition, Academic Press, 2008
6. A First Course in Fuzzy Logic, Third Edition, Hung T. Nguyen, Elbert A. Walker, Taylor & Francis Group, LLC, 2008
7. Introduction to Fuzzy Logic using MATLAB, S. N. Sivanandam ,S.Sumathi, S. N. Deepa, Springer Verlag, 2007

Syllabus for Unit Test:

Unit Test-IUnit- I, II, III

Unit Test-II Unit- IV,V, VI

SEMINAR

Teaching Scheme
Lecture: 00 Hours/week
Practical: 02 Hours/week

Examination Scheme
TW & Oral: 50 marks
Total Credits: 01

Course objective:

1. To develop ability of thinking and motivation for seminar
2. To expose the students to the state of the art
3. To develop ability to perform literature survey
4. To develop Seminar presentation and Technical Communication Skills

Course Outcomes:

On successful completion of this course, students will be able to

1. Effectively communicate his technical idea or project
2. Learn master survey and literature survey techniques
3. Write Motivational Statement
4. Present the topic

Seminar Documentation should include

Cover Title page, plagiarism assessment, report Certificate from Guide, Abstract, list of Figures, List of Tables, Abstract, Presentation Slide using Microsoft power point including bibliography/references in IEEE standard format.

The student shall submit the seminar report in standard format, duly certified for satisfactory completion of the work by the concerned Guide and head of the department.

PROJECT STAGE - II

Teaching Scheme
Lecture: 00 Hours/week
Practical: 08 Hours/week

Examination Scheme
TW & Oral: 150 marks
Total Credits:08

Course prerequisites:
Project Stage -I

Course objective:
1. To familiarize the students with the product development cycle.
2. To impart the importance of working as a team.
3. To introduce the student to literature survey and documentation process.
4. To encourage the students to visualize and formulate a viable solution to practical engineering problems.

Course Outcomes:

On successful completion of this course, students will be able to
1. Implement solution for an Engineering problem.
2. Test and troubleshoot the implemented design.
3. Execute the project implementation & financial budget in a timely manner.
4. Student will be able to contribute and work effectively as team member.
5. Generate project report and present it effectively.

Project Stage –II includes various steps such as:
1. System design
2. Testing
3. System documentation
4. Project report

RULES REGARDING ATKT, CONTINUOUS ASSESSMENT AND AWARD OF CLASS

Standards of Passing and ATKT Rules

1. For all courses, both UE (Universtiy Evaluation) and IA (Internal Assessment) constitue separate heads - of - passing (HoP). In ordar to pass in such courses and to 'earn' the assigned credits.
   a) The learner must obtain a minimum grade point of 5.0 (40 % Marks) at UE and also a minimum grade point of 5.0 (40 % Marks) at IA.

OR

   b) If he/she fails in IA, the learner passes in the course provided he/she obtains a minimum of 25% in IA and GPA for course is atleast 6.0 (50% Aggregate). The GPA for a course will be calculated only if the learner passes at the UE.
2. A student who fail at UE in a course has to reappear only at UE as a backlog candidate and clear the HoP. Similarly, A student who fails in a course at IA has to reappear only at IA as backlog candidate and clear the HoP.

Rules of ATKT

1. A student is allowed to carry backlog of courses prescribed for B.Tech Sem - I, III, V, VII to B.Tech Sem - II, IV, VI, VIII respectively.
2. A student is allowed to keep term of Sem - III, if he/she is failing in any number of subjects of Sem I & II.
3. A student is allowed to keep term of Sem - V, if he/she is failing in any number of subjects of Sem - III & IV but passed in all subjects of Sem - I & II.
4. A student is allowed to keep term of Sem - VII, if he/she is failing in any number of subjects of Sem - V & VI but passed in all subjects of Sem - III & IV.

Award of Class for the Degree Considering CGPA

Award of Honours

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The Criteria for the Award of Honours at the End of the Programme are as given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
9.50 ≤ CGPA ≤ 10.00	0	Outstanding	80 ≤ Marks ≤ 100
9.00 ≤ CGPA ≤ 9.49	A+	Excellent	70 ≤ Marks ≤ 80
8.00 ≤ CGPA ≤ 8.99	A	Very Good	60 ≤ Marks ≤ 70
7.00 ≤ CGPA ≤ 7.99	B+	Good	55 ≤ Marks ≤ 60
6.00 ≤ CGPA ≤ 6.99	B	Average	50 ≤ Marks ≤ 55
5.00 ≤ CGPA ≤ 5.99	C	Satisfactory	40 ≤ Marks ≤ 50
CGPA Below 5.00	F	Fail	Marks Below 40