BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE

Faculty of Management Studies
MCA
New Syllabus

Bharati Vidyapeeth

(Deemed To Be University), Pune (India)

***Accredited 'A+' Grade (2017) By NAAC ***
***'Category -I' University Status by UGC ***
*** 'A' Grade University Status by MHRD Govt. of India ***
*** Ranked '63rd' by NIRF-2020 under University Category ***

Faculty of Management Studies

Board of Studies in Computer Applications

Master of Computer Applications Programme

(MCA)

(2022 Course)

(Under Choice Based Credit System)

To be implemented from 2022-23

Content

Bharati Vidyapeeth (Deemed To Be University), Pune India
Faculty of Management Studies (Board of Studies in Computer Applications)
Master of Computer Applications Programme (2022 Course)
(Under Choice Based Credit System)
To be effective from 2022-23 at Part I

I. INTRODUCTION:

The MCA Program is a full time 108 credits programme offered by Bharati Vidyapeeth (Deemed to be University), Pune and is conducted in regular and distance mode at its Management Institutes in Pune, Karad, Kolhapur, Sangli, and Solapur. This programme is also conducted in onlne mode at CDOE under BV(DU). All the five institutes have excellent faculties, laboratories, library, and other facilities to provide proper learning environment. The University is reaccredited by NAAC with an 'A+' grade (3rd cycle). The expectations and requirements of the software industry, immediately and in the near future, are visualized while designing the MCA programme. This effort is reflected in the Vision and Mission statements of the MCA programme. Of course, the statements also embody the spirit of the vision of Late Dr. Patangraoji Kadam, the Founder of Bharati Vidyapeeth and Chancellor, Bharati Vidyapeeth Deemed to be University which is to usher in "Social Transformation through Dynamic Education."

II. VISION STATEMENT OF MCA PROGRAMME

Achieve excellence in Computer Applications with respect to teaching, learning and research to meet the growing needs of the industry and society.

III. MISSION STATEMENT OF MCA PROGRAMME

- Promote outcome-based learning strategies in-order to meet global industry standards.
- Encourage innovations and problem-solving capabilities in students and faculty.
- Cultivate collaborative research in both, students and faculty members through industry interactions and collaborations.
- Enhance entrepreneurship skills among students.

IV. PROGRAMME UNIQUE FEATURES

Keeping the view of National Education Policy, MCA Programme is designed with following features

- MCA is 2 year masters programme with 114 credits.
- The structure of programme is common for all learning modes - Regular, Distance, Online
- Provision to acquire interdisciplinary knowledge through MOOCs covering total 12 credits.

- Interdisciplinary General Courses covering Human Ethical Values, Life Skills, Swachh Bharat, Environmental Studies to make students aware about environment concerns and human values.
- Students can choose any of the elective group through which he/she will be trained in specialized area for better career.
- Internship project provides a platform which gives acquaintance for solving IT problems.

V. PROGRAMME OBJECTIVES

1: To build a strong foundation for students to become proficient in all academic concepts and technical skills necessary to become an IT Professional.

2: To provide a conducive environment for designing, implementing and testing various software applications through Software Development.

3: To keep the students and faculty abreast with the emerging technologies in the field of computer applications.

4: To bring professionalism amongst the students and promote holistic development.

5: To involve students in sustainable IT practices and community services.

VI. PROGRAMME OUTCOMES (PO)

PO1: Computational Knowledge: Apply knowledge of computing fundamentals, mathematics and given domain to design appropriate models for a given problem and/or requirements.

PO2: Problem Analysis: Apply fundamental knowledge of software engineering and various systems domain in order to analyze, identify, formulate and provide the solution to given problem.

PO3: Design/Development of Solutions: Design and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations.

PO4: Conduct research in Computing problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage: Use of modern tools for delivering milestones like problem analysis, design, development, testing and deployment.

PO6: Professional Ethics: Learn and inculcate professional ethics, cyber regulations, professional responsibilities and norms of professional computing world.

PO7: Lifelong Learning: Acknowledge the need for continuous professional development and practice it through self-motivated, independent learning.

PO8: Management Domain: Involving in projects development as individual or group to solve problems in various domains and environments using computational and management skills.

PO9: Communication Efficacy: Demonstrate efficacy in verbal and non-verbal means of communication like reports, design documentation and presentations to elaborate about complex computing.

PO10: Innovation and Entrepreneurship: Provide conducive environment for innovation and entrepreneurship leading to solutions for betterment of society.

VII. PROGRAMME SPECIFIC OUTCOMES

PSO1: Ability to learn the various programming languages with database concepts and development environment

PSO2 : Ability to apply theoretical and practical knowledge to solve business problems in effective software solution through data communication technology concepts.

PSO3 : Enrich the knowledge in the areas of Advanced technologies and business practices.

PSO4 : Foster analytical and critical thinking abilities for efficient programming

PSO5 : Flourish the innovation and research attitude to develop IT artefact.

PSO6 : Maintain the personality with environmental and social concerns

VIII. ELIGIBILITY FOR ADMISSION:

Admission to the programme is open to any Graduate (10+2+3) of any recognized University satisfying the following conditions.

1. Passed BCA/ Bachelor Degree in Computer Science Engineering or equivalent Degree. OR Passed B.Sc./ B.Com./ B.A. with additional bridge Courses (Bridge Course I/ Bridge Course II)as per the norms of the University.

OR

Passed any graduation degree (e.g. BE/ BTech/ BSc/BCom/BA/B.Voc/ etc) preferably with mathematics at 10+2 level or at Graduation Level

2. The candidate should have secured at least 50% marks (45% for SC/ST) in aggregate at graduate level university examination.
3. For students having no Mathematics background compulsory bridge course framed by the Bharati Vidyapeeth (Deemed to be University) and additional bridge course related to computer subjects should be completed
4. The candidate studying in final year of Bachelor's degree may also apply. Admission of such candidates will remain provisional until submission of final result certificates in original.
5. Subject to the above conditions, the final admission of final admission is based solely on –

a. The merit at All India Entrance Test conducted by Bharati Vidyapeeth (Deemed to be University), Pune.
b. Submission of Migration Certificate, Transfer Certificate, anti-ragging affidavit etc.

IX. DURATION OF THE PROGRAMME

The duration of this programme is two years divided into four semesters or a minimum of 114 credits whichever is later. The medium of instruction and examination will be only English.

X. MOOC Policy :

MOOCS stands for Massive Open Online Courses. The student will complete MOOCS courses prescribed by Institute from following sources in respective semesters. Following are the sources from where Students/Learners can undertake MOOCs

1. iimb.ac.in
2. swayam.gov.in
3. alison.com
4. edx.org
5. nptel.com (technical courses)
6. Coursera

7. harvardx.harvard.edu
8. udemy.com
9. futurelearn.com
10. Indira Gandhi National Open University (IGNOU)
11. National Council of Educational Research and Training (NCERT)
12. National Institute of Open Schooling (NIOS)
13. National Programme on Technology Enhanced Learning

(NPTEL)Important Note:

- Students should complete the MOOCs during four semesters of the program.
- Students have to submit completion certificate of all MOOCs. Unless certificate of all MOOCs are not submitted the mark sheet of the final semester will not be issued.

XI. SCHEME OF EXAMINATION:

For some courses there is Internal Assessment (IA) conducted by the respective institutes as well as a University Examination (UE) at the End-of-the Term. UE will be conducted out of 60 marks and IA will be conducted for 40 marks then these are converted to grade points and grades as per the Table I. For courses having only Continuous Assessment (CA) the respective institutes will evaluate the students in varieties of ways during the term for a total of 100 marks. Then the marks will be converted to grade points and grades using the Table I.

XII. STANDARD OF PASSING:

For all courses, both UE and IA constitute separate heads of passing (HoP). In order to pass in such courses and to earn the assigned credits, the student/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.

If Student fails in IA, the learner passes in the course provided, he/she obtains a minimum 25% marks in IA and GPA for the course is at least 6.0 (50% in aggregate). The GPA for a course will be calculated only if the learner passes at UE.

A student who fails at UE in a course has to reappear only at UE as backlog candidate and clear the Head of Passing. Similarly, a student who fails in a course at IA he has to reappear only at IA as backlog candidate and clear the Head of Passing. to secure the GPA required for passing.

The 10 point Grades and Grade Points according to the following table

Range of Marks (%)	Grade	Grade Point
80≤Marks≤100	O	10
70≤Marks≤80	A+	9
60≤Marks≤70	A	8
55≤Marks≤60	B+	7
50≤Marks≤55	B	6
40≤Marks≤50	C	5

Marks < 40	D	0

Table I : Grade Points and Grades

The performance at UE and IA will be combined to obtain GPA (Grade Point Average) for the course.The weights for performance at UE and IA shall be 60% and 40% respectively.

GPA is calculated by adding the UE marks out of 60 and IA marks out of 40.The total marks out of 100are converted to grade point, which will be the GPA.

Rules of ATKT

For course upto four semesters, a student is allowed to carry any number of Backlogs of a prescribed course in Sem-I, II, III to Sem-IV provided he appears and have backlogs

A student can appear for any four continuous semesters in an examination season including the regular semester, provided the student has appeared and have backlogs for other three semesters.

Formula to calculate Grade Points (GP)

Suppose that "Max" is the maximum marks assigned for an examination or evaluation, based on which GP will be computed. In order to determine the GP, Set x = Max/10 (since we have adopted 10 point system). Then GP is calculated by the following formulas

Range of Marks	**Formula for the Grade Point**
$8x \leq Marks \leq 10x$	10
$5.5x \leq Marks \leq 8x$	Truncate (M/x) +2
$4x \leq Marks \leq 5.5x$	Truncate (M/x) +1

Two kinds of performance indicators, namely the Semester Grade Point

Average (SGPA) and theCumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester, while the CGPA measures the cumulative performance in all the courses since his/her enrollment. The CGPA of learner when he /she completes the programme is the final result of the learner.

The SGPA is calculated by the formula

$$SGPA = \frac{\sum Ck * GPk}{\sum Ck}$$

where, Ck is the Credit value assigned to a course and GPk is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study during the Semester, including those in which he/she might have failed or those for which he/she remained absent. **The SGPA shall be calculated up to two decimal place accuracy.**

The CGPA is calculated by the following formula

$$CGPA = \frac{\Sigma C_k * GP_k}{\Sigma C_k}$$

where, Ck is the Credit value assigned to a course and GPk is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the studyfrom the time of his/her enrollment and also during the semester for which CGPA is calculated. The CGPA shall be calculated up to two decimal place accuracy.

The formula to compute equivalent percentage marks for specified CGPA: = (Final CGPA-0.5)*10

XIII. Award of Honors :

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 are given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
9.5≤CGPA ≤10	O	Outstanding	80≤Marks≤100
9.0≤CGPA ≤9.49	A+	Excellent	70≤Marks≤80
8.0≤CGPA ≤8.99	A	Very Good	60≤Marks≤70
7.0≤CGPA ≤7.99	B+	Good	55≤Marks≤60
6.0≤CGPA ≤6.99	B	Average	50≤Marks≤55
5.0≤CGPA ≤5.99	C	Satisfactory	40≤Marks≤50
CGPA below 5.0	F	Fail	Marks below 40

Important Note:

- Student or Learner is expected to write Two Research Papers and publish it in Peer Reviewed Journals.
- A Student /Lerner can carry any number of backlog paper till Semester-IV provided his/her academic term(s) is/are granted

XIV. Question Paper Patterns for University Examination:

Question Paper Pattern for University Examinations (Common for Regular and Distance mode)
[The marks will be converted to appropriate UE : IA ratio]

*The pattern of **question paper** for the courses having University Examinations will be as follows:*

Title of the Course

Day: **Total Marks: 100**

Date: **Time: 3 Hours**

Instructions:

a. Attempt any FIVE questions from Section I Each question carries 12 Marks.

b. Attempt any TWO questions from Section II Each question carries 20 Marks.

SECTION – I

It should contain 06 questions covering the syllabus & should test the conceptual knowledge of the students	
Question	**Marks**
Q.1 ……	(12 marks)
Q.2 ……	(12 marks)
Q.3 ……	(12 marks)
Q.4 ……	(12 marks)
Q.5 ……	(12 marks)
Q.6 Write **Short Notes** on ANY TWO	(12 marks)
SECTION – II	
It should contain 03 questions covering the entire syllabus & should be based on application of the Concepts	
Q.7……..	(20 marks)
Q.8……	(20 marks)
Q.9……..	(20 marks)

Question Paper Pattern for University Examinations (Online Mode)

*The pattern of **question paper** for the courses having University Examinations will be as follows:*

Title of the Course

Day : **Total Marks: 70**

Date: **Time: 03 Hours**

Instructions: 50 Marks objective questions

Subjective 20 marks. Solve any FOUR, each carries 5 marks

SECTION-I

Question 1 **25 Objective Questions carrying 2 Marks each**	**Marks(50)**

SECTION – II

It should contain 06 questions covering the syllabus & should test the conceptual knowledge of the students	
Question	**Marks**
Q.2 ……	(5 marks)
Q.3 ……	(5 marks)
Q.4 ……	(5 marks)
Q.5 ……	(5 marks)
Q.6 ……	(5 marks)
Q.7 ……	(5 marks)

XV.SEMESTER WISE COURSE STRCTURE

	Semester I	**Credits**	**Hours/Week**			**IA Marks**	**EoTE Marks**
			L	T	P		
101	Applied Database Management Systems	4	3	1	-	40	60
102	Computer Networks	4	3	1	-	40	60
103	Java Programming	4	3	1	-	40	60
104	Computational Statistics	4	3	1	-	40	60
105	Management Concepts and Applications	4	3	1	-	40	60
106	Lab on Applied Database Management Systems	3	1	0	4	40	60
107	Lab on Java Programming	3	0	0	6	40	60
108	MOOCS-I *	4	-	-	-	00	00
109	Open Course-I **	2	2			50	00
		32	**18**	**05**	**10**	**330**	**420**

*Student has to complete MOOCS compulsory [Please refer MOOCS guidelines as per pointno. X]

**** Student can select any one of the following courses as Open Course - I in consultation with HOD/Coordinator**

Sr. No.	**(109) Open course – I**
1	**Universal Human Values (UHV)**
2	**Cyber Security**
3	**Soft Skills**

	Semester II	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
201	Object Oriented Software Engineering	4	3	1	-	40	60
202	Cloud Computing Concepts	4	3	1	-	40	60
203	Data structures using Python	4	3	1	-	40	60
204	Data Warehousing and Data Mining	4	3	1	-	40	60
205	Web Supporting Technologies	4	2	1	4	40	60
206	Lab on Data Structures using Python	3	0	0	6	40	60
207	Minor Project – 1	3	3	-	-	00	100
208	MOOCS-II *	4 4	-	-	-	-	00
209	Open Course-II**	2	2			50	
		32	**19**	**05**	**10**	**290**	**460**

*Student has to complete MOOCS II compulsory [Please refer MOOCS guidelines as per pointno. X]

**** Student can select any one of the following courses as Open Course- II in consultation with HOD/Coordinator**

Sr. No.	(209) Open course – II
1	Foreign Language
2	Digital Technology
3	Human Psychology at Workplace

	Semester III	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
301	Software Design Patterns	4	3	1	-	40	60
302	Artificial Intelligence	4	3	1	-	40	60
303	Information Security	4	3	1	-	40	60
304	EL-GRP-1 (A)	3	2	1	-	100	-
305	EL-GRP-2 (A)	3	2	1	-	100	-
306	Lab on Software Testing	3	1	0	4	40	60
307	Minor Project – 2	3	3	-	-	00	100
308	MOOCS-III *	4	-	-	-	-	00
309	Open Course-III **	2	2	-	-	50	00
		30	**19**	**05**	**04**	**410**	**340**

*Student has to complete MOOCS II compulsory [Please refer MOOCS guidelines as per pointno. X]

**** Student can select any one of the following courses as Open Course- III in consultation with HOD/Coordinator**

Sr. No.	(309) Open course – III
1	Social Change in Technology
2	Water Management
3	Economics for IT Industry

	Semester IV	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
401	Seminar on Recent Trends in IT[#]	4	-	-	-		100
402	El-GRP - 1 (B)	3	2	1	-	100	-
403	El-GRP –2 (B)	3	2	1	-	100	-
404	Major Internship Project	10	-	-	-	-	100
		20	**07**	**07**	**-**	**200**	**200**

Practical Examinations:

For courses 106, 107, 205, 206 and 306 University Practical Examination will be held and marks will be reported to the University.

Project Guidelines:

Minor Project I (207) and Minor Project II(307)

Students are expected to choose a problem which will provide software solutions. The project should be based on the courses student students studied in the previous semester. The projects can be completed as individual project or if the scope of the project is comprehensive then project can be divided into modules by the project guide and a group of students can work on it. The number of students in the group can be decided by project guide and it should not be less than 2 and more than 4. Every student or group must have meeting about progress of project with their project guide regularly as specified in time table or if required at a communicated by guide.

The project dissertation/document is expected to be created and it should have the following contents.

a. SRS – Problem Statement, BRD- Business Requirement Document
b. General Requirement
c. Requirement as per user Role
d. System design (RED/Class Diagrams, DFD/Activity diagrams)
e. User screen design and client side validation
f. Database Design
g. User interface design /user manual
h. Test cases
i. Scope and limitation
j. Conclusion
k. Bibliography

Major Internship Project (404)

The student is expected to get exposure of industry through 'Major Internship Project'. Guidelines about project are as bellow.

1. Student must undergo 60 Days Industrial Internship.
2. Every project will be evaluated by University appointed panel at the end of the semester.
3. Student must report about the progress of project to the internal project guide regularly as specified in time table or if required at a time given by guide.

Seminar on Recent Trends in IT: (401)

Student will select any topic of interest and study it thoroughly throughout the semester. At the end of the semester, student will give a presentation on the topic before the panel appointed by the University and submit the seminar report.

XVI. List of Elective Groups:

Elective Code	Elective Group	Subject Code	Subjects
01	Cloud Computing	A	Virtualization
		B	AWS
02	Data Science	A	Statistical Programming in R
		B	Introduction to Data Science
03	Linux	A	Linux Desktop Environment, Shell Programming and System Administration
		B	Linux Internals and Network Administration
04	Open Source Technologies	A	Perl Scripting
		B	Ruby
05	Mobile Computing	A	Java Script
		B	Android
06		A	C# Programming and Applications

	Dot Net Technologies	B	ASP Dot Net with MVC
07	Net Centric Technologies	A	HTML 5
		B	AJAX Programming
08	Information Systems	A	Recommender System
		B	Knowledge Management
09	IOT	A	IoT Architecture Sensors and Fundamentals with Hands-on lab
		B	Internet Of Things: Sensing And Actuator Devices and Smart city use case
10	Big Data	A	Introduction to Big Data
		B	Business Intelligence Tools With Hadoop
11	Cyber Security	A	Introduction to Information Security
		B	Information Security Threats and Mitigation Strategies
12	Data Management	A	Data Management Environment
		B	Industrial Data Management and Security

XVII. Bridge Course I:

This course is designed and compulsory for the students from Non-IT background. The course can be conducted concurrently with semester I courses. The evaluation of this course will be at institute level for 100 marks. The student must score minimum 40 marks to pass this course. There will be no credits assigned to this Bridge Course.

Subject Name	Bridge Course I
No. of Credits	00
Pre Requisite	Basic Mathematics and MSCIT course
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Basic formula for finding areas, volumes, graphical representation of data is to be remembered.
Understanding	Do calculations by using formulas, algorithm, C program structure are to be understood
Applying	Apply basic knowledge of mathematics and computers to write programming codes.
Analyzing	Analyze the problem to represent in proper format such as graphs, trees for effective working
Evaluating	Evaluate the programs or problems for algorithms, logic
Creating	Creating proper program logic so as to reduce lines of codes is expected
Unit	**Content**
1.	Algorithm ,flow charts, integers, division, relations, relations and their types, representation of relation in computer memory, number conversion systems
2.	Trees, applications of trees, tree traversal algorithms, minimum spanning trees
3.	Fundamentals of C programming, Keywords and Identifiers, Constants, Variables, Data types, Declaration of variables, Declaration of variables as constant, Operators, Types of operators, Input and Output functions - printf(), scanf(), getchar(), putchar(), Formatted input and formatted output.
4.	Control Statements- Sequential, Selection, Iteration Statements, Branching structure- if statement, if-else statement,Nested if-else statement, else if Ladder, Conditional operator, switch statement, Loop control structures- while loop, do-whileloop, for loop, Nested for loop, Jump statements-break, continue, goto statements

5.	Function call, return statement, Function parameters, Types of functions, Arrays and functions
6.	Introduction to OOP concepts.
Text Books	1. Discrete Structures by Kenneth Rosen 2. C programming by Yashwant Kanetkar 4. Object Oriented Programming by Balguruswamy
Reference Books	C Programming language by Brain W. Kernighan

Bridge Course II :

This course is designed and compulsory for the students from Non-Mathematics background and who have not completed mathematics in their 12^{th} or graduation course. The course can be conducted concurrently with semester I courses. The evaluation of this course will be at institute level for 100 marks. The student must score minimum 40 marks to pass this course. There will be no credits assigned to this Bridge Course.

Subject Name	Bridge Course II
No. of Credits	00
Course Objective	To prepare background of the student to study courses in MCA
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Remembering basic concepts and their representations
Understanding	Understanding applications of various discrete structures like sets, relations, graphs etc.
Applying	Applying various structures to represent problem data.
Analyzing	Learn to analyze the data for the given problem for representing it using proper structure.
Evaluating	Evaluate the problem for proper discrete structures.
Creating	Design new structures based on basic discrete structures to represent data..
Text Books	Discrete Structures by Kenneth Rosen
Course Plan	
Unit	**Content**
1.	**Set Theory :** Definition of a set, Representation of elements of sets, Methods of representing sets , types of sets, operations on sets , cardinality of a set, Principle of Inclusion and Exclusion , Venn Diagram , Proof by using Venn diagram
2.	**Functions and Relations :** Definition of Function, Types of Functions ,Composite Function, Relation definition, representation of relations
3.	**Logic:** Propositions, Logic Operations-Negation, Disjunction, Conjunction, Conditional and Biconditional, Truth Tables of compound propositions, Translating English sentences in to logical statements and vice versa, Logic gates and circuits

4.	**Matrices:** Matrix Definition, General Form, Representation of matrix in computers, Types of matrices, Operations on matrices: Addition, Subtraction and Multiplication, transpose , row / column transformations , Inverse of the matrix by Co-factor and Adjoint method, solutions to three variable problems by using matrices, application problems of matrices
5.	**Graphs -** Graph terminologies, types of graphs, representation of graph in computers, Paths, Eular and Hamilton graphs, graph colorings.

SEMESTER I

Subject Name	**101 Applied Database Management Systems**
No. of Credits	4 Credits
Pre Requisite	Basics of Computing and Data Storage
Course Objectives	• To teach the fundamentals of the database systems at a master level. A variety of topics will be covered that are important for modern databases in order to prepare the students for real life applications of databases. • To impart knowledge of the concepts related to database and operations on databases. It also gives the idea how database is managed in various environments with emphasis on security measures as implemented in database management systems.
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	• Remember the database concepts
Understanding	• Understand the concept of database and techniques for its management • Understand data security standards and methods. • Understand the fundamentals of Distributed Database Systems
Applying	• Design different data models at conceptual and logical level and translate ER Diagrams to Relational Data Model. • Normalize the database.
Analyzing	• Identify and study the file organization schemes for DBMS. • State and Describe features for Concurrency and Recovery.
Evaluating	• Convert the relational algebra statements to the SQL statements.
Creating	• Design the queries using Relational Algebra
Unit	**Content**
1	**Introduction to DBMS (5 Lectures)** Difference between Data, Information, Data Processing & Data Management. File Oriented Approach, Database oriented approach to Data Management, Need for DBMS, Characteristic of Database, Database Architecture: Levels of Abstraction, Database schema and instances, 3 tier architecture of DBMS, Data Independence. Database users, Types of Database System. Database Languages, DBMS interfaces .
2	**Data Modeling in Database (7 Lectures)** Data Models, Logical Data Modeling : Hierarchical Data Model, Network Data Model, Relational Data Model. Conceptual Data Modeling: Entity Relationship Model, Entities, Attributes, Types of Attributes, Relationships, Relationship set, Degree of relationship Set, Mapping Cardinalities, Keys, ER Diagram Notations, Roles Participation: Total and Partial, Strong and Weak Entity Set.The extended entity relationship (EER) model, Subclass, Superclass, generalization, specialization, Attribute Inheritance. Relational Data Model : Codd's Rules for RDBMS, Translating ER Diagram toRelational Database.
3	**Normalization and Relational Algebra: (7 Lectures)** Normalization Vs De-Normalization, Decomposition, Lossy and

	Lossless Decomposition,FunctionalDependencies,Normal forms 1NF, 2NF, 3NF, BCNF, Case Studies on Normalization. **Relational Algebra:** Keys: Composite, Candidate, Primary, Secondary, Foreign,Relational Algebra Operators: Select, Project, Divide, Rename. Set Operations: Union, Intersect, Difference, And Product,Joins: Outer Joins, Inner Joins with example.
4	**File Structures and Data Administration: (6 Lectures)** File Organization, Overview of Physical Storage Media, Magnetic Disk, RAID, Tertiary Storage, Storage Access, Data Dictionary Storage, Organization of File (Sequential, Clustering), Indexing and Hashing, Basic Concepts, indices, B+ Tree index file, B- tree index file, Static hashing, Dynamic Hashing
5	**Concurrency Control And Recovery Techniques: (7 Lectures)** **Concurrency Control:** Single User and Multiuser systems, Multiprogramming and Multiprocessing, Basic Database access operations, Concept of transaction, transaction state, ACID properties, Schedules, Serializability of schedules., Concurrency Control, Need for Concurrency control, lock based protocols, timestamp based protocols, Multiple granularity, Multiple Version Techniques, Deadlock and its handling, Wait-Die and Wound-Wait, Deadlock prevention without using timestamps, Deadlock detection and time outs, Starvation **Recovery Techniques:** Database Recovery, Types of Failures, Storage Structure: Volatile, Non Volatile and stable storage, Data access. Recovery and atomicity, Recovery Techniques / Algorithms: Log Based Recovery, Check points, Shadow Paging.
6	**Data Administration And Security: (7 Lectures)** Data administration, Role and Responsibility of DBA, Creating/Deleting/Updating table space, Database Monitoring, User Management. Basic data security principles – user privileges, data masking, encryption and decryption. Data Security Implementation, revalidation of user, role, privileges. Data Quality Management, Basic quality principles, data quality audit, data quality improvement
7	**Introduction to Distributed Database, NOSQL and MongoDB (6 Lectures)** Heterogeneous and Homogeneous Databases, Distributed database features and needs, Advantages and Disadvantages, Distributed DatabaseArchitecture. Levels of distribution, transparency, replication. Fragmentation. • Introduction to NoSQL – Architecture, Sharding , Replica sets • NoSQL Assumptions and the CAP Theorem • Strengths and weaknesses of NoSQL • MongoDB Functionality Examples
Text Books	

Reference Books	1. "Fundamentals of Database Systems" Global Edition By RamezElmasri, Shamkant B. Navathe 2. "Database System and Concepts"ASilberschatz, H Korth, S Sudarshan, published by McGraw-Hill. 3. "Practical MongoDB" by Shakuntala Gupta Edward, Navin Sabharwal published by APress. **Suggested MOOC :**Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com, www.coursera.com

Subject Name	**102. Computer Networks**
No. of Credits	4 Credits
Pre Requisite	Knowledge about hardware , network devices and data communication concepts
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Using some basic concepts of Computer Hardware and Network terminology for development of basic networks in the organization .
Understanding	By remembering students the basic concepts students will understand the concepts of Network topology, network operating systems and how the networks are developed ad per the need of the organization
Applying	Students will Have thorough knowledge about Computer Network and its use for the Information Sharing , device sharing and use of various new network technologies .
Analyzing	Students will acquire a good knowledge of the computer network, its architecture and operation. Student will be able to pursue his study in advanced networking courses (This knowledge will help them to create base for the Network Electives to be studied in the next semesters). Students will be able to follow trends of computer networks. So, students will get exposer to advanced network technologies like MANET, WSN, and 4G.
Evaluating	Ability to select proper method to design the network systems, selecting the proper tool to design the network protect the network from misuse.
Creating	Design and create their own procedure to protect the computer network and use the sharing proper resources .
Unit	**Content**
1	**Introduction to Computer Networks (6 Lectures)**

	Basic concepts of computer hardware and network terminology, What is Computer Network? Network Goals and Motivations, Application of Networks, Network Topologies, Classification of Networks, **Network software in brief:** Network Protocols, Protocol Hierarchies, Design issues for the Layers, Connection Oriented and Connectionless Services, Service Primitives, Relation of services to Protocols, **Network Models:** The OSI Reference Model, The TCP/IP Reference Model, Comparison of OSI and TCP/IP Reference Model, A critique of OSI Model, A critique of TCP/IP Model, **Examples of some networks:** Internet, X.25, ISDN, Frame relay, ATM, Ethernet, Wireless LANs- (wi-fi)
2	**Data Transmission and Physical Layer: (7 Lectures)** **Signals:** Analog and Digital Signals, Data Rate, Transmission Impairment, Signal Measurement: Throughput, Propagation Speed and Time, Wavelength, Frequency, Bandwidth, Spectrum **Transmission Media& its Characteristics:** Guided and Unguided Media, Synchronous and Asynchronous Transmission, Multiplexing**:** FDM, WDM, TDM, Switching**:** Circuit, Message and Packet Switching.
3	**Unit 3: Network Layer: (7 Lectures)** **Network Layer Design Issues; Routing Algorithms:** Static/ Dynamic , Direct/ Indirect, Shortest Path Routing, Flooding, Distance Vector Routing , Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, **Congestion Control Algorithms:** General Principal of Congestion Control, congestion prevention polices, Load shedding, Jitter Control, **IP Addressing:** IP-Protocol, IP-Address Classes (A, B, C, D, E), Broadcast address, Multicast address, Network Mask.
4	**Unit 4: Transport and Application Support Protocols (7 Lectures)** Transport service, Service Primitives, Internet, and Transport Protocols: TCP/UDP, Remote Procedure Calls, RTP, **Session Layer:** Token Concept **Presentation Layer:** Data Encryption and Data Security, Message Authentication,
5	**Unit 5 : Advance Networks: (7 Lectures)** Concept of 4G Networks, Introduction of 802.16, 802.20, Bluetooth, Infrared, MANET, Sensor Networks. Technical Issues of Advanced Networks, **Mobile Ad-hoc Networks:** Introductory concepts, Destination- Sequenced Distance Vector protocol, Ad Hoc On-Demand Distance Vector protocol, **Wireless Sensor Networks:** Sensor networks overview: Introduction, applications, design issues, requirements.
6	**Unit 6: Internet Basics (7 Lectures)** Concept and Characteristics of Internet , Intranet, Extranet . Structure of Internet through Client Sever . Domain name , Website Development formats for Business Applications. **Practical Application on:** Domain Name Service, Telnet, FTP, SMTP, SNMP, MIME, POP, IMAP, WWW,HTTP, TCP/IP, LAN, WAN Some basic Operations and commands.
7	**Unit 7 : Mobile Network - (7 Lectures)**

	Mobile Telephone Systems: various generations mobile technology , Smart Mobile facilities and Apps on Mobile . Sub netting, Internet control Protocol-ICMP, IGMP, Mobile-IP, IPv6
Text Books	1.A.S. Tanenbaum, **Computer Networks** (4th ed.), Prentice-Hall of India, Latest Edition 2.W.BehrouzForouzan and S.C. Fegan, **Data Communication and Networking,** McGraw Hill, Latest Edition 3. William Stalling "Data and Computer Communication"
Reference Books	1. Network Essential Notes GSW MCSE Study Notes 2. Internetworking Technology Handbook CISCO System 3. Introduction to Networking and Data Communications Eugene Blanchard 4. Computer Networks and Internets with Internet Applications Douglas E. Comer. 5. Computer Network in Brief : - http://www.nripesheschool.com 6. JyotiBiradar (Patil),Anil Gaikwad "Software Project Management - Made Easy" Lambert Academic Publishing House Dec.2019 .
MOOC on NPTEL	https://nptel.ac.in/courses, http://www.freetechbooks.com/computer network ,In house on www.bharatividyapeeth.edu , Computer Network in Brief : -http://www.nripesheschool.com/

Subject Name	**103. Java Programming**
No. of Credits	**4 Credits**
Pre Requisite	Any programming Language and Concepts of OOP
Cognitive Abilities	At the end of this course, student should be able to • Design interfaces, abstract and concrete classes needed, given a problem specification • Implement classes designed using object oriented programming language • Make them comfort to muse Java API for Input/output and Java Collections and utility classes • Able to achieve object persistence using object serialization and write modules to take advantages of concurrent programming
Remembering	▪ Java language Data Types, control structures, OOP concepts, ▪ Java API to handle numbers, strings ▪ Get knowledge about core Java API (Wrapper classes; String classes, Math class) ▪ Java API hierarchy for Input/output, collections and concurrent programming
Understanding	▪ Understanding how to write, compile and run a Java program. ▪ Structure of class and using Inheritance among them. ▪ How to create Arrays. ▪ Come to know need of inheritance, abstract class and interface and how to use them ▪ Get knowledge about core Java API, API hierarchy for Input/output, collections and concurrent programming
Applying	▪ **Design** classes and interfaces for given problem statement by making use of OOP concepts. ▪ Using proper I/O classes and Collections classes for given problem statement.
Analyzing	▪ Analyze a given problem statement to identify classes and relationships among them and making use of Java API efficiently.
Evaluating	▪ Given a problem statement; students should able to decide/ best mechanism of class design using is_a or has_a relationships. ▪ Read/listen a problem statement and able to decide which I/O classes to be used. ▪ Able to debate about when make to use of threads and which collection implementation should be used.
Creating	Writing Java Applications with use of classes, interfaces and taking advantages of polymorphism.
Unit	**Content**
1	**Introduction to Java (9Lectures)** Java Basics: Features of Java, History of Java, Installations of JDK and

	eclipse as IDE Writing and executing first Java program. Understanding role Java compiler, JVM, Understanding how Java is platform independent and secure. Java data types, variables, operators, expressions, type conversion and casting in Java. Control structures in java: if, if-else and switch statements, using iterative/looping statements in Java: while, do-while and for. Writing functions: Need of functions/methods, Writing and using static method; concepts of passing values and returning
2	**Class and Object Concepts: (7Lectures)** Introduction to Object Oriented concepts, Defining a class, creating objects from class, adding attributes and methods to the class, using constructors, Java naming conventions for class, properties and methods/functions. Passing values to the functions – pass by value, pass by reference, Function overloading. Modifiers – public, private, protected, default, static, final Understanding use of Wrapper classes and Garbage collection in Java
3	**Arrays and Strings (6Lectures)** One dimensional arrays, Multidimensional arrays, exploring String class and methods, String Buffer class. Packages - creating and accessing a package, importing, packages, creating user defined packages, Concept of package. Introduction to Exception Handling and user defined exceptions.
4	**Inheritance and Polymorphism(6Lectures)** Concept and importance of inheritance, is-a relationship, types of inheritance, Polymorphism – function overriding, dynamic method dispatch. Overriding methods with throws clause. Using abstract and final keywords with class declaration, Concept of interface, Comparison of Interface and class. Access modifiers and data accessibility in derived classes, method access modifier and method overriding.
5	**Concurrent Programming (7Lectures)** Concept of threads, lifecycle of threads, creating threads, Thread class, Runnable interface, Thread synchronization, inter thread communication – wait(), notify(), notifyAll() methods .
6	**Java Input/Output (7Lectures)** Concept of streams, types of streams – byte streams, character streams, The Console: System.out, System.in, and System.err Understanding File class, InputStream class, OutputStream class, FileInputStreams, FileOutputStream, Using character oriented Reader and Writer class, FileReader, FileWriter. Introduction to Buffered streams – DataInput and DataOutput Streams using BufferedReader, BufferedWriter. Making use of Object Streams for Serialization and deserialization
7	**Java Collections and Utility Classes(8Lectures)** Introductions to generics: generic types and methods

	Collection Basics- A Collection Hierarchy, Using ArrayList and Vector, LinkedList, making use of Iterator to access collection elements. Set: HashSet, LinkedHashSet, TreeSet , Role of Comparable and Comparator interfaces, Introduction Map: Hashmap, HashTable, TreeMap, LinkedHashMap Understanding bounded types, erasures.
Text Books	Herbert Schildt, Java: The Complete Reference, McGraw-Hill Osborne Media;
Reference Books	1. Herbert Schildt, Java: The Complete Reference, McGraw-Hill Osborne Media; Seventh Edition, 2007 2. Cay S. Horstmann and Gary Cornell ,Core Java-Volume-I, Sun Core Series, Eighth Edition, 2008 3. Bruce Eckel , Thinking In Java – Printice Hall, Fourth Edition

Subject Name	**104 Computational Statistics**
No. of Credits	4 Credits
Pre Requisite	
Course Objectives	**.**Tobuild a strong foundation for students to become proficient in all Statistics concepts and theirApplicationnecessary to become aDatascience Professional. **.**To provide a conducive environment for understanding,implementing and Prediction on various Historical data. **.** To keep the students and faculty abreast with the emerging technologies in the field of computer applications. **.** To bring professionalism amongst the students and promote holistic development.
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	• Remember the definitions of concepts
Understanding	• Understand the concept of Statistics and their methods for its Data Analytics • Understand data engineering and standards and methods. • Understand the fundamentals of statistics and their Application
Applying	• Data engineering and their concept
Analyzing	• Identify and study the data foranalytics purpose. • State and Describe features for Analytics
Evaluating	• Future Prediction for historical data
Creating	• Write programming of R for Data Analysis
Unit	**Contents**
1	**Introduction to Statistics** (**4Lectures**): Meaning of Statistics as a Science, Importance of Statistics Scope of Statistics, Types of data: Primary data, Secondary data , Cross-sectional data, time series data, directional data, classification data and its classification, ungrouped frequency distribution,, grouped frequency distribution, cumulative frequency distribution, and relative frequency distribution.
2	**Measures of Central Tendency** (**15Lectures**): Concept of central tendency of statistical data, Statistical averages, characteristics of a good statistical average. Arithmetic Mean (A.M.): Definition, effect of change of origin and scale, combined mean of a number of groups, merits and demerits, trimmed arithmetic mean. Mode and Median: Definition, formulae (for ungrouped and grouped data), merits and demerits, Quartiles, Deciles and Percentiles (for ungrouped and grouped data), Geometric Mean (G.M.): Definition, formula, merits and demerits. Harmonic Mean (H.M.): Definition. Formula, merits and demerits. mean Weighted Mean: weighted A.M., G.M. and H.M. Measures of Dispersion :Concept of dispersion, characteristics of good measure of dispersion.

	Range, Quartile deviation Mean deviation: Definition, merits and demerits, Variance and standard deviation
3	**Moments, Skewness and Kurtosis** (**6Lectures**) : Concept of Raw and central moments, Formulae for ungrouped and grouped data (only first four moments), relation between central and raw moments upto fourth order. (without proof) , Measures of Skewness, Types of skewness, Pearson's and Bowley's coefficient of skewness, Measure of skewness based on moments, Measure of Kurtosis: Types of kurtosis, Measure of kurtosis based on moments
4	**Correlation** (**5Lectures**): Bivariate data, Scatter diagram and interpretation., Concept of correlation between two variables, positive correlation, negative correlation, no correlation. variance between two variables , Karl Pearson's coefficient of correlation (r) , Spearman's rank correlation coefficient, compute Karl Pearson's correlation coefficient between ranks
5	**Regression** (**5Lectures**) Meaning of regression, difference between correlation and regression, Concept of error in regression, error modeled as a continuous random variable. Simple linear regression model Estimation of a, b by the method of least squares. Interpretation of parameters.
6	**Time Series** (**5Lectures**) Meaning and utility , Components of time series , Additive and multiplicative models , Methods of estimating trend : moving average method, least squares method and exponential smoothing method(with graph and interpretation)
7	**Introduction to R Programming** (**15Lectures**) Concept of R, Installation of R, Data Types , Vector, List, Frame, Array, Matrix, Statistics Commands, Base graphics, Data manipulation with data table ,concept of cluster, Concept of Prediction Model ,Analysis of Real world Problem
Text Books	
Reference Books	1. Fundamental of Statistics byS.C.Gupta 2. Freedman, David, Robert Pisani, & Roger Pervis(2007).*Statistics.*New York: W. W. Norton. 3. James, Gareth, Daniela Witten, Trevor Hastie, & Robert Tibshirani(2013).*An Introduction to Statistical Learning: With Applications in R.* New York: Springer. **Suggested MOOC :**Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com, www.coursera.com

Subject Name	105. Management Concepts and Applications
No. of Credits	4Credits
Pre Requisite	General awareness about the organization and atomization used
Remembering	Students are expected to recalling day to day management concepts that are unknowingly applied in real life situations
Understanding	Gathering information about management ,its origin and the contributions of some of the management gurus is achieved .
Applying	Students will learn implementation of management functions in real life cases so as to justify decision being taken and through ERPs availability
Analyzing	Students will learn fact finding in a situation using the objectives of each functions' achievement and its effective utilisation in e commerce environment
Evaluating	Generating or creating the ability amongst the students in fact finding techniques and evaluating the actual performance with the planned.
Creating	Students are expected to capture the new cases in real life situation and create a solution in the form of model so as to resolve the problem such as ERPs
Unit	Contents
1	**Management (9 Lectures)** Definition and Meaning ,Nature and purpose ,Evolution of Management thoughts, Contributions of F.W Taylor ,Contributions of Henry Fayol, Human relations approach, System approach to management, Skills and Functions of a manager
2	**Planning (9 Lectures)** Definition and Importance ,Types of Plans, Types of Planning , Steps in Planning ,Limitations of Planning ,Planning Premises, Management by Objectives (MBO):Concept, Objective setting Process, Benefits and Weaknesses, concept of software project planning (9)
3	**Organization (9 Lectures)** Definition ,nature of organizing, importance , process of organizing ,organization chart ,structure of IT organization , New Organisational Designs – Project, Matrix, Organic Structure & Mechanistic Structure Challenge of Modern Organisation, Virtual Organisation,Case study (7)
4	**Staffing (8 Lectures)** Nature & Significance, A brief knowledge of Recruitment, Selection, Training & Development, Performance Appraisal in IT organisation. Case study (8)
5	**Directing and Controlling (15 Lectures)** Nature, Concept of Leadership, Leadership Styles, Theories of Leadership, Charismatic Leadership Theory, Role of Software Team Leader, case study , Concept and Importance of Control, Control Process, Types of Control Mechanism, Responsibility and authority , Management by Exceptions, case study.
6	**Decision making (6 Lectures)**

	Decision making and its process, Decision making conditions , need of computer based decision making , decision support system, expert system.
7	**Introduction to E-commerce (6 Lectures)** E commerce types,E commerce spread in recent years ,E commerce importance ,Security measures under E commerce, introduction to Enterprise Resource Planning (ERP) ,ERP advantages, Introduction to SAP
Text Books	1.Principles of Management by L M Prasad, Sultan Chand Publications 2.E – Commerce: Strategy, Technologies and Applications" by David Whiteley
Reference Books	1. Principles of management by TRamaswamy , Himalaya Publications 2. Principals of Management by Tripathi and Ready, 3. New Era of Management by Richard Daft ,South Western Sangage Learning 4.Management Principles and Practices by Lallan Prasad and SS Gulshan. Publications :Excel Books India. 5.Decision Support System , Janaki Raman ,PHI publications

Subject Name	**106 Lab on Applied Database Management Systems**
No. of Credits	3 Credits
Pre Requisite	Concept of Database Management Systems, Familiarity with data processing concepts and applications.
Course Objective	• To practice the application of the concepts related to database its techniques and Operations. • SQL (Structured Query Language) is introduced in this subject.Thishelpsto create strong foundation for application of database design.
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Make use of different operators as per the questions
Understanding	Understand the theoretical and physical aspect of a relational database.
Applying	Implementation of RDBMS concepts through Oracle.
Analyzing	Observe the performance of the query with different data sets.
Evaluating	Test the results obtained from the different queries, PL/SQL blocks, functions
Creating	Construct Simple and complex queries on sample datasets Writing PL/SQL blocks
Unit	**Contents**
1	**Introduction to Oracle and SQL (8 Lectures)** History, Features, Versions of Oracle, Database Structure: Logical Structure and Physical Structure, Oracle Architecture: System Global Area Processes: Server Processes, Background Processes, Tools of Oracle: SQL * Plus, PL/SQL, Forms, Reports, Pre Compilers:SQL Loader, Import, Export. **Introduction to SQL** Keywords, Delimiters, Literals, Data Types, Components of SQL: **DDL Commands**– Defining a database in SQL, Creating table, changing table definition, removing table, Creating Tables with constraints on row level and column level, primary key, foreign key, check. Altering Constraints. **DML Commands**- Inserting, updating, deleting data, **DQL Commands**: Select Statement with all options. Renaming table, Describe Command, Distinct Clause, Sorting Data in a Table, Creating table from a table, Inserting data from other table, Table alias, and Column alias. **DCL commands**- Granting and Revoking Permissions
2	**Operators and Functions (5 Lectures)** **Operators:**Arithmetic, Logical, Relational, Range Searching, Pattern Matching, IN & NOT IN Predicate, all, % any, exists, not exists clauses, Set Operations: Union, Union All, Minus, Intersect, Grouping data. **Functions :**Aggregate Functions, Numeric Functions, String Functions, Date Functions,

	Conversion Functions, MiscellaneousSub queries **Joins:**Relating data through join concept. Simple join, equi join, non equi join, Self join, Outer join
3	**Database Objects (5 Lectures)** **Views:**Introduction, Creating a View, Selecting data from a view, Updateable views, Views on multiple tables, Destroying a View. **Sequences:**Introduction, Creating a Sequence, Altering a Sequence, Referencing a Sequence, Dropping a Sequence. **Index:**Introduction, Creating Index, Simple Index, Unique Index, Reverse Key Index, Dropping Index.
4	**Introduction To PL/SQL (5 Lectures)** Introduction, Advantages, PL/SQL Block, PL/SQL Execution Environment, PL/SQL Character set, Literals, Data types, PL/SQL Block: Attributes %type, %rowtype,Variables, Constants, Displaying User Message on screen, Conditional Control in PL/SQL, Iterative Control Structure: While Loop, For Loop, Goto Statement, Commit, Rollback, Savepoint
5	**Cursor Management and Triggers (5 Lectures)** **Cursor**:Explicit& Implicit Cursor, Declaring Cursor Variables, Constrained & Unconstrained Cursor Variables, Opening Cursor, Fetching Cursor into Variables, Closing Cursor, Cursor For Loops, Parametric Cursors. **Triggers:**Definition, Syntax,Parts of triggers:statement, body, restricted, Types of triggers: Enabling& disabling triggers.
6	**Stored Procedures / Functions and Exception Handling (5 Lectures)** Introduction, How oracle executes procedures/ functions, Advantages, How to createProcedures& Functions, Examples. **Error Handling in PL/SQL:** Exception Handling & Oracle Engine, Oracles Named Exception Handlers, User NamedException Handlers.
7	**MongoDB (7 Lectures)** Installation of MongoDB, Checking Shell, Creating Users and Enabling Authorization, Basic Querying Using Shell, sorting, indexing – single indexing and compound indexing, Using Conditional Operators in queries
Text Books	References (Books, Websites etc.): 1. Ivan Bayross SQL,PL/SQLThe Programming Language of Oracle 3rd Revised Edition BPB Publications 2. "Practical MongoDB" by Shakuntala Gupta Edward, NavinSabharwal by APress.
Reference Books	**Suggested MOOC :** Please refer these websites for MOOCS: NPTEL / Swayamwww. edx.com ; www.coursera.com

Subject Name	**107 Lab on Java Programming**
No of Credits	**3 Credits**
Course Objective	This is companion course of Object Oriented Programming Practical aspects of OOP towards problem solving is covered.
Prerequisite	**Theoretical Knowledge of Java Programming**
Course Outcome	The students will develop adequate programming skills with respect to following • Write simple programs to use basic programming language constructs • Design interfaces, abstract and concrete classes needed, given a problem specification • Implement classes designed using object oriented programming language • Learn how to test, verify, and debug object-oriented programs and create programs using • Make them comfort to muse Java API for Input/output and Java Collections and utility classes • Able to achieve object persistence using object serialization and write modules to take advantages of concurrent programming
Unit No	**Programming Exercises**
1	**Introduction to Java** Writing, compiling and Executing Java programs using basic language constructs as bellow - Using Operators : arithmetic, relational, logical and bitwise - Control structures (if, if-else, switch) - Iterative statements (while, do-while, for)
2	**Class and Object Concepts** - Wring a class, creating objects and using it - Using constructors to initialize object - Programs to demonstrate parameter passing - Making use of access modifiers
3	**Arrays and Strings** - Programs to work with single dimensional and multidimensional arrays - Searching and sorting - Programming with string and operations on it - Programs to understand and study string literal pool
4	**Inheritance and Polymorphism** - Defining classes as generic types ; using it to write new class/classes

	– Need and example of method overriding – Writing abstract class and interface – Using abstract classes to write concrete classes – Using interface as base type to write new interface and implementing it to write new concrete class/classes – Anonymous and inner classes
5	**Concurrent Programming** – Designing and using Thread class and Runnable interface – Thread synchronization – Program to demonstrate Thread priorities, thread join and making use of yield – Programs with classes making use of thread and inter communication between them.
6	**Java Input/Output** – Programs to make using InputStream and OutStream classes. – Reading and Writing data into files – Making use to console to read data. – Using readers and writers to write data into Files – Making use of Buffered Streams and reader and writer – Programs to take advantages of serialization
7	**Java Collections and Utility Classes** – Programs to make use collections (ArrayList, Vector, Set and Maps) – Writing user defined generic data types types – Programs to illustrate bounded types and erasures
Reference Books :	1. Herbert Schildt, Java: The Complete Reference, McGraw-Hill Osborne Media; Seventh Edition, 2007 2. Cay S. Horstmann and Gary Cornell ,Core Java-Volume-I, Sun Core Series, Eighth Edition, 2008 3. Bruce Eckel ,Thinking In Java – Printice Hall, Fourth Edition

The outline provided above provides the types of computational problems are expected to be given to students. List of the example assignment is provided here; these assignments are just examples and it is not limited to this only.

Subject Name	**109 Universal Human Values**
No. of Credits	**2 Credits**
Pre Requisite	
Course Objectives	• To help the student to see the need for developing a holistic perspective of life. • To sensitize the student about the scope of life – individual, family, society and nature/existence. • Strengthening self-reflection. • To develop more confidence and commitment to understand, learn and act accordingly.
Cognitive Abilities	**Course Outcomes**
Remembering	To provide an overview of Prerequisites to Human Values
Understanding	Understand the role of a human being in ensuring harmony in self and society
Applying	To actualize a harmonious environment wherever they work
Analyzing	To analysing ethical dilemma while discharging duties in professional life
Evaluating	To evaluate ethical and unethical decisions and take a right stand
Creating	To develop a harmonious environment for holistic development of self and body
Syllabus	
1	**Introduction to Value Education& Harmony in Human Being** 1. Value Education, Definition, Concept and Need for Value Education. Self exploration as a means of Value Education.
2	**Harmony in the Human Being** 1. Human Being is more than just the Body. 2. Harmony of the Self ('I') with the Body - happiness and physical facility 3. Understanding Myself as Co-existence of the Self and the Body. 4. Understanding Needs of the Self and the needs of the Body. Understanding the activities in the Self and the activities in the Body
3	**Harmony in the Family and Society and Harmony in the Nature** 1. Family as a basic unit of Human Interaction and Values in Relationships. 2. The Basics for Respect and today's Crisis: Affection, e, Guidance, Reverence, Glory,

	Gratitude, Prosperity and Love. 3. Comprehensive Human Goal: The Five Dimensions of Human Endeavour. 4. Harmony in Nature: The Four Orders in Nature. 5. The Holistic Perception of Harmony in Existence.
4	**Professional Ethics** 1. Value based Life and Profession. 2. Professional Ethics and Right Understanding. 3. Competence in Professional Ethics. Issues in Professional Ethics – The Current Scenario.
Reference Books	• Human Society in Ethics & Politics by Bertrand Russell publisher Taylor and Francis 2015 reprint • Ethical Philosophy of India by I.C. Sharma publisher Johnsen 1965
OnlineResources:	• https://fdp-si.aicte-india.org/verifiedProgramDetailsList.php • https://citizenchoice.in/course/Universal-Human-Values/Unit%201/Happiness-and-Prosperity
MOOCs:	Swayam.gov.in https://epgp.inflibnet.ac.in

Subject Name	**109 Soft Skills**
No. of Credits	**2 Credits**
Pre Requisite	
Course Objectives	• To familiarise students about the various soft skills • To boost students' communication and presentation skills
Course Outcomes	• Development of Critical and reflective thinking; • Self-management and self awareness skills amongst the students
1	**Introduction to Soft Skills** Introduction ,the objectives of soft skills development , Integral Parts of Soft Skills ,Outcomes of Soft Skills Development ,Personal Developmental Plan (PDP), self awareness
2	**Communication Skills** Definition, Nature and Scope of Communication ,Importance and Purpose of Communication, Process of Communication ,Types of Communication, Aspects of communication skills ,verbal and non verbal communication skills, Essentials of Effective Communication
3	**Presentation Skills** Objectives , Types of presentations, factors to be considered while preparing presentation , creating a Presentation, delivering a Presentation, attending a Presentation , body Language and etiquettes
4	**Time Management Skills** Need, objectives, time management techniques , benefits of time management , factors to be considered -delegation of task, prioritse work,creating schedule,set up deadline,Overcome Procrastination,dealing with stress, avoiding multitasking,start early etc.
Reference Books	.Soft Skills 3rd Edition: Personality Development for Life Success By Prashant Sharma , BPB publications Time Management: The Brian Tracy Success Library by Brian Tracy

Subject Name	**109 Cyber Security**
No. of Credits	**2 Credits**
Pre Requisite	
Course Objectives:	• To understand different types of threats . • To know the ways of different cyber attack being adopted . • To recognize types of viruses such as malware, virus, hacking and cracking activities.
Course Outcomes:	• To understand techniques of encryption . • To understand the term Cryptography and its importance in computer forensics and cyber security To identify Cyber Crime and the action thereof .
1	**CyberSecurity** Meaning of Cyber security ,meaning of Cyber Crimes, ways of achieving Cyber Security, IT Act, Computer Ethics and Security Policies, Guidelines to choose web browsers, Guidelines for setting up a Secure password, Online Banking Security, Mobile Banking Security ,Web Application Security, Digital Infrastructure Security
2	**Information Security-** Threat to business continuity due to accidents related to information systems, Cyberspace, Information assets, Vulnerabilities ,Information security measures, Threats such as Unauthorized intrusion, Unauthorized access, Eaves dropping , Spoofing ,Alteration , Cracking.
3	**Kinds of Cyber-attack** Information leakage, DoS attack, Rumor, Flaming, SPAM e-mail , Computer virus ,Macro virus, Worm, Bot (botnet, remote operated virus), Trojan horse, Spyware, Ransomware, Key logger, Root kit, Backdoor, Fake anti-virus software
4	**Cryptography-** **Meaning of cryptography , e**ncryption , decryption ,Symmetric cryptography , Public key cryptography
Reference Books	1.Fundamentals of Cyber Security by BhushanMayank , BPB Publications **2.** Foundations of Information Security :A Straight forward Introduction by Jason Andress

Subject Name	201. Object Oriented Software Engineering
No. of Credits	4 Credits
Pre Requisite	Programming skills, Database Concepts.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Should be able to remember various steps carried out in development of software.
Understanding	Should be able to understand requirements of the user.
Applying	Should be able to apply object oriented concepts and UML diagrams to the defined problem.
Analyzing	Should be able to analyze requirements of the user and convert to functionalities of the software.
Evaluating	Should be able to Evaluate design of the existing software.
Creating	Should be able to de Design their own software.
Unit	Contents
1	**Software and Software Engineering (5 Lectures)** The nature of software, Software Engineering Concept, SDLC, Process Models: Waterfall Model, V Model, Prototyping Model, Spiral Model, RAD (Rapid Action Development) Model
2	**Object Oriented Concepts, Modeling and UML(5 Lectures)** 2.1 What is Object Orientation? (Introduction to class, object, inheritance, polymorphism) 2.2 Modeling 2.2.1 Introduction of Modeling 2.2.2 Object Oriented Modeling 2.3 UML (Unified Modelling Language) 2.3.1 History of UML 2.3.2 UML Diagrams 2.4 Iterative Development with RUP and Phases of RUP
3	**Requirement Understanding and Requirement Modelling with Use Case Diagram (5Lectures)** 3.1 Requirement Engineering 3.2 Requirement Elicitation 3.3 Developing Use Cases 3.4 Use Case Diagram 3.4.1 Realization of Use Cases 3.4.2 Finding Actors 3.4.3 Defining Relations among Use case 3.4.4 Writing Use Cases 3.5 Activity Diagram
4	**Basic and Advanced Structural Modeling (10 Lectures)** 4.1 Class Diagram 4.1.1 Identifying the elements of an object model

	4.1.1 Identifying classes and objects 4.1.2 Specifying the attributes 4.1.3 Defining operations 4.1.4 Finalizing the object definition 4.1.5 Advanced class Modelling 4.1.6 Interface, Types and Roles 4.2 State Chart Diagram 4.3 Package Diagram 4.4 Object Diagram
5	**Interaction Modelling (5 lectures)** 5.1 Introduction to Interaction Diagrams 5.2 Need of Interaction Diagrams 5.3 Interaction Diagrams 5.3.1 Collaboration Diagram 5.3.2 Sequence Diagram
6	**Architectural Modeling (5 Lectures)** 6.1 Component Diagram 6.1.1 Need of Component Diagram 6.1.2 Realization of Components 6.1.3 Relating Components 6.2 Deployment Diagram 6.2.1 Software Architecture 6.2.2 Architectural Styles 6.2.3 Representing Architecture using Deployment Diagram
7	**Case Studies (10 Lectures)** 7.4 Discussion on following case Studies- a. Library Management System b. Hospital Management System c. Online Shopping d. Nukari.com website e. Matrimonial website
Text Books	1. Software Engineering by Pressman Publisher BPB
Reference Books	1. The Unified Modeling Language User Guide by Grady Booch, James Raumbaugh, Ivar Jacobson. Publisher Addison-Wesley Professional 2. Object Oriented Software Engineering Use case driven approach by Ivar Jacobson Publisher Pearson 3. UML Distilled by Martin Fowler Publisher Addison-Wesley Professional 4. UML Toolkit 2 by Hans-Erik Eriksson Publisher Wiley.

Subject Name	202. Cloud Computing Concepts
No. of Credits	4 Credits
Pre Requisite	1. Knowledge of Web technologies 2. Knowledge of Web services andmultimedia 3. Knowledge of DBMS
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	How to provide Flexible and scalable infrastructures
Understanding	Increased availability of high-performance applications to small/ medium-sized businesses
Applying	Reduces implementation and maintenance costs
Analyzing	The case studies will help us to understandmore of practice of cloud computing in the market.
Evaluating	Comparison of cost-wise solution to the problem and selecting the best solution for the problem suggested to the organization
Creating	Creating flexible and scalable infrastructure suitable to the organizational need
Unit	Contents
1	**Cloud Computing Fundamentals (10 Lectures)** Definition of Cloud Computing, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public Vs private clouds
2	**Virtualization And Cloud Computing (7 Lectures)** Role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications, Visualizing Virtualization, Managing Virtualization, Taking Virtualization into the Cloud
3	**Service Oriented Architecture And The Cloud (7 Lectures)** Defining Service Oriented Architecture, Understanding the Coupling, Implementation of Service Oriented Architecture (SOA), Understanding Services in the Cloud, Serving the Business with SOA and Cloud Computing.
4	**Cloud Applications (7 Lectures)** Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages.
5	**Management Of Cloud Services (7 Lectures)** Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics: Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs (e.g Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat)
6	**Application Development (7 Lectures)** Service creation environments to develop cloud based applications.

	Development environments for service development; Amazon, Azure, Google App.
7	**Cloud It Model (7 Lectures)** Analysis of Case Studies when deciding to adopt cloud computing architecture. How to decide if the cloud is right for your requirements. Cloud based service, applications and development platform deployment so as to improve the total cost of ownership (TCO)
Text Books	1. Cloud Computing: Principles and Pardigms by RajkumarBuyya, jamesBroberg and Andrzej M.Goscinski, Wiley, 2011. 2. Distributed & Cloud computing, Kai Hwang, GeofferyC.Fox,jack Elsevierm,2012 3. Cloud Computing implementation,management and security by John W.Rittinghouse,James E Ransome,CRCPress,Taylor& Francis group,2010 4. Cloud Computing a practical approach by Anthony T.Velte,TobyJ.Velte Robert Elsenpeter,Tata Mc Graaw Hill edition,2010
Reference Books	1. Cloud Application Architecture by George Reese,Oreillypublishers 2. Cloud computing and SOA convergence in your enterprise,byDavidS.Linthicum,Addison- Wesley

Subject Name	**203. Data Structures and Algorithms using Python**
No. of Credits	**4 Credits**
Pre Requisite	School Level Mathematics. It does not assume any prior knowledge of programming.
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Using some motivating examples to remember and quickly builds up basic concepts such as conditionals, loops, functions, lists, strings and tuples.
Understanding	Students will get acquainted built in data structures in python, understand features and programming constructs of python language. During this course, they will understand main control structures of procedural programming languages. understand the complexity of various algorithms
Applying	They will make of function to reduce problem into small modules, To familiarize with exceptions and mechanism to handle it , make use of python to read and write data into files, implement ADT for various user defined data structures, implement data structures like: Stack, Queue, Link List, Tree.
Analyzing	Compare efficiency of various data structures for solving a particular problem. Analyzing performance of a algorithm.
Evaluating	Ability to choose appropriate data structures for problem solving Ability to use combination of these data structures for problem solving. Evaluating the performance of various Algorithms and Data Structures.
Creating	Design and create their own data structure for solving a real life problem
Unit	**Contents**
1	**Basics of Python (6 Lectures)** Python Installation, writing and executing first python script, using python editors to write and execute python scripts **Identifiers and Operators:** Writing get familiar with python variables and data types, variables and assignments, Operator understanding and its usage, **Python Control structures in Python:** Conditionals and Loops: if statement, else Statement, el-if Statement, while Statement, for Statement, break Statement, continue Statement, pass Statement, Arrays Working strings in python: String type, strings concatenations and comparing strings, using string functions
2	**Working with functions and Built in data structures Functions (6 Lectures)** Writing a simple function and using it, functions and parameters,

	functions retuning values, functions and variable scope, Variable number of arguments, passing objects and collections in function, understanding recursive functions, writing and using recursive functions. Variable number of arguments to functions **Python data Structures:** List: Crating and using list and tuples. Operations on list and tuples, Special Features of Lists and tuples, introduction to List comprehensions Dictionaries: Introduction to Dictionaries, Operators, Built-in Functions, Built-in Methods, Dictionary Keys, Using Set data structure
3	**Handling Exceptions and File Input/Output (8 Lectures)** Need of exception Handling, Simple mechanism to handle exception, Using if exceptions to handle the code cracks, Using else clause while handling exceptions, Handling generic and specific exceptions, handling multiple exceptions, Raising exception, File Objects, creating a file object, reading File contents, Writing data into file, reading and writing CSV files, using with clause, Using Exception handling with file operations
4	**Introduction ADT (9 Lectures)** Writing a simple Class in Python, creating object of class, Instance Methods, Class Variables and special methods. Understanding ADT, Defining ADT using pseudo-code, Defining ADT for Date, Stack and Queue, Implementation of Date, Stack and Queue ADT. Concepts of circular and double ended queue. Applications of Stack and Queue
5	**Linked Lists (8 Lectures)** Defining List as ADT, Implementation of Singly Linked Lists, Circularly Linked Lists, Doubly Linked Lists, The Positional List ADT, Sorting a Positional List, Link-Based vs Array-Based Sequences. Implementation of Stack and Queue using Link List. Applications of Linked List (polynomial Equations)
6	**Trees (9 Lectures)** Concepts of tress and Binary Trees, Defining binary tree as ADT, Implementing Binary Trees, Tree Traversal Algorithms **Search Trees**: Binary Search Trees ,Balanced Search Trees ,Python Framework for Balancing Search Trees ,AVL Trees ,Splay Trees, Red-Black Trees **Heaps, Maps, Hash Tables, and Skip Lists**
7	**Searching , Sorting and Analysis of Algorithms (9 Lectures)** Need of searching, linear search, using binary search for efficient search. Need of sorting and various sorting algorithms: insertion sort, bubble sort, selection sort; Merge sort and quick sort algorithms. Python's Built-In Sorting Functions, Selection Algorithms. Analysis of Algorithms: Measuring Algorithm Efficiency, Asymptotic Analysis, The Big-O Notation, Find the complexity of Algorithms: Linear

	Search, Binary Search, Sorting Algorithms. Compare complexity of various searching and sorting Algorithms
Text Books	Data Structures and Algorithms in Python Paperback – 2016 by Michael T. Goodrich (Author), Roberto Tamassia (Author), Michael H. Goldwasser (Author) WILEY PUBLICATION Data Structure and Algorithmic Thinking with Python Paperback – 2015 by NarasimhaKarumanchi (Author)
Reference Books	Problem Solving in Data Structures & Algorithms Using Python: Programming Interview Guideby Hemant Jain
MOOC on NPTEL	https://nptel.ac.in/courses/106/106/106106145/#

Subject Name	204. Data Warehousing and Data Mining
No. of Credits	4 Credits
Pre Requisite	Thorough understanding of Relational database normalization techniques , Physical design of a database, Concepts of algorithm design and analysis, Basic understanding of: Software engineering principles and techniques, Probability and statistics
Course Objectives	• This course will enable to expose the students to Study various design and implementation issues and techniques in data warehousing and data mining.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Remembering the fundamentals of Database technology and its application in data warehousing and data mining.
Creating	Creating multi dimensional data models using star, snowflake and fact constellation schemas.
Understanding	Understand the components, architecture and other important tools of data warehousing and data mining.
Applying	Apply the techniques of clustering, classification, association and other data mining algorithms to real world data.
Analyzing	Gather and analyze large sets of data to gain useful information using data mining techniques.
Evaluating	Producing and interpreting quantitative analysis using various data mining algorithms.
Unit	Contents
1	**Business Intelligence (5 Lectures)** Business Environment and Computerized Decision Support, Managerial Decision Making, Computerized support for Decision Making, Decision Support System, Early Framework for Computerized Decision Support, Business Intelligence, Importance of BI, BI for Decision makers, The BI process, A framework for Business Intelligence
2	**Data warehousing (10 Lectures)** OLTP and OLAP Systems, Introduction to Data Warehouse, Differences between OLTP Systems and Data Warehouse, Characteristics of Data Warehouse; Advantages of Data Warehouse; Data Warehouse Users, Metadata, Classification of Metadata, and Importance of Metadata. Data Marts, Reasons for creating Data Marts, Building Data Marts: Top down Approach & Bottom up Approach, Data Warehouse Architecture, Two tier Architecture, Three Tier Architecture. Data Warehouse Schema, Star, Snow Flake & Fact Constellation Schema. OLAP Operations, OLAP Models.
3	**Data Preprocessing (5 Lectures)** Need, Objectives and Techniques of data preprocessing. **Descriptive Data Summarization**: Measuring the Central Tendency, Measuring the Dispersion of Data, Graphic Displays of Basic Descriptive Data Summaries **Data Cleaning:** Handling of Missing values and Noisy Data, Data cleaning as a process **Data Integration and Transformation:** Data Integration: Schema integration, Controlling redundancies using

	correlation. Data Transformation: Smoothing, Aggregation, Generalization, Attribute construction, Normalization **Data Reduction:** Data Cube Aggregation; Attribute Subset Selection, Dimensionality Reduction, Numerosity Reduction, Discretization & Concept Hierarchy Generation for Numerical Data and for Categorical Data.
4	**Introduction Data Mining (5 Lectures)** Evolution of database system technology, introduction to data mining, architecture of a typical data mining system, Types of data that can be mined, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining.
5	**Mining Association Rules (5 Lectures)** Introduction, Market Basket Analysis, Multi-Level and single level Mining, Mining Association Rules on Transactional database, Multi-Dimensional Association Rules From Relational Databases & Data Warehouses, From Association Mining To Correlation Analysis, Constraint Based Association Mining, Association Rule mining using Apriori Algorithm, and FP Growth algorithm. Generalized association rule.
6	**Classification & Prediction (5 Lectures)** Introduction to Classification and Prediction; Basics of Supervised & Unsupervised Learning; Preparing the Data for Classification and Prediction; Comparing Classification and Prediction Methods, Classification by Decision Tree Induction, Tree Pruning, Rule-based Classification Using IF-THEN Rules for Classification; Rule Extraction from a Decision Trees; Bayesian Classification: Bayes' Theorem, Naïve Bayesian Classification. Prediction using Regression analysis.
7	**Cluster Analysis (5 Lectures)** Introduction to Cluster Analysis; Types of Data in Cluster Analysis; Classification of clustering methods-Partitioning Method, Hierarchical Method, Density-based Method, Grid-Based Method, Model-Based Method, Constraint-based Method Partitioning Methods: K-Means and K-Medoids
Text Books	**References (Books, Websites etc.):** • Jiawei Han, MichelineKamber, Data Mining: Concepts and Techniques, Harcourt India Pvt., 2011.
Reference Books	• Alex Berson, Stephen J. Smith, Data Warehousing, Data Mining and OLAP,McGrawHill, 2004 • D. Hand, H. Mannila, and P. Smyth, Principles of Data Mining, MIT Press, 2011

Subject Name	205. Web Supporting Technologies
No. of Credits	4 Credits
Pre Requisite	Any pre-requisite knowledge is not required.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	The students will get information of the basics of internet with the help of examples. It will help them to identify and remember Web supporting concepts.
Understanding	Remembering the definitions will help the students to understand basic concepts of HAML, JavaScript, CSS and PHP etc. In this subject, students will understand various tags, programming constructs of JavaScript, technical issues, cascading Style Sheets, forms and PHP concepts.
Applying	Students will Have thorough knowledge of HTML and JavaScript. They will be able to design various forms as per requirements. They will be able to apply CSS concepts in scripting. The students will also apply their creativity to display the output.
Analyzing	The students will relate real life problem with the JavaScript solution. They will analyze the problem and solve it.
Evaluating	Ability to use JavaScript construct for problem solving, handling technical issues etc.
Creating	Design and create their own forms for solving a real-life requirement.
Unit	Contents
1.	**Basics of Internet (4 Lectures)** Understanding internet and intranet, difference between internet and intranet, Introduction to WWW, Concept of client and server, Introduction to web server and web browser, using Apache as web server, Internet Service Providers (ISP)
2.	**Introduction to HTML (8 Lectures)** Overview of HTML, concept of Tag, types of HTML tags, structure of HTML program, Text Formatting Through HTML: Emphasizing Material in a Web Page, Using Image tag, attributes of Image tag, Lists: Using unordered, ordered, definition lists, Handling Tables: To define header rows & data rows, use of caption tag, changing height & width of table, BGcolor, Handling Tables: cell padding, cell spacing, colspan, row span, handling table data, images in table, Frames: Introduction To frames, using frames & framesets, named frames, Concept of hyperlink, types of hyperlinks, linking to the beginning of document, linking to a particular location in a document, image as hyperlinks
3.	**Cascading Style Sheets (4 Lectures)** Introducing CSS, Types of style sheets: inline, embedded and external style sheets, working with CSS properties: text properties, color and background properties, border and shading, box and block properties, positioning with CSS, various types of CSS selectors, Using class and span tag, External style sheets,

4.	**Introduction to JavaScript (Client-Side Scripting) (8 Lectures)** Introduction to scripting, overview of Java Script, advantages, client-side java Script, capturing user input, writing JavaScript into HTML,Advantages and limitations of JavaScript, **JavaScript Basics:** Data types, literals, variables and operators, Java Script arrays, dense array, operators, expressions, **JavaScript Programming Constructs:** Assignment, data declaration, if, switch, while, for, do while, label, break, continue, function call, return, with, delete, method of invocation **Dialog boxes** -Alert dialog box, prompt dialog box, confirm dialog box, window objects **JavaScript Functions-** Types of functions in Java Script- Built in functions, User defined functions, function declaration, passing parameters, variable scope, return values, recursive functions Arrays- Introduction to arrays, arrays with methods
5.	**Forms (6 Lectures)** Interactive web pages concepts, difference between static & dynamic web pages, Concept of form, how form works, Different elements - text, password, button, submit, reset, checkbox, Radio, Text Area, select & option, properties of form elements, form object's Method, Other built-in Object: String object, math object, date object, Regular Expressions, Form validation
6.	**JavaScript Events (6 Lectures)** What is an Event? Onclick Event Type, onsubmit Event Type, onmouseover and onmouseout, onchange, onload, onkeydown, working with DOM, Concept of Cookies and sessions, when and how to use cookies and sessions,
7.	**Introduction to PHP (4 Lectures)** Server-side web scripting, Adding PHP to HTML, Syntax and Variables, PHP control structures, Establishing connectivity with MySQL database
Text Books	1. Ivan Bayross (2006) Web Enabled Commercial Application Development Using HTML, DHTML, JavaScript, Perl CGI, BPB Publications
Reference Books	1. Thomas Powell, Web Design The complete Reference, Tata McGrawHill 2. Thomas Powell and Fritz Schneider JavaScript 2.0 : The Complete Reference, Second Edition 3. PHP: The Complete Reference By Steven Holzner, Tata McGrawHil 4. Luke Welling, PHP and MySQL Web Development, Pearson Education; Fifth edition
MOOC on NPTEL	NPTEL / Swayam www.edx.com www.coursera.com www.w3schools.com

Subject Name	**206. Lab on Data Structures using Python**
No. of Credits	**4 credits**
Pre Requisite	School Level Mathematics. It does not assume any prior knowledge of programming.
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Using some motivating examples to remember and quickly builds up basic concepts such as conditionals, loops, functions, lists, strings and tuples.
Understanding	By remembering students the basing concepts students will understand the concepts of searching and sorting algorithms, dynamic programming and backtracking, as well as topics such as exception handling and using files. As far as data structures are concerned, the course covers Python dictionaries as well as classes and objects for defining user defined data types such as linked lists and binary search trees.
Applying	Students will Have thorough knowledge about data structures and will be able to design & develop program using linear data structures&non linear data structures for solving problems
Analyzing	Compare efficiency of various data structures for solving a particular problem.
Evaluating	Ability to choose appropriate data structures for problem solving Ability to use combination of these data structures for problem solving.
Creating	Design and create their own data structure for solving a real life problem

Unit	**Contents**
1	Informal introduction to programming, algorithms and data structures via gcd, Downloading and installing Python,gcd in Python: variables, operations, control _flow - assignments, conditionals, loops, functions. **Suggested Programs** Installation of Python IDE, understand various platforms for Python (google collaborator, Jupitar notebook) • Basic program to understand Data Types • creating variables, accepting input variable from user and printing their datatype • Mathematical functions (apply various operations on data +, -, /, *) • Conditional Statements (if, else, , • Create functions to o Find average of marks of five subjects Find sum of first n prime numbers
2	Python: types, expressions, strings, lists, tuples, arrays | Python memory model: names, mutable and immutable values | List operations: slices etc - Binary search | Inductive

	function denitions: numerical and structural induction | Elementary inductive sorting: selection and insertion sort | In-place sorting. **Suggested Programs** • Operations on Strings, Lists , tuples and arrays o Creating lists/tuple/array and accessing list elements using index o Access the list/tuple element using –ve index o Extract specific element from list/tuple/array o Use len(), del(), remove() and range functions on list/tuple • Applying different searching and sorting algorithm on data (list)
3	Basic algorithmic analysis:inputsize,asymptotic,omplexity,O() notation | Arrays vs lists | Merge sort | Quicksort | Stable sorting. Dictionaries | More on Python functions: optional arguments, default values | Passing functions as arguments | Higher order functions on lists: map, lter, list comprehension. **Suggested Programs** • Write a program for sorting given list using Quick Sort • Fuction calling (passing the variables) o Find factorial of a number o Find fibbonacci series for a given number • Create Dictionaries with key,value pair, and access various elements of Dictioneries, Various operation using Dictionaries. • Usage of map, lter functions on list
4	Exception handling | Basic input/output | Handling files | String processing. **Suggested Programs** • Read, write, search operations on File data structure • Write Programs based on exception handling • Write program for various operations on string variables
5	Backtracking: N Queens, recording all solutions | Scope in Python: local, global, nonlocal names | Nested functions | Data structures: stack, queue | Heaps. **Suggested Programs** • Creation and various operations on Stack • Creation and various operations on queue • Creation and various operations on heap • Defining scope variables in Python
6	Abstract datatypes | Classes and objects in Python | "Linked" lists: find, insert, delete | Binary search trees: find, insert, delete | Height-balanced binary search trees. **Suggested Programs**

	• Creation of class data structure ,Abstract classes • Creation of Link List and various operations on Link List • Implementation of tree data structure using class concept
7	Efficient evaluation of recursive denitions: memoization | Dynamic programming: examples | Other programming languages: C and manual memory management | Other programming paradigms: functional programming. **Suggested Programs** Comparison of all discussed algorithm with their implementation in C and compare memory usage
Text Books	Data Structures and Algorithms in Python Paperback – 2016 by Michael T. Goodrich (Author), Roberto Tamassia (Author), Michael H. Goldwasser (Author) WILEY PUBLICATION Data Structure and Algorithmic Thinking with Python Paperback – 2015 by Narasimha Karumanchi (Author)
Reference Books	Problem Solving in Data Structures & Algorithms Using Python: Programming Interview Guide by Hemant Jain
MOOC on NPTEL	https://nptel.ac.in/courses/106/106/106106145/#

Subject Name	**209 Foreign Language : Japanese Language Proficiency**
No. of Credits	**2 Credits**
Pre Requisite	Basic English (Grammar and Sentence Formation)
Cognitive Abilities	The ability to understand some basic Japanese. • One is able to read and understand typical expressions and sentences written in hiragana ,katakana , and basic kanji . • One is able to listen and comprehend conversations about topics regularly encountered indaily life and classroom situations, and is able to pick up necessary information from short • conversations spoken slowly.
Remembering	▪ Recognise the symbols, Numbers in Kanjis ▪ Greetings
Understanding	▪ Understand the Language Knowledge（Vocabulary, Grammar, Kanji）
Applying	▪ Reading and understand typical expressions and sentences ▪ Using Kanjis in expressions and sentences
Analyzing	▪ Basic Communication in Japanese
Evaluating	▪ Frame the dialogue to communicate in Japanese
Creating	Construct the simple sentences
Syllabus	
1	General Features of Japanese Japanese Script Pronunciation of Japanese Daily Greetings and Expression Numerals
2	a) Vocabulary b) Translation – Sentence Pattern and Example Sentence c)Conversation – How do you do? Reference word- Country , people and Language
3	a) Vocabulary b) Translation – Sentence Pattern and Example Sentence c)Conversation – This is just a token Reference word- Family Names
4	a) Vocabulary b) Translation – Sentence Pattern and Example Sentence c)Conversation – I ‘ll take it Reference word- Department Store
5	a) Vocabulary b) Translation – Sentence Pattern and Example Sentence c)Conversation – What are your opening hours? Reference word- Phone and Letter
6	a) Vocabulary b) Translation – Sentence Pattern and Example Sentence c)Conversation – Does this train goes to koshien? Reference word- National Holidays

Text Books	Minna No Nihongo -I

Subject Name	**209: Digital Technology**
Credits	**2 credits**

Course Objective:

- To understand, communicate and adapt to a digital world as it impacts their personal life, society, and the business world.
- To actively engage students in the processes of analysing problems and opportunities, designing, developing and evaluating digital solutions, and creating and sharing information that meets a range of current and future needs.
- To learn and ethically exploit the capacity of information systems to create digital solutions.

Learning Outcome : At the end of this course, student should be able to

- Exposure to foundation knowledge in hardware, software, programming, web design, IT support, and networks.
- Students will apply their knowledge to situations and defend their actions/ decisions/ choices through the knowledge and skills acquired in this course.

Pre-requisites:

Preliminary knowledge of computer, ICT, Digital learning, their operations and applications.

References (Books, Websites etc):

- https://www.education.vic.gov.au/school/teachers/teachingresources/digital/Pages/teach.aspx
- https://www.encyclopedia.com/history/dictionaries-thesauruses-pictures-and-press-releases/digital-technology
- https://www.education.vic.gov.au/school/teachers/teachingresources/digital/Pages/teach.aspx
- https://www.cambridgeinternational.org/Images/271191-digital-technologies-in-the-classroom.pdf
- https://www.digitaled.in/blogs/digital-learning-types-technology-and-methods-of-teaching-and-learning/

Suggested MOOC: Please refer these websites for MOOCS:-

Course Plan

Unit	**Contents**
1	**Introduction:** Introduction to Digital Technology, Purpose of Digital Technology, History of Digital Technology, Scope of Digital Technology, Examples of Digital

	Technology: social media, online games, multimedia and mobile phones. Benefits and challenges of digital technologies in the classroom.
2	**Terms are associated with digital technology:** Bring your own device (BYOD), E-portfolios, Flipped classroom, Personal Learning Network (PLN), Virtual Learning Environment (VLE), Interactive Whiteboards (IWB), Software Applications (Apps), Web 2.0, Telecommunication, Fibre Optics, Cellular Telephones, Digital printing, pulse code modulation (PCM)
3	**Types of Digital Technology:** Artificial Intelligence (AI): Introduction, Applications, scope, history Advantages and Disadvantages, Machine Learning (ML) : Introduction, Applications, scope, history Advantages and Disadvantages Deep Learning (DL) : Introduction, Applications, scope, history Advantages and Disadvantages
4	**Digital Learning:** Types, Technology and Methods of Teaching and Learning
5	**Support System:** Support system for teachers and students to use of digital technologies in the classroom, SAMR (Substitution, Augmentation, Modification, Redefinition) model developed by Dr Ruben Puentedur

Subject Name	**209 Human Psychology at Workplace**
No. of Credits	**2 Credits**
Objectives	• To expose the students to the fundamentals of Human Psychology - such as working with people, nature of organizations, communication, leadership and motivation of people. • To help students develop a conceptual understanding of Behavioral theory theories • To enable the students to put the ideas and skills of Psychology into practice
Course Outcome	• To understand the dynamics of individual and Human Psychology and relationships. • To understand the importance of human behavior in managerial functions
Unit No	**Syllabus content**

1	**Foundations of Individual Behavior** Attitudes and Job Satisfaction, Components of Attitude, Major Job Attitude, Job Satisfaction, Personality and Values, Personality Determinants, MBTI, Big – Five Model, Values, Formation, Types of Values, Perception, Factors influencing perception
2	**Motivation and Leadership :** Motivation and Leadership Concept of motivation, Definition, Theories of Motivation,Maslow's need Theory, ERG Theory, Theory X and Theory Y, Two Factor Theory,McClelland"s Theory, Equity Theory, Vroom"s Expectancy Theory. Concept ofLeadership, Theories of leadership, Traits of good Leader, Difference between Leaderand Manager
3	**Groups and Teams:** Concept of OB, Foundations of Group Behaviour, Formation of Group, Group Classification, Properties, Roles, norms, status, size and cohesiveness, Group decision making, Understanding teams, creating effective teams, Conflict Process, Conflict management communication
4	**Culture** Culture Definition, Culture's function, need and importance of Cross Cultural management, Stress and its Management.
Reference Books	1) Kavita Singh, Organizational Behavior, Vikas Publications 2) Robbins, Timothy Judge, SeemaSanghi, Organizational Behavior, Stephen PearsonPrentice Hall, 12 edition 3) Fred Luthans, Organizational Behavior, McGraw Hill Inc. 4) John Newstrom and Keith Davis, Organizational Behavior, Tata McGraw Hill, 11 edition 5) AshwaThapa, Organizational Behavior

SEMESTER III

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Subject Name	**301. Software Design Patterns**
No. of Credits	**4 Credits**
Pre-Requisite	This course assumes students should have following knowledge: • OOAD and UML. • Software Engineering • Java Programming
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Ability to identify the structure, framework of Design Patterns for a given problem
Understanding	Ability to understand the meanings, concepts and types of Design Patterns
Applying	Ability to decide and suggest a design pattern for the given problem
Analyzing	Exploit the possibilities and limitations of basic design patterns for a given problem and ability to analyze a software development problem
Evaluating	Ability to evaluate, assess the design pattern that are appropriate for a given problem
Creating	Create software design that are scalable, robust and easily maintainable and consisting multiple modules
Unit	**Contents**
1	**Introduction to Design Patterns (4 Lectures)** Reusable design Patterns: Meaning & Use of Design Patterns, Organizing the Patterns, describing pattern, how to use the patterns while solving the problem, Applications of different design patterns in various cases. Selection of a Design Pattern
2	**Creational Patterns (8 Lectures)** Intent, Motivation, Applicability, Structure, Participants, Collaborations, Consequences and Implementation of following Creational Patterns: - Factory Method, Abstract Factory, Builder, Prototype, Singleton. Tutorial: Tutorials should be conducted in LAB using JAVA for implementing Creational design pattern.
3	**Structural Patterns (8 Lectures)** Intent, Motivation, Applicability, Structure, Participants, Collaborations, Consequences, Implementation of Following Structural Patterns Adapter (class), Adapter (object), Bridge, Composite, Decorator. Façade, Flyweight, Proxy. Tutorial: Tutorials should be conducted in LAB using JAVA for implementing Structural design patterns.

4	**Behavioral Patterns – I (8 Lectures)** Intent, Motivation, Applicability, Structure, Participants, Collaborations, Consequences, Implementation of following Behavioral Pattern Interpreter, Template Method, Chain of Responsibility, Command, Iterator Tutorial: Tutorials should be conducted in LAB using JAVA for implementing Behavioral Design Patterns – I
5	**Behavioral Patterns – II (8 Lectures)** Intent, Motivation, Applicability, Structure, Participants, Collaborations, Consequences, Implementation of following Behavioral Pattern Mediator, Memento, Observer, State, Strategy, Visitor Tutorial: Tutorials should be conducted in LAB using JAVA for implementing Behavioral Design Patterns – II
6	**JEE Patterns (6 Lectures)** Presentation Layer Design Pattern, Business Layer Design Pattern, Integration Layer Design Pattern Tutorial: Tutorials should be conducted in LAB using JAVA for implementing above Patterns
7	**Case Study (4 Lectures)** • Designing a parking lot • Designing Movie Ticket Booking System • Design Logistic System • Online Hotel Booking System OYO
Text Books	Head First Design Patterns, Eric Freeman, Elisabeth Freeman, Kathy Sierra, Bert Bates,
Reference Books	• Design Patterns Elements of Reusable Object-oriented Software- Erich Gama, Richard Helm, Ralph Jonson • Ben Schneiderman, Designing the User Interface, Pearson Education, 1998
MOOCs on NPTEL	https://nptel.ac.in/courses/106/105/106105224/
Web Resources	https://www.tutorialspoint.com/design_pattern/index.htm https://www.javatpoint.com/design-patterns-in-java

Subject Name	302. Artificial Intelligence
No. of Credits	4 Credits
Pre Requisite	
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Using some motivating examples to remember and quickly builds up basic concepts such as visual perception, speech recognition, decision-making, and translation between languages
Understanding	By remembering the basic concepts students will understand the concepts of Natural-language understanding (NLU) or natural-language interpretation (NLI), as well as topics such as simulation process of human intelligence by machines and special computer systems. As far as artificial intelligence is concerned the course covers natural language processing, Knowledge Representation Issues, Symbolic Reasoning under Uncertainty as well as Machine Learning (ML) using Python.
Applying	Students will have thorough knowledge about various level of mathematics, including probability, statistics, algebra, calculus, logic and algorithms. Bayesian networking or graphical modeling, including neural nets. Physics, engineering and robotics, Computer science, programming languages and coding. Knowledge of Python is essential.
Analyzing	Compare efficiency of various Theories of Intelligence and learning from experience for solving a particular problem.
Evaluating	Ability to choose appropriate Knowledge based approach for problem solving. Ability to use combination of these artificial intelligence theories for problem solving.
Creating	Design and create their own artificial intelligence applications for solving a real life problem
Text Books	1) Artificial Intelligence : A Modern Approch, Stuart Russel, Peter Norvig 2) Artificial Intelligence and Machine Learning by Chandra S.S.V, PHI
Reference Books	• "Artificial Intelligence" -By Elaine Rich And Kevin Knight (2nd Edition) Tata McGraw-Hill • Artificial Intelligence A New Synthesis :Nilson, Elesevir • Introduction to Artificial Intelligence and Expert System-Patterson, Prentice Hall India. • Shai shalev-shwartz, Shai Ben-David: Understanding Machine Learning from Theory to algorithms, Cambridge University press.
Refer these websites for MOOC's	NPTEL / Swayam www.edx.com www.coursera.com
Unit	Content

1	**Introduction (4 Lectures)** What is AI? ,The AI Problems, Background/history, What Is An AI Techniques, The Level Of The Model, Criteria For Success, Some General References, High-level overview of field, State of the art.
2	**Introduction and historical perspective, Hard and Soft AI(7 Lectures)** Disciplines and applications, Theories of Intelligence, Detecting and Measuring Intelligence, Knowledge based approach, Problems, State Space Search & Heuristic Search Techniques: Defining The Problems as A State Space Search, Production Systems, Production Characteristics, Production System Characteristics, And Issues In The Design Of Search Programs, Additional Problems. Generate – And-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis.
3	**Knowledge Representation Issues(6 Lectures)** Representations And Mappings, Approaches To Knowledge Representation. Using Predicate Logic: Representation Simple Facts In Logic, Representing Instance And Isa Relationships, Computable Functions And Predicates, Resolution. Representing knowledge Using Rules: Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning
4	**Symbolic Reasoning under Uncertainty(5 Lectures)** Introduction To Non-monotonic Reasoning, Logics For Non monotonic Reasoning. Statistical Reasoning: Probability And Bays' Theorem, Certainty Factors And Rule-Base Systems, Bayesian Networks, Dumpster-Shafer Theory, Fuzzy Logic.
5	**Natural Language Processing(5 Lectures)** Introduction, Syntactic Processing, Semantic Analysis, Semantic Analysis, Discourse And Pragmatic Processing, Spell Checking. Connectionist Models: Introduction: Hopfield Network, Learning In Neural Network, Application Of Neural Networks, Recurrent Networks, Distributed Representations, Connectionist AI And Symbolic AI.
6	**Introduction to machine learning (7 Lectures)** IntroductionMachine Learning Concepts, methods and models, Supervised Learning, unsupervised and semi-supervised, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, , **Introduction to Numpybasics**, creating numpy arrays ,structure and content of arrays, subset, slice, index and iterate through arrays, multidimensional arrays, python lists vs numpy arrays, introduction to numpy operations on numpy arrays , operations on arrays basic linear algebra operations.

7	**Introduction to pandas (8 Lectures)** Introduction, pandas basics, indexing and selecting data, merge and append, grouping and summarizing data frames, lambda function & pivot tables, reading delimited and relational databases, reading data from websites, getting data from apis, reading data from pdf files, cleaning datasets. **Case study**: For example, to explore a dataset stored in a CSV on your computer. Pandas will extract the data from that CSV into a Data Frame — a table, basically — then let you do things like: Calculate statistics and answer questions about the data, like 1) What's the average, median, max, or min of each column? 2) Does column A correlate with column B? 3) What does the distribution of data in column C look like? 4)Clean the data by doing things like removing missing values and filtering rows or columns by some criteria 5) Visualize the data with help from Matplotlib. Plot bars, lines, histograms, bubbles, and more. 6)Store the cleaned, transformed data back into a CSV, other file or database

Subject Name	**303. Information Security**
No. of Credits	**4 Credits**
Pre Requisite	Basic Knowledge about Software Development Life Cycle, System Analysis
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Using some basic concepts of software development and software engineering Information can be understood and remembered .
Understanding	By remembering students the basing concepts students will understand the concepts of Information , Characteristics , Levels of Information, Information Security Measures and various stages in Information testing Life Cycle .
Applying	Students will Have thorough knowledge about Measures of Information Security and Cyber security at higher level , network security measures and various scanner and cleaners
Analyzing	To Measure the risk of Information loss or theft and over come the Information Security by scientific and proper methods .
Evaluating	Ability to select proper method to protect the information from misuse and make the organization full proof from various Information threats.
Creating	Design and create their own procedure to protect the important data and information at all the levels.
Unit	**Contents**
1	**Introduction and Background (5 Lectures)** Basic concepts of Information, Information Characteristics, sources of Information, Types of Information, Generating Information in Organizations. Business Application of Information and Information System, What is Information security? Need for Information Security , Types of Organization , Functions of Business organization , Levels of Organization , How Organizations manage the information , flow of information.
2	**Basics of Networking for Security Purpose (8 Lectures)** Network Installations, Types of Networks and their security issues, Types of Network of OS. Functions of Information security officer. Different measures to safe guard the important information in the organization. Network policy for protecting important resources of the Network. Basic concept of MIS and Organization flow of Information.
3	**Importance of Information Security (7 Lectures)** Improvement in corporate reputation based on the height of the level of information security, threat to business continuity due to accidents related to information systems, cyber space, information assets, threats, and vulnerabilities. Information Security Measures. **Threats** :- Ty p e s of threats physical threats (accident, disaster, fault, destruction, theft, unauthorized intrusion, etc.), technical threats (unauthorized access, eave S dropping , spoofing, alteration, error, cracking, etc.), man-made threats

	(operational error, loss, damage, peep, unauthorized use, social engineering, etc.), cyber-attack, information leakage, intent, negligence, mistake, fraudulent behavior, sabotage, DoS attack, rumor, flaming, SPAM e-mail, file sharing software [Malware / malicious programs] computer virus, macro virus, worm, bot (botnet, remote operated virus), Trojan horse, spyware, ransom ware, key logger, root kit, backdoor, fake anti-virus software
4	**Information security technology (cryptography) (7 Lectures)** **CRYPTREC** ciphers list, cryptography (encryption key), decryption (decryption key), decoding, symmetric cryptography (common key), public key cryptography (public key, private key)), AES (Advanced Encryption Standard), S/MIME (Secure MIME), PGP (Pretty Good Privacy), hybrid encryption, hash function (SHA-256, etc.), key management, disk encryption, file encryption, compromise. digital signature (signature key, verification key), timestamp (time authentication), message authentication, MAC (Message Authentication Code), challenge-response authentication. **Human assets** (people, and their qualifications, skills, and experience), intangible assets, service, risk management (JIS Q 31000), monitoring, information security events, information security incidents.
5	**Information security Management (7 Lectures)** Management of information based on the information security policy, information, information assets, physical assets, software assets **Risk analysis and evaluation (Information asset review / Classification)** information assets review, classification and management by importance of information assets, information assets ledger Risk analysis and evaluation (Risk type)loss of property, loss of responsibility, loss of net earnings, human cost, operational risk, supply chain risk,
6	**Information security regulations (8 Lectures)** (Company regulations including information) security policy) organizational operation according to the information security policy, information security policy, information security purpose, information security measures criteria, information management regulations, security control regulations, documentation control regulations, regulations on measures to be taken against computer virus infection, regulations on measures against accidents, information security education regulations, privacy policy (personal information protection policy), employment agreement, office regulations, penal provisions, outward explanation regulations, regulations for exceptions, regulations for updating rules, procedure for approving regulations
7	**Management of Information Asset. (8 Lectures)** Security Incidents management, reducing risk in Information loss and keeping the information safe from unauthorized users and threats . **Information Technology Act**, Cyber Crimes and Cyber Laws. -What are cyber-crimes? Types of cyber-crimes. Categories of Cyber Crime, Online business threats , Online business frauds Safety tips for online business. , IT Policy for Information protecting. risk involved in usage of external service, risk involved in distribution of information by SNS, moral hazard, estimated annual loss, scoring method, cost factor .

Text Books	1. Information Security Management Handbook, Sixth Edition, Volume 5-2012 Amazon BooksEdited by - Micki Krause Nozaki, Harold F. Tipton. 2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives Nina Godbole and SunitBelpure, Publication Wiley. 3. Information Security: Principles and Practice 1st , Kindle Edition - 2005 Amazon BooksAuthor - Mark Stamp 4. "Cryptography and information Security" V.K.Pachghare, PHI Learning Private Limited, Delhi India. 5. Analyzing Computer Security by Charles P. Pfleeger, Shari LawerancePfleeger, Pearson Education India 6. Anil Gaikwad , JyotiBiradar (Patil) "Basic Concepts of System Analysis" Lambert Academic Publication Dec. 2019 .
Reference Books	1. Practical Information Security Management: A Complete Guide to Planning and Implementation-Dec-2016 Amazon Books . Tony Campbell 2. Managing Risk and Information Security :- Protect to Enable 3. Anil Gaikwad , JyotiBiradar (Patil) Software Project Management Made Easy Lambert Academic Publication Dec 2019.
MOOC on NPTEL	https://nptel.ac.in/courses/, http://www.freetechbooks.com/managing-risk-and-information-security-protect-to-enable-t1150.html

Subject Name	306. Lab on Software Testing
No. of Credits	3 Credits
Pre Requisite	• Fundamental knowledge of computer. • Fundamental knowledge of Software Engineering, System Analysis and Design.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	The purpose of this course is to build the skills necessary to perform software testing at the function, class and application level. This course will enable students to
Understanding	Concepts of developing test plan, test cases, execution of test cases etc.
Applying	Work on automated software testing tools like bugzilla, winrunner, selenium, test link etc.
Analyzing	Analyse the requirements for the given problem statement Find defects which may get created by the programmer while developing the software.
Evaluating	Gain confidence to write and execute test cases. To get the knowledge about automated testing and automated testing tools.
Creating	Design and implement the solution for given problem in any programming language. Derive test cases and execute test cases for any given problem.
Unit	Contents
1	**Software Testing basics** Basic testing vocabulary, Quality assurance versus Quality control, Cost of quality, Software quality factors, How quality is defined? Why do we test software? What is a defect?, The Multiple roles of the software tester, Scope of testing, When should testing occur?, Testing constraints, Life cycle testing, Independent testing, Levels of testing, The "V" Concept of testing
2	**Testing Techniques and test administration** Structural versus Functional Technique Categories, Verification versus Validation, static versus Dynamic Testing, Examples of Specific Testing Techniques like white box testing and black box testing, Test Planning, Customization of the Test Process, Budgeting, Scheduling
3	**Create the Test Plan** Prerequisites to test planning, Understand the Characteristics of the Software Being Developed, Build the Test Plan, Write the Test Plan. Study of test management tool: Test Director
4	**Test cases** Test Cases, Test case Design, Building test cases, Test data mining, Test execution, Test Reporting, Defect Management, Test Coverage – Traceability matrix

	Test Metrics – Guidelines and usage, Test reporting: Guidelines for writing test report, Test Tools used to Build Test Reports Manual testing Case Study • Requirements / User Story Study Hands on • Test planning Hands on • Test design Hands on • Test execution Hands on
5	**Managing Change** Software Configuration Management, Change Management, Risks: Risk Analysis and Management with examples, User Acceptance testing: in detail explanation with details Case Study: How to test web, stand alone and database applications – with examples. Help with resume and testing interview skills
6	**Automation Testing** Basics of automation testing – why, when, how to perform automation testing, Factors for choosing a particular tool, An overview for the major functional testing tools. Overview of Test management and bug tracking tools.
7	**Automation testing tools** Study of bug tracking tool: Bugzilla. Study of winrunner, study of web testing tool selenium. Study of open source testing tool: test link, Case study for automation testing
Text Books	Hetzel, The Complete Guide to Software Testing, John Wiley & Sons. Software Testing by RenuRajani and Pradeep Oak
Reference Books	1. Testing in 30+ Open Source Tools, Rahul Shende, Shroff Publishers & Distributor Pvt. Ltd, ISBN 13: 9789350231005 (page numbers from 15 to 117) 2. http://seleniumhq.org/ 3. http://sourceforge.net/projects/sahi/ 4. http://testng.org/doc/index.html
MOOC on NPTEL	www.SWAYAM.com www.NPTEL.com www. edx.com www.coursera.com

Subject Name	**309: Water Management**
No. of Credits	**2 Credits**
Pre Requisite	Basics of Environmental studies
Cognitive Abilities	• To learn how to analyse and comprehend basic principle of water resources and its planning and management • To visualise systematic process on environmentally water resource management and sustainable water resource development • To launch the skillful techniques for water resource planning and management
Remembering	Basic Needs of Human
Understanding	Availability of water resource
Applying	Method for water harvesting based on the area.
Analyzing	The issues related to planning and management of water resources
Evaluating	Water issues related to particular area
Creating	Construct the solution based on Water Management Problem
Syllabus	
1	Introduction:Sources and Uses of water (primary, secondary and tertiary sector uses); Concept of virtual water; Health and environmental concerns of availability and quality of water resources.
2	Crisis in Water Resources:Water crisis and water stress; Protection of aquifers; Water rights and its legal implications; Politics of water sharing
3	**Water Resources Planning and Management**: Necessity, System components, planning scales, Approaches, planning and management aspects, Analysis, Models for impact prediction and evaluation, Adaptive Integrated Policies, Post Planning and management Issues
4	**Water Harvesting and Conservation**: Water Harvesting Techniques – Micro-catchments -Design of Small Water Harvesting Structures – Farm Ponds – Percolation Tanks – Yield from a Catchment, Rain water Harvesting-various techniques related to Rural and Urban area.
Reference Books	K. Subramanya, Engineering Hydrology, Tata McGraw Hill Publishers, New Delhi. H.M. Raghunath, Ground Water, Wiley Eastern Publication, New Delhi. Daniel P. Loucks and Eelco van Beek, Water Resources Systems. Planning and Management, UNESCO Publication. Mollinga, P. et al, Integrated Water Resources Management, Water in South Asia Volume I, Sage Publications, 2006. Singh, Chhatrapati Water Rights in India, Ed: Chhatrapati Singh. Water Law in India: The Indian Law Institute, New Delhi,1992. Dhruva Narayana, G. Sastry, V. S. Patnaik, Watershed Management, CSWCTRI, Dehradun, ICAR Publications, 1997

Subject Name	**209 Economics for IT Industry**
No. of Credits	**2 Credits**
Pre Requisite	Introductory knowledge of IT industry with application skills.
Course Objectives	• To study changes in the environment in which firms operate influence their decision-making and outcome • To acquaint learners with basic concepts and techniques of economic analysis and their application to managerial decision-making in the IT industry. • To prepare the students for the use of various economics terminologies and techniques in IT industry. • To understand recent developments in the economic situation and its impact on economic decision making.
CognitiveAbilities	**. Course Outcome as per Blooms Taxonomy**
Remembering	Students will have the fundamental knowledge of the industrial economy and especially of the IT industry
Understanding	Understand the concept of economics for IT industry Use of economics in IT industry A better understanding of IT industry contribution to the Indian economy
Applying	Economics allows you to drive positive change for the betterment of the company and the industry
Analyzing	Analyze the demand and supply conditions and assess the position of a company.
Evaluating	Examine the possible economic risks and identify policies to address them Study price structure of designed software
Creating	Study the economics of IT sector
Unit	**Content**
1	**Introduction Economics and IT industry** • Meaning and scope of Industrial Economics . • Need and importance of industry economics. • IT industry and its contribution to the Indian Economy. • Factors hindering the IT Industry in India
2	**Theory of Demand and Supply** • Theory of Demand Supply • Law of Demand and Supply. • Elasticity of demand . • Supply and demand chain
3	**Theory of company /Firm :** • Size and structure of the company • Size and structure of the IT industry in India • Technological View of the firm • Marketing Boundaries • Determining the marketing boundaries ans Structure • Competition

	• Price output- log run/ short run • Monopoly
4	**Macro economics** • Macroeconomics • Competition and industrial Policy • Current issues in the IT industry and Competition • Government and IT industry policies • R& D in It Industry • Government Monetary policy and its impact in IT industry
Text Books	• Managerial Economics DN Dwivedi Vikas Publishing • Managerial Economics and Micro Economic G.S Gupta • Macro Economics R.Dornbusch, S.Fischer • Factors underlying the slow growth of Indian industry A V Desai Oxford University Press.
Reference Books	1 www.rbi.org.in 2 www.economicshelp.org 3 www.federalreserve.gov 4 www.economist.com 5 International Journal of Economic policy in Emerging Economieshttps://www.inderscience.com/jhome.php?jcode=ijepee

Subject Name	**309. Social Change in Technology**
No. of Credits	**2 Credits**
Course Objective	• To help the student to see the need for developing a holistic perspective of life. • To aware the student to see the need for developing science and Technology. • To sensitize the students about the scope of technology and its impact on social change. • To develop more confidence and commitment to understand, learn and act accordingly
Pre Requisite	
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Understand the meaning of technology and social change
Understanding	Learn the ideas of prominent sociological thinkers on social change and understanding their explanation on society and how it changes with time
Applying	Describe and assess technological development and resulting social changes emanating from the information revolution
Analyzing	Analyse social changes emanating from the information revolution
Evaluating	Describe and evaluate the relationship of social change to the development, impact
Creating	Diffusion of modern communication technologies in society
Unit	**Contents**
1	**Introduction to Social Change** :What is Social change , Role of society in change, social change as a dynamic concept , existing theories of social change., innovation and invention as a social process for social change
2	**Discovery Social change :** Link between education and social change ,concept of Science and Technology, role of technology in social change, Causes and Effects of Technology in social changes, discovery as a social process for social change and technological development, trends of technology, social processes that are involved in the development of technologies and social change
3	**Digital divide and social change :** Computers, equity, education and digital divide, technology & work/business, Role of ICT in government & military, technological development and resulting social changes emanating from the information revolution, relationship of social change to the development, impact and diffusion of printed materials, Internet, email and social media in society.
4	**Social issues caused by the rise in technology :** Computer crime and security, Intellectual property and responsible computing, identify and evaluate past, present, and potential future political and ethical issues involving technology and economy
Text Books	Human Societies as Sociocultural System by Nolan & Lenski1983
Reference Books	Technology and Globalisation: An Overview by McMaho 200
Online Resources	http://www.youtube.com/watch?v=0dK3mL35nkk http://www.researchchannel.org/mov/usc_ctt_reltec_250k_qt.mov
MOOC on NPTEL	www.SWAYAM.gov.in

ELECTIVES

ELECTIVE GROUP (01): CLOUD COMPUTING

Subject Name	**01(A) Virtualization**
No. of Credits	3 Credits (2 Lectures + 1 Tutorial)
Pre Requisite	Knowledge of Cloud Computing Concepts Knowledge of Virtualization Knowledge of Cloud secuity Knowledge of Web technologies
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	How to provide Flexible and scalable infrastructures as per user requirement
Understanding	Understanding the components of Virtualization
Applying	Carrying out practical's through Virtualization
Analyzing	The case studies will help us to understand more of practice of cloud computing in the market.
Evaluating	Comparison of cost-wise solution to the problem and selecting the best solution for the problem suggested to the organization
Creating	Creating flexible and scalable infrastructure suitable to the organizational need
Unit	**Contents**
1	**Overview Of Virtualization (Lectures/practical's : 7)** Introduction to Virtualization, Virtualization Approaches, Virtualization for Server Consolidation and Containment, Hardware Support for Virtualization, Para-Virtualization, vmWare's Virtualization Solutions
2	**Understanding Virtualization (Lectures/practical's :7)** The Roots of Virtualization, Making Better Use of Your Systems with Virtualization, Approaches to Virtualization, Understanding the Virtualization Ecosystem, Reasons to Invest in Virtualization Hardware. **vmWare :** what is VmWare, Virtulization with Vmware, VmWareProducts,Data Center and Cloud Infrastructure, Networking and Security, SDDC Platform, Storage and Availability, The vmWare Approach to the Cloud, vmWare vSphere 4, Server Consolidation and Containment
3	**Hypervisor (Lectures/practical's : 7)** What is Hypervisor, Type 1 Hypervisor, Type 2 Hypervisor, Types of Hardware Virtualization : Full Virtualization, Emulation Virtualization, Para virtualization., Installing Hyper-V In Windows Server 2012,
4	**Types Of Virtualization (Lectures/practical's : 7)** Server Virtualization, Client & Desktop Virtualization Services and Applications Virtualization, Network Virtualization, StorageVirtualization
5	**Tools For Virtualization (Lectures/practical's : 05)** Virtualization with Xen, Virtualization with Bochs and QEMU, Virtualization with Lguest, Virtualization with KVM
6	**Virtualization For Businesses (Lectures/practical's:05)**

	Need for Virtualization in a Business, Implementation of Virtualization in a Business, Cost-Benefit Analysis of Virtualization
7	**Openstack And Its Role In Virtualization (Lectures/practical's : 05)** Understanding Openstack, nine Core key components of openstack. CASE STUDIES OF VIRTULIZATION : Xen Hypervisor, OpenVZ Hypervisor, MS Virtual Server 2005 R2, Oracle VM
Text Books	**References:** 1. "Virtulization" – A Manager's Guide, By Dan Kusnetzky, O'reilley Publications, 2. "Virtulization for Dummies", 1st Edition, Kindle Edition, by Bernard Golden.
Reference	Please refer these websites for MOOC's: NPTEL / Swayam www.edx.com www.coursera.com

ELECTIVE GROUP (01): CLOUD COMPUTING

Subject Name	**(1)Cloud Computing Services (Amazon Web Services)**
No. of Credits	3 Credits (2 Lectures +1 Tutorial)
Pre Requisite	Knowledge of Cloud Computing Concepts Knowledge of Virtualization Knowledge of Cloud secuity Knowledge of Web technologies Knowledge of Iaas, PaSS,SaSS&DaSS
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	How to provide Flexible and scalable infrastructures as per user requirement
Understanding	Understanding the components of AWS
Applying	Carrying out practical's through AWS
Analyzing	The case studies will help us to understand more of practice of cloud computing in the market.
Evaluating	Comparison of cost-wise solution to the problem and selecting the best solution for the problem suggested to the organization
Creating	Creating flexible and scalable infrastructure suitable to the organizational need
Unit	**Contents**
1	**Cloud Computing Fundamentals (Lectures/practical's : 10)** Definition of Cloud Computing , private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public Vs private clouds
2	**Infrastructure &Networking (Lectures/practical's :10)** Introduction to Amazon Web Services AWS Global Infrastructure Introduction to Network Switches & Virtual Private Cloud VPC & Subnets Internet Gateways, VPC Peering & NAT Gateways IP Addressing in AWS Understanding AWS Security Groups Launching our first EC2 instance EC2 instance types & Pricing Models
3	**Storage (Lectures/practical's : 10)** Introduction to Block & Object storage mechanism Introduction to Elastic Block Store - EBS EBS Snapshots EBS Volume Types Instance Store Volumes Introduction to Simple Storage Service (S3) Features of S3
4	**Elastic Load Balancers –(** Lectures/practical's : 10) Understanding High Availability Configuration ELB Configuration

	Elasticity Auto Scaling **Identity & Access Management** Understanding the IAM Policies IAM User, IAM Policy and IAM Role
5	**Relational Databases(Lectures/practical's : 05)** Introduction to Relational Databases Creating our first database structure in MySQL Getting started with DynamoDB
6	**Domain Name System(Lectures/practical's : 05)** Introduction to DNS Understanding DNS Records Introduction to Route53
7	**AWS Lambda and API(Lectures/practical's : 05)** Getting started with AWS Lambda Introduction to API Understanding working of API Building our API with API Gateway
Text Books	1. Cloud Computing: Principles and Pardigms by RajkumarBuyya, jamesBroberg and Andrzej M.Goscinski, Wiley, 2011. 2. Amazon Web Services for Dummies – Wiley Brand. 3. Learning AWS – Design, Build and Deploy responsive applications using AWS cloud components by Aurobindo Sarkar, Amit Shah
Reference Books	1. Learn AWS – David Clinton 2. AWS Lab by Zoom Technologies

ELECTIVE GROUP (02):DATA SCIENCE

Subject Name	**(A) - Statistical Programming in R**
No. of Credits	3 Credits (2 Lectures + 1 Tutorial)
Pre Requisite	Statistical Knowledge required
Course Objectives	• To teach the Beginners of R Programming of the a master level. A variety of topics will be covered that are important for Data science in order to prepare the students for real life prediction of data engineering. • To impart knowledge of the concepts related to Probability and Application on data sets. It also gives the idea how data is managed in various environments with emphasis on Predictions measures as implemented in data sets.
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	• Remember the definitions of concepts and their Implementation in R.
Understanding	• Understand the concept of data and techniques for its Implementation • Understand data data standards and methods. • Understand the fundamentals of Data science
Applying	• Design different data behaviors and their Predictions. • Predictions Model Develop.
Analyzing	• Analyzing Data set • Studying Historical Data.
Evaluating	• Convert the historical Data into Prediction Model.
Creating	• Write R coding for Prediction Model.
Unit	**Contents**
1	**Introduction of Probability (8 Lectures)** Concept, Types of Probability, Permutation and Combination concept ,Addition and Multiplication Theorem, Condition Probability, Bayes's Theorem
2	**Random Variable (5 Lectures)** Concept, Discrete and Continuous Random Variable, Probability density function, Mathematical Expectation and their Theorem
3	**Data Distribution (7 Lectures)** Distribution, Types of Data distribution, Exponential distribution, Binomial distribution, Normal distribution, Poisson distribution, Random number generation, Monte Carlo Simulation.
4	**Testing of Hypothesis (5 Lectures)** Procedure of Testing Hypothesis, Standard Error and Sampling distribution, Estimation, Student's t-distribution, Chi-Square test and goodness of fit, F-test and analysis of variance. Factor analysis.
5	**Introduction to R programming language (5 Lectures)** Getting R, Managing R, Arithmetic and Matrix Operations, Introduction to Functions, Control Structures. Working with Objects and Data: Introduction to Objects, Manipulating Objects, Constructing Data Objects, types of Data items, Structure of Data items, Reading and Getting Data, Manipulating Data, Storing Data.
6	**Graphical Analysis using R (5 Lectures)** Basic Plotting, Manipulating the plotting window, BoxWhisker Plots, Scatter Plots, Pair

	Plots, Pie Charts, Bar Charts.
7	**Advanced R (10 Lectures)** Statistical models in R, Correlation and regression analysis, Analysis of Variance (ANOVA), creating data for complex analysis, Summarizing data, and case studies.
Text Books	"Fundamentals of Statistics" Seven Edition By S.C.Gupta
Reference Books	1."Fundamentals of Statistics" Seven Edition By S.C.Gupta 2."R Programming Fundamentals by KaelenMedeiras 3." Reinforcement Learning e-book. 4. Learning R Programming Guide on line **Suggested MOOC :**Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com, www.coursera.com

ELECTIVE GROUP (02):DATA SCIENCE

Subject Name	**(02) B - Introduction to Data Science**
No. of Credits	3 Credits (2 Lectures + 1 Tutorial)
Pre Requisite	Statistical and Programming Knowledge required
Course Objectives	• To teach the Beginners of Data analysis through R /Python Programming of the a master level. A variety of topics will be covered that are important for Data science in order to prepare the students for real live Project Analysis • To impart knowledge of the concepts related to Machine Learning and implement and variety Application on data sets. It also gives the idea how data is managed in various environments with emphasis on Analysis measures as implemented .
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	• Remember the definitions of concepts and their Programming skills.
Understanding	• Understand the concept of coding and techniques for its Implementation • Understand data different Methods . • Understand the fundamentals of Data science
Applying	• Design different Model and their validity check. • Concept applying in other domain area.
Analyzing	• Analyzing Data set. • Comparing different Model .
Evaluating	• Convert the analysis in Modern approaches.
Creating	• Write R/Python coding for Analysis
Unit	**Contents**
1	**Association Rule** (5 Lectures) Mining Frequent Patterns, Associations, and Correlations: Basic Concepts and a Road Map, Association Rules, the Apriori Algorithm Classification and Prediction
2	**Classification (5 Lectures)** Classification, Issues Regarding Classification, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Metrics for Evaluating Classifier Performance, Holdout Method and Random Sub sampling
3	**Prediction (5 Lectures)** Prediction, Issues Regarding Prediction, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor. Clustering : Cluster Analysis, Agglomerative versus Divisive Hierarchical Clustering, Distance Measures in Algorithmic, Evaluation of Clustering
4	**Linear Regression (5 Lectures)** Prediction using Linear Regression, Gradient Descent, Linear Regression with one variable, Linear Regression with multiple variables, Polynomial Regression, Feature Scaling/Selection
5	**Logistic Regression (5 Lectures)**

	Classification using Logistic Regression, Logistic Regression vs. Linear Regression, Logistic Regression with one variable and with multiple variables
6	**Deep Learning (10 Lectures)** History, Scope and specification, why deep learning now, building block of neural network, neural networks, Deep learning hardware. Backward and forward neural networks, XOR model, cost function estimation (maximum likelihood), units, activation functions, layers, , normalization, hyper-parameter tuning, Convolution neural networks, architecture
7	**Case study (10 Lectures)** Iris Data set ,Loan Data set, Titanic survival Data set ,Share Market Data set, Covide -19 Data set etc
Text Books	**An Introduction to Machine Learning Springer by GopinathRebala**
Reference Books	1. Fundamentals of Statistics" Seventh Edition By S.C.Gupta **2.An Introduction to Machine Learning Springer byGopinathRebala** **3.Deep Learning MIT Press by John D.Kelleher.** **Suggested MOOC :**Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com, www.coursera.com

ELECTIVE GROUP (03): LINUX

Subject Name	**(03)A- Linux Desktop Environment, Shell Programming and System Administration**
No. of Credits	**3 Credits**
Pre Requisite	Knowledge of any operating system
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Linux Architecture and Shell Commands
Understanding	Understanding of Linux operating system and environment
Applying	Use Linux operating system for configuring the environment.
Analyzing	
Evaluating	Writing shell scripts and evaluating them
Creating	Creating small applications for smart home/city using Arduino
Unit	**Contents**
1	**Linux Installation (8 Lectures)** **Using Shell Interface:** ▪ Introduction to Linux ▪ Internal and external commands ▪ General purpose utilities ▪ Navigating the file system ▪ Handling ordinary files **Using GUI Environments:** ▪ GNOME desktop environment KDE desktop environment
2	**Using open source office suite (8 Lectures)** ▪ Word processor application ▪ Spreadsheet application ▪ Presentation application ▪ Desktop database application **Using the Internet** ▪ World wide web ▪ FTP ▪ Telnet **Using Multimedia** ▪ Graphics ▪ AudioVideo
3	**Introduction to shell (8 Lectures)** ▪ Introduction to 'bash' shell ▪ Redirection ▪ Pipes ▪ Tees ▪ Command substitution ▪ Introduction to other shells: Korn shell, C Shell etc. **Shell environment** ▪ Shell variables ▪ Handling the command line arguments

	▪ Login scripts ▪ Terminal characteristics ▪ Aliases **Text editors** 'vi' editor , 'emacs' editor
4	**Shell commands (5 Lectures)** ▪ General purpose utilities ▪ File management ▪ Process management ▪ Communication management **Regular expressions** ▪ Pattern matching ▪ Wild cards ▪ Regular expressions ▪ Utilities: grep, egrep, fgrep etc. **Filters** ▪ Introduction to filters Utilities: pr, head, tail, cut, paste, sort, uniq, nl, tr etc.
5	**Shell scripting (6 Lectures)** ▪ Introduction to shell scripting ▪ Programming constructs ▪ Mathematical operators ▪ Logical operators ▪ String manipulation ▪ Interactive scripts Handling command line arguments
6	**Understanding system administration (6 Lectures)** ▪ Introduction to the routine activities in system administration ▪ Shell commands for system administration ▪ Administrative tools Managing file systems and disk space
7	**Setting up and supporting users (8 Lectures)** ▪ Managing user accounts ▪ Providing support to the users **Automating system tasks:** ▪ Aut System initialization ▪ System startup and shutdown ▪ Scheduling system tasks omating system tasks: **Backing up and restoring files:** ▪ Backup and restore strategy ▪ Backup and restore tools **Computer security issues:** ▪ Password protection FirewallsImplement one small project
Text Books	**Textbook:** ▪ Red Hat Linux Bible: Fedora and Enterprise Edition - by Christopher Negus

Reference Books	UNIX Concepts and Applications - by Sumitabha Das
MOOC on NPTEL	

ELECTIVE GROUP (03): LINUX

Subject Name	**(03)B -Linux** **Linux Internals and Network Administration**
No. of Credits	**3**
Pre Requisite	Basics of Operating System
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Remembering Linux Internal and Network Management commands
Understanding	Understanding of Linux operating system and Network administration.
Applying	Creating Proxy, server, File server, web server
Analyzing	Analyzing inter process communication
Evaluating	Performance of different servers
Creating	Use of Linux administration for creation of server and management
Unit	**Contents**
1	**Setup And Manage a Local Area Network (8 Lectures)** Basic Networking, Introduction to networking, OSI Model,IP addressing (IPV4, IPV6) & LAN establishment with Linux , Configuring internet in Linux through broadband, dial-up, data card & through mobile (gprs). **Setup And Manage Proxy Server :** Basics of proxy services, Configuring proxy services, Creating ACL's for controlling access to internet, SQUID: Proxy server setup, Blocking Websites, content filtering, Bandwidth Management
2	**Setup And Manage FILE Server (8 Lectures)** NFS: network file sharing & resource sharing across Linux environment. YUM server: Setting up local YUM, FTP YUM, HTTP YUM, EPEL, REMI &RPMForge like YUM configuration, DHCP:Dynamic Host Configuration Protocol setting up, Allocating IP, Subnet mask, default gateway and hostname, communication with DNS and other protocols. **Setup And Manage FTP Server**
3	**Setup And Manage Web Server (8 Lectures)** Basics of Web Services, Introduction to Apache, Configuring Apache for main site, Configuring Apache for multiple sites using IP-based, port based and name-based, Web Server: Apache installation, configuring dedicated server, shared server, user based authentication, load balancing and apache tuning. NIS, LDAP: (user's liberty to sit into remote machine) MAIL Server: knowing MUA,MTA& MDA, setting up and configuring POSTFIX,PO3s v/sIMAPs, Squirrel mail, accessing via Outlook, Thunderbird and evolution. Multi/virtual domain management, email security. Postfix Administration.
4	**Setup And Manage boot Server (5 Lectures)** What is booting and boot process of Linux?,Init Process or Run levels **Setup And Manage DNS Server :** Basics of Internet, Basics of DNS and BIND 9, Configuring DNS primary server, DNS:master DNS, slave DNS with forward & reverse zone, one DNS resolving multiple domain, dynamic DNS etc
5	**(6 Lectures)** Architecture of Linux, User and Kernel Space, Introduction to System

	Calls, System Calls in Detail, trace – Tracing system calls. **Process management** Introduction to Process and process attributes, process vs. Program, Process States, Creating Process, Process termination, process commands Special case of processes. **Inter Process Communication** Introduction to IPC, Pipe, FIFO, Shared Memory, Advantages and Disadvantages of various IPC mechanisms, Application of IPC
6	**Working with Signals and Threads (6 Lectures)** **Thread and Process Synchronization** Threads and resources management, Race condition in multi-threaded applications,writing thread safe code,Mutex, POSIX Semaphores, Usage of Binary semaphores and Mutex Race condition in multi-process applications, Limitations of shared memory, Semaphore Implementation
7	**Linux Networking (8 Lectures)** OSI and TCP/IP models, Addressing in TCP/IP, IPv4 and IPv6 differences, TCP three-way handshake, Network packet analysis in Linux, Networking commands in Linux, Using socket API to implement client server communication, Working with TCP and UDP sockets, Synchronous I/O
Text Books	1. Linux Administration : A Beginner's Guide, Shah, TMH 2.LINUX: The Complete Reference, Petersen, TMH 3.LINUX Network Administrator's Guide, Kirch,SPD/O'REILLY
MOOC on NPTEL	https://nptel.ac.in/courses/106/105/106105166/

ELECTIVE GROUP (04):OPEN SOURCE TECHNOLOGIES

Subject Name	**(04) A. Perl Scripting**
No. of Credits	3 Credits
Pre Requisite	
Course Objectives	**Course Objective :** • To introduce basic concepts of Perl Programming and write, modify, and run simple Perl scripts and study working with files and using perl as an object oriented language
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Using some basic concepts of Perl scripting terminology for development of applications for organization .
Understanding	By remembering students will understand concepts of perl language and how to develop and implement various types of programs as per need of organization
Applying	Students will Have thorough knowledge about programming of Perl.
Analyzing	Students will acquire a good knowledge of programming with perl. Student will be able to pursue his study in object oriented concepts also using perl.
Evaluating	Ability to select proper programming concept to design applications to solve real world problem.
Creating	Design and create ir own applications using procedures, functions, file handling & OOP objects.

References (Books, Websites etc) :

- Mastering Perl : Brian, O'Reilly
- www.tutorialspoint.com/perl/index.htm

Suggested MOOC :
Swayam

Course Plan

Unit	Contents
1	**Perl ─ Introduction** What is Perl? Perl features , Perl ─ Syntax Overview, Perl ─ Data Types , Numeric Literals String Literals , Perl ─ Variables , Creating Variables, Perl─ Scalars, Scalar Operations ,Perl ─ Arrays Perl ─ Hashes
2	**Control Flow and Looping Statement** if statement , if else statement, if elsif else statement, unless statement, switch statement, ? : Operator **Perl ─ Loops :** while loop , until loop, for loop, For each loop do while loop nested loops, next statement, last statement, continue statement, redo statement, go to statement, Infinite Loop
3	**Perl ─ Operators** What is an Operator? Perl Arithmetic Operators, Perl Equality Operators, Perl Assignment Operators, Perl Bitwise Operators, Perl Logical Operators, Quote-like Operators, Perl ─ Date and Time, GMT Time Format, Date & Time, Epoch time,

	POSIX Function strftime()
4	**Perl ─ Subroutines** Define and Call a Subroutine, Passing Arguments to a Subroutine, Passing Lists to Subroutines, Passing Hashes to Subroutines, Returning Value from a Subroutine, Private Variables in a Subroutine, Temporary Values via local(), State Variables via state() Subroutine, Call Context **Perl ─ References :** Create References Dereferencing Circular References, References to Functions Perl ─ Formats Define a Format Using Format, Define a Report Header Number of Lines on a Page, Define a Report Footer , String and Mamatical Functions
5	**Perl ─ File I/O** Opening and Closing Files, Open Function, Sysopen Function, Close Function, Operator getc Function, read Function, print Function, Copying Files Renaming a file, Deleting an Existing File Positioning inside a File **Perl ─ Directories :**Display all Files, Create new Directory, Remove a directory, Change a Directory
6	**Perl ─ Regular Expressions** Pattern Matching, Match Operator Match Operator Modifiers Matching Only Once Regular Expression Variables. Substitution Operator Substitution Operator Modifiers. Translation Operator Translation Operator Modifiers More Complex Regular Expressions Matching Boundaries Selecting Alternatives Grouping Matching. \G Assertion Regular-expression Examples
7	**Introduction to Object Oriented Programming in Perl** Object Basics, Defining a Class Creating and Using Objects, Defining Methods, Inheritance Method Overriding , Default Auto loading, Destructors and Garbage Collection, Object Oriented Perl Example

ELECTIVE GROUP (04):OPEN SOURCE TECHNOLOGIES

Subject Name	**(04)B- Ruby**
No. of Credits	3 Credits
Pre Requisite	
Course Objectives	**Course Objective :** • Main objective of this paper is to learn, object-oriented programming with Ruby, Rails fundamentals and how to create basic online applications. How to work with HTML controls, use models in Rails applications, and work with sessions. Details on working with databases and creating, editing and deleting database records, Methods for handling cookies and filters and for caching pages.
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Using some basic concepts of Ruby scripting for development of applications for organization .
Understanding	By remembering students will understand concepts of ruby rails and how to develop and implement various types of programs as per need of organization
Applying	Students will Have thorough knowledge about object-oriented programming with Ruby.
Analyzing	Students will acquire a good knowledge of programming with HTML controls, use models in Rails applications, and work with sessions. Student will be able to pursue his study in object oriented concepts for online application development..
Evaluating	Ability to select proper programming concept to design applications to solve real world problem.
Creating	Design and create ir own applications using OOP objects & rails application developement.

References (Books, Websites etc.):

- Programming Ruby: Pragmatic Programmers' Guide, Second Edition
- Agile Web Development with Rails, Third Edition
- www.webtechlearning.com

Suggested MOOC :
SWAYAM

Unit	Contents
1	**Introduction to Ruby** Creating a first web application, getting started with Ruby, Checking ruby documentation, working with numbers in ruby, working with strings in ruby.
2	**Variables and Constants in Ruby** Storing data in variables, creating constants, interpolating variables in Double-Quoted strings, reading text on command line, creating symbols in ruby, working with operators, Handling operator precedence, working with Arrays, using Two Array Indices, working with Hashes, working with ranges.

3	**Conditional Loops, Methods and Blocks** If Statement, Using case statement, using loops, creating and calling a method, making use of Scope, working with Blocks
4	**Classes:** creating a class, creating an object Data Encapsulation, Data Abstraction, Polymorphism, Inheritance
5	**Objects** Understanding Ruby's object Access, overriding method, creating class variables, creating class methods, creating Modules, creating Mixins
6	**Rails** Putting Ruby to Rails, introducing Model View Controller Architecture, giving view something to do, mixing ruby code and HTML inside view, passing data from an action to a view, escaping sensitive text, adding a second action.
7	**Building Simple Rails Applications** Accessing data user provides, using rails shortcuts for HTML controls, working with models, tying controls to models, initializing data in controls, storing data in sessions

ELECTIVE GROUP (05): MOBILE COMPUTING

Subject Name	**(05) A- JavaScript Programming**
No. of Credits	3 Credits
Pre Requisite	Basic Knowledge about website development.
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Using some basic concepts of programming be understood and remembered .
Understanding	By remembering students the basing concepts students will understand the concepts of programming structure
Applying	Students willHave thorough knowledge about website working
Analyzing	To study the form elements and its working
Evaluating	Ability to select proper functionality of a page and form.
Creating	Design and create their own websites with proper validation
Unit	**Contents**
1	**Introduction to Javascript (5 Lectures)** JavaScript Overview , JavaScript Programming Basics, **Variables and Operators** : Variables and Data Types , Operators , Array
2	**Control Statements (5 Lectures)** Controlling the Flow: JavaScript Control Statements, **Functions :** Parameters and working, **The Window Object** : The Window Object, Dialog Boxes ,Window function
3	**The Document Object (4 Lectures)** The Document Object, Writing to Documents, Document related functions**Forms and Forms-based Data :** The Form Object , Working with Form Elements and Their Properties ,Event related with form
4	**Form Validation (4 Lectures)** A Process, Testing Data , Preparing Data for Validation and Reporting Results, Validating Non-text Form.
5	**Frames: (6 Lectures)** HTML Frames Review, Scripting for Frames **The String and RegExpObjects** : The String Object, Properties and methods of String Object, Using String Object Methods to Correct Data Entry Errors, The RegExp Object **Dates and Math:** The Date Object, Properties and methods of Date Object, The Math Object , Properties and methods of Math Object
6	**AJAX (8 Lectures)** **Animation**: Frequently used Animation function, Manual and Automated animation. **AJAX**: Introduction to AJAX, Interacting with the Web Server using XMLHttpRequest Object, Need of Web server
7	**JS Frameworks & Libraries (8 Lectures)** Need of JSON , RESTful API with JSON, jQuery, Intro ,Effects and

	animations DOM/HTML Updates,jQuery and Ajax
Reference Books	1. JavaScript and JQuery: Interactive Front-End Web Development, by Jon Duckett *2.* JavaScript: The Definitive Guide, by David Flanagan 3. Learn JavaScript VISUALLY, by IvelinDemirov
MOOC on NPTEL	https://nptel.ac.in/courses/106/105/106105084/ https://youtu.be/uUhOEj4z8Fo

ELECTIVE GROUP (05): MOBILE COMPUTING

Subject Name	**(05)B - Android**
No. of Credits	3 Credits (2 Lectures + 1 Tutorial)
Pre Requisite	Basic Knowledge about Java language
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Using some basic concepts of programming with GUI .
Understanding	By remembering students the basing concepts students will understand the concepts of program structure with layout
Applying	Students will Have thorough knowledge how programming affects on layout, output design.
Analyzing	To see various parts of design and its elements
Evaluating	Ability to create effective layout.
Creating	Design and create their own screen with proper view.
Unit	**Contents**
1	**Introduction to Android (5 Lectures)** Evolution of Android ,Advantages of Android, SDK Tools for Android **Overview of Android Platform :** Android Development IDE Understand the Working of Android, The Android Application Framework, Screen Layout Design, User Interface Design, Introduction to Graphics and Animation Design, Interactivity, Introduction to Content Providers, Intent and Intent Filters
2	**Android Development Environment (8 Lectures)** **Setting up the Android Development Environment :**Installing Android Development Environment, Updating the Android SDK Setting up AVDs and Smartphone Connections **Introduction to the Android Software Development Platform :** Understanding Java SE and Dalvik Machine, The Directory Structure of an Android Project, Android XML, Android Application Resources ,Launching an Android Application, Creating first Hello Application
3	**Overview of Android Framework (7 Lectures)** Overview of Object Oriented Programming, Overview of XML The Anatomy of an Android Application, Components of an Android Application, Android Intent Objects, Android Manifest XML
4	**Screen Layout Design (7 Lectures)** Android View Hierarchies, Activity Lifecycle, Defining Screen Layouts (Screen size, pixel density) **User Interface Design:** Using Common UI Elements, Using Menus in Android , Adding Dialogs(Date picker, Time picker, Custom Dialog, Alert

	Dialog
5	**Introduction to Graphics Resources (7 Lectures)** Introduction to Drawables, Using Bitmap Images, Using Transitions, Creating 9-Patch Custom Scalable Images, Playing Video in Android Apps **Handling User Interface Events:** An Overview of UI Events, Handling onClick Events for all Views, Android Touch-screen Events: onTouch Touch-screen's Right-Click Equivalent: onLongClick, Keyboard Event Listeners: onKeyUp, onKeyDown, Context Menus: onCreateContextMenu, Controlling the Focus
6	**(8 Lectures)** **Understanding Content Providers:** An Overview of Android Content Providers, defining a Content Provider, Working with a Database **Intents and Intent Filters :**Understanding the Intents, Android Intent Messaging via Intent Objects, Intent Resolution, Using Intents with Activities, Android Services, Using Intents with Broadcast Receivers
7	**Bars and Views (8 Lectures)** Action Bar, Toolbar, Navigation Drawer, TextView, EditView, Button, WebView, ImageView ,ListViewetc
Reference Books	1.Android Application Development All-in-One For Dummies- Barry A. Burd 2.Android Programming: The Big Nerd Ranch Guide Programming Android: 3.Java Programming for the New Generation of Mobile Devices- Authors: Zigurd R. Mednieks, Laird Dornin, G. Blake Meike, Masumi Nakamura
MOOC on NPTEL	https://nptel.ac.in/courses/106/106/106106147/ https://youtu.be/bBt5sTXaOJA

ELECTIVE GROUP (06): DOT NET TECHNOLOGIES

Subject Name:	**(06) A- C# Programming and Applications**
No. of Credits:	3 Credits (2 Lectures + 1 Tutorial)
Pre Requisite:	Basic Knowledge of Object-Oriented Programming, Event Driven Programming was and Database Applications.
Cognitive Abilities:	Course Outcome as per Blooms Taxonomy
Remembering:	Using basic concepts of object-oriented programming, event driven programming and database application programming in C# can be understood and remembered.
Understanding:	By remembering basic concepts students can understand how to work with programming in C#. Students need to understand programming structures of OOP in C#. Needs to understand methods and properties of various controls of windows forms application along with database objects and their methods.
Applying:	Students will have detailed knowledge of Abstraction, Inheritance, Polymorphism, Encapsulation, Exception Handling, Windows forms applications and database applications
Evaluating:	Students will have ability to use proper methods of C# to solve object oriented problems.
Creating:	Students can apply the concepts of C# programming to create console based and windows based applications.
Syllabus:	**Unit 1: Introduction to C#: (7 Lectures)** Programming Features of C#, Keywords in C#, Namespaces, Data Types, Variables, Operators, Type Conversions, The '?:' Operator, Control Statements. Methods, Passing Method Parameters, Method Overloading, Array, ArrayList class, String Methods, foreach loop.
	Unit 2: Classes and Objects: (7 Lectures) Basic Principles of OOP, Define a Class, Member Access Modifiers, Constructors, Types of Constructors (Default Constructor, Overloaded Constructor, Static Constructor, Private Constructor and Copy Constructor), Destructors, 'this' Reference, Constant Members, Properties, Auto Implemented Properties, Object Initializer, Collection Initializer, Anonymous Types, Extension Methods, Partial Class, Partial Methods, Indexers.

	Unit 3: Inheritance and Polymorphism: (8 Lectures) Define Inheritance, Types of Inheritance, Method Overriding, Abstract Class, Abstract Methods, Sealed Class and Methods, Define Polymorphism, Static Polymorphism: Function Overloading Operator Overloading, Overloadable and Nonoverloadable Operators, Dynamic Polymorphism, Defining Interface, Extending interface, Interface and Inheritance, Explicit Interface.
	Unit 4: Errors and Exception Handling: (7 Lectures) Types of Errors, Exceptions, Syntax for Exceptions Handling Code, Multiple catch Statements, finally Statement, Nested try Block, Throwing Our Own Exception.
	Unit 5: Working with Windows Form Controls: (7 Lectures) Properties, Events and Examples of: Button, Label, LinkLabel, TextBox, RichTextBox, ListBox, ListView, ComboBox, RadioButton, CheckBox, CheckedListBox, DateTimePicker, PictureBox, Timer, ProgressBar, TrackBar, HScrollBar, VScrollBar.
	Unit 6: Menus, MDI and Containers: (7 Lectures) ContextMenuStrip, MenuStrip, StatusStrip, ToolStrip, SDI and MDI, Visual Inheritance, GroupBox, Panel, TreeView, SplitContainer, TabControl Example.
	Unit 7: Data Access and Data Bindings: **(7 Lectures)** ADO.NET Overview, .NET Data Providers, ADO.Net Objects, Connections, Commands, Data Adapters, Data Readers , Data Sets , Data Tables , Data Views , Data Bindings, Reports.
References (Books, Websites etc)	• C#: The Complete Reference, McGraw-Hill Osborne Media- Herbert Schildt. • C # Programming- Wrox publication. • Programming in C# -A Primer. E. Balaguru
Suggested MOOC:	1) Coursera (www.coursera.org) 2) mymooc (www.my-mooc.com) 3) Class Central (www.class-central.com) 4) edX (www.edx.org) 5) Mooc List (www.mooc-list.com

ELECTIVE GROUP (06): DOT NET TECHNOLOGIES

Subject Name:	**(06)B-ASP.Net with MVC**
No. of Credits:	3 Credits
Pre Requisite:	Basic Knowledge of Website Development, JavaScript, Validations, State Management etc..
Cognitive Abilities:	Course Outcome as per Blooms Taxonomy
Remembering:	Using basic concepts of website development, methods and properties ASP. Net in C# can be understood and remembered.
Understanding:	By remembering basic concepts students can understand how to work with web designing in C#. Students need to understand methods and properties of various client and server side controls. Working of state management is also needs to understand.
Applying:	Students will have detailed knowledge of Website design and development, validation, state management, use of web parts and Ajax controls.
Evaluating:	Students will have ability to use proper client side and server side controls of C# to design modern web design.
Creating:	Students can apply the concepts of C# programming for designing a programs for desktop or mobile, as well as web application.
Syllabus:	**Unit 1: Introduction to ASP.Net: (7)** Introduction to ASP.Net, ASP.Net Architecture, ASP.Net Page Life Cycle, Page Life Cycle Events, ASP.Net Directives., FileUpload Control, Calendar Control, AdRotator Control, MultiView Control, and Wizard Control Examples, Validation Controls, Menu, SiteMapPath, TreeView Control.
	Unit 2: Master Pages, CSS, and JavaScript: (8 Lectures) Working With Master Pages, Nested Master Pages, CSS Overview, Adding Style Sheets into, Web Pages, Editing Styles, Applying Styles to Master Pages, Applying Styles to Web Page, JavaScript Overview, Adding JavaScript files into ASP.Net, Editing JavaScript Files, Applying JavaScripts to Master Pages, Applying JavaScripts to WebPage.
	Unit 3: State Management: (7 Lectures) View State, Hidden Field, Session State, Application State, QueryString,

	HttpContext, Cookies, Caching, Types of Caching.
	Unit 4: Data Access in ASP.Net: (7 Lectures) Data Source Controls, DataList, DataPager, GridView, DetailsView, FormView, Object Data Sources, ListView, DataPager, Repeater.
	Unit 5: ASP. Net Web Parts: (7 Lectures) Introduction, Advantages of Web Parts, WebPartsManager, CatalogPart, PageCatalogPart, EditorPart, WebPartZone,, EditorZone, CatalogZone Controls.
	Unit 6 :Ajax Controls: (7 Lectures) AJAX control toolkit, Building a ASP.NET Page with AjaxScriptManager Control, UpdatePanel Control, UpdateProgress Control, Timer Control
	Unit 7: Working with MVC: (7 Lectures) Introduction to .Net MVC Framework, MVC Framework Features, MVC Architecture, MVC Components, MVC Application Folders, Configuration files- global.asax, packages.config, web.config, Working with Views, Woking with Controls.
Reference Books:	• ASP.Net: The Complete Reference, Matthew MacDonald • Professional ASP.Net (4/4.5) in C #- Wrox publication
Suggested MOOC:	1) Coursera (www.coursera.org) 2) mymooc (www.my-mooc.com 3) Class Central (www.class-central.com) 4) edX *(*www.edx.org*)* 5) Mooc List (www.mooc-list.com)

ELECTIVE GROUP (07): NET CENTRIC TECHNOLOGIES

Subject Name	**(07)-A HTML 5.0**
No. of Credits	3 Credits
Pre Requisite	Basic concepts of Languages and HTML tags with functions.
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Understand the Concepts of HTML 5 & the Applications of HTML 5 to WebsiteDevelopment.
Understanding	By remembering students the basic concepts of HTML and the applications of advanced features of HTML 5. 0 for web development. .
Applying	Students will Have thorough knowledge about practical approach in designing website for various business applications..
Analyzing	To Measure the knowledge about website development and practical applications of advanced features to the web applications
Evaluating	Ability to select proper method to use better tools for website development using HTML 5.0 features and apply security measures to the websites also use useful functions of HTML 5.0
Creating	Design and Develop Websites for various BusinessApplications. Check information inputted into a Database and validateit.
Syllabus	**Unit-1 Introduction to HTML: (7 Lectures)** MIME Types, Standards for the Internet, Evolution of HTML, Introduction to XHTML, Introduction to Working Group, W3C
	Unit-2 Features of HTML5: (6 Lectures) Detection of HTML5 Support, Modernizr: An HTML5 Detection Library, Canvas, Canvas , Text, Video, Video Formats, Local Storage, Web Workers, Offline Web Applications, Geolocation, Input Types, Placeholder Text, Form Autofocus, Microdata
	Unit-3 Elements of HTML5: (7 Lectures) The Doctype, The Root Element, The <head> Element, New Semantic Elements in HTML5, Handling of Unknown Elements by the Browsers, Headers, Articles, Dates and Times, Navigation, Footers
	Unit-4 :Drawing Surface: (7 Lectures) Introduction to Canvas, Simple Shapes, Canvas Coordinates, Paths, Text, Gradients, Images
	Unit-5 :Video on the web (6 Lectures) Video Containers, Video Codecs, Audio Codecs
	Unit-6 :Geolocation and Local Storage for Web Applications (7 Lectures) Geolocation API, Handling Errors, geo.js Library, Evolution of Local Storage, Introduction to HTML5 Storage
	Unit-7 :Web Forms and Offline Web Application (6 Lectures) Introduction to Web Forms, Placeholder Text, Autofocus Field, e-Mail, Addresses, Web Addresses, Numbers as Spinboxes, Numbers as Sliders, Date Pickers, Search Boxes, Color Pickers, Introduction to Offline Web application, The CacheManifest

Text Books	1. .Anil Gaikwad , JyotiBiradar (Patil) Basic Concepts of System Analysis Lambert Academic Publication Dec. 2019 . 2. Brian Albers, Frank Salim, and Peter Lubbers "Pro HTML 5.0Programming
Reference Books	1. Bruce Lawson, Remy Sharp –Introducing HTML 5.0 –Google Books 2010. 2. Jeffrey Zeldman and Jeremy Keith "HTML 5 for Web designers – GoogleBooks-2010. 3. Christopher Murphy, DivyaManian, and Richard Clark :Beginning HTML5 andCSS3.2012. 4. Anil Gaikwad ,JyotiBiradar (Patil) Software Project Management Made Easy Lambert Academic Publication 2019 Dec .
MOOC on NPTEL	Please refer these websites for MOOC"s: NPTEL / Swayamwww.edx.comwww.coursera.com

ELECTIVE GROUP (07): NET CENTRIC TECHNOLOGIES

Subject Name	**(07) B - AJAX PROGRAMMING**
No. of Credits	3 Credits
Pre Requisite	Basic concepts of Languages and HTML tags with functions.
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Understand the Concepts of Basic Programming skills and how to use AJAX Programming for software development .
Understanding	Understand the Concepts of AJAX Programming & the Applications of AJAX to WebsiteDevelopment. Design and Develop Websites for various Business Applications using AJAXProgramming. Check information and handle database inwebsites..
Applying	Students will Have thorough knowledge about practical approach in AJAX rogramming language for Software development .
Analyzing	Computer programming detail knowledge , An intermediate knowledge on Programming Languages and its structure for developing professional web applications for business organizations.
Evaluating	Ability to select proper method to use better tools for website development using AJAX programming language . Use maximum features of AJAX language and know the details about security features of the language .
Creating	Design and Develop Web applications or web sites for various BusinessApplications.
Syllabus –	**Unit-1 Introduction to AJAX (6 Lectures)** Introduction to Web Architecture, Traditional Web Communication Processes and Technologies , Introduction to AJAX
	Unit-2 Interacting with the Web Server using XMLHttpRequest Object: (7 Lectures) Introduction to Interaction with Web Server, Create an XMLHttpRequest Object, Interact with the Web Server
	Unit-3 :Working with PHP and AJAX: (6 Lectures) Introduction to PHP , Process Client Requests , Accessing Files Using PHP
	Unit-4 Manipulating XML Data: (7 Lectures) Basics of XML , Create an XML Document Using DOM , Retrieve Data from XML
	Unit-5 :Working with XSLT and AJAX: (7 Lectures) Basics of XSLT , Transform Responses Using XSLT
	Unit-6 :Working with JSON: (6 Lectures) Introduction to JSON Format, Create Data in JSON Format , Implement JSON on the Server Side scripting.
	Unit-7: Using Frameworks in AJAX: (6 Lectures)

	Understand AJAX Frameworks , Use Prototype and Script.aculo.us , Use jQuery **Applying Basic AJAX Techniques** Download Images Using AJAX, Auto-Populate Select Boxes **Implementing Security and Accessibility in AJAX Applications** Create Secure AJAX Applications , Create Accessible Rich Internet Applications
Text Books	1. Anil Gaikwad ,JyotiBirada (Patil) Basic Concepts of System Analysis Lambert Academic Publication Dec. 2019 . 2. Brian Albers, Frank Salim, and Peter Lubbers "Pro HTML 5.0Programming.
Reference Books	1. Ajax: The Definitive Guide: Interactive Applications by Anthony T. Holdener-2014. 2 Kris Hadlock "Ajax for Web Developers Amazon Books2012. 3 Ajax: The Complete Reference by Thomas A. Powell-Amazon Books2013 4. Anil Gaikwad ,JyotiBiradar (Patil) Software Project Management Made Easy Lambert Academic Publication Dec. 2019
MOOC on NPTEL	Please refer these websites for MOOC"s: NPTEL / Swayamwww.edx.comwww.coursera.com Website :-https://www.amazon.com/Learn-JavaScript-Ajax-w3Schools-W3Schools/dp/0470611944/

ELECTIVE GROUP (08): INFORMATION SYSTEMS

Subject Name	**(08) A -Recommender System**
No. of Credits	3 Credits
Pre Requisite	Basic Knowledge about Relational Database Management system and Software Development , Knowledge about Business Organizations and its functions , Theory of Recommender Systems and Decision Making process .
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Using some basic concepts of software databases ,development stages and software development also software engineering Information can be understood and remembered .
Understanding	By remembering students the basing concepts students will understand the concepts of Recommender system , Internet and database concepts .
Applying	Students will Have thorough knowledge about practical approach in database design and design the recommender systems for business applications
Analyzing	To Measure the Information systems applications with respect to business benefits . reduce the risk of decision making
Evaluating	Ability to select proper method to use proper recommender system for business applications and make it useful for business functions.
Creating	Design and create own recommender system as per the requirements of the business and functions of the business After going through this course a student should be able to understand : • Will be able to understand the concepts of Decision MakingProcess. • Can be able to design and develop Recommender for Businessapplications. Implementation of Recommender System for various areas of Interest in Business Organizations.
Unit No	**Syllabus contents**
1	**:Introduction to Basic Concepts:** Collaborative Recommendation: User Based Nearest Neighbor recommendation, Item Based Nearest Neighbor recommendation, model based and pre-processing based approaches. Recent practical approaches and systems. Content based Recommendation: content representation and content similarity, similarity based retrieval, other text classification methods, Knowledge Based Recommendation: Knowledge representation and reasoning, interacting with constraint based recommenders, interacting with case based recommenders,
2	**:Hybrid recommendation approaches:** Opportunities for hybridization, Monolithic hybridization design, parallelized hybridization design, pipelined hybridization design,
3	**:Evaluating recommender systems :** General properties of Evaluation research, popular evaluation designs, evaluation on historical datasets, alternate evaluation design
4	**: Recent developments:**

	Attacks on collaborative recommender systems, Online consumer decision making
5	**: Recommender systems and the next-generation web** Recommendations in ubiquitous environments.
6	**: Explanations in recommender systems** Explanations in constraint-based recommenders, explanation in case based recommenders, explanation in collaborative filtering recommenders.
7	**:**Case studies on Recommender System for various Business applications
Text Books	1. "Innovation Management A Business Development Approach - Anil Gaikwad , Rajesh Kanthe –Lambert Academic Publication Dec 2019. 2. "Recommender systems An Introduction" by DietmarJannach, Markus Zanker, AlexzanderFelfering, Gerhard friedrich by Cambridge university press2011 3. Recommender systems handbook [book] by francescoricci, liorRokach, Paul b. Kantorin books
Reference Books	1. Amazon books Recommender System Practical Approach Dec-2019 Amazon Books . 2. Tony Campbell Managing Risk and Information Security :- Protect to Enable. A-Press Open Access Book (Free). 3. Anil Gaikwad , JyotiBiradar (Patil) Software Project Management made Easy Lambert Academic Publication 2019
MOOC on NPTEL	https://nptel.ac.in/courses/, NPTEL / Swayamwww.edx.comwww.coursera.com

ELECTIVE GROUP (08): INFORMATION SYSTEMS

Subject Name	**(08) B -Knowledge Management**
No. of Credits	3 Credits
Pre Requisite	Knowledge about Information System and MIS with Implementation of MIS
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Using some basic concepts of software development , information system and applications of databases o business problems The objective of the course is to provide the basic skills of managing knowledge in organizations. Knowledge is an asset for retaining the competitive advantage of the organization. This course develops the capabilities of towards managing students to manage knowledge in organizations.
Understanding	By remembering students the basic concepts of Knowledge management students will understand the concepts of applications of knowledge management to the business problems .
Applying	Students will Have thorough knowledge about practical approach in designing knowledge management systems for business functions and apply the various advanced tools of software development .
Analyzing	To Measure the knowledge management applications with respect to business benefits . reduce the risk of decision making
Evaluating	Ability to select proper method to use proper knowledge management system for business applications and make it useful for business functions.
Creating	Design and create own knowledge management After going through this course a student should be able to understand : Will be able to understand the concepts of Knowledge and knowledge management. Can be able to design and develop Knowledge management systems for Business applications. Implementation of KM to various areas of Interest in Business Organizations.
Unit No	**Syllabus**
1.	**Introduction:** Definition, Scope and Significance of Knowledge Management , Difficulties of Knowledge Management, Techniques of KM – Implementation of KM, Organizational knowledge, Characteristics and Components of Organizational Knowledge
2.	**Drivers of knowledge Management** Pillars of knowledge Management, KM framework , Supply Chain of KM , Formulation of KMstrategy.
3.	**Technology and KM:** Technology components of KM – IT &KM , Ecommerce and KM
4.	**Total Quality Management and KM:** TQM and KM , Bench marking and KM.

5.	**Implementation of KM:** Discussion on Roadblocks to success, Implementing a KM programme , Critical Success Factors in KM , Implementation of KM
6.	**KM and Organizational Restructuring:** The Mystique of Learning, Organization:- Outcomes of learning, Learning and Change – Innovation, continuous Improvements, Corporate Transformation.
7.	**Case studies in Knowledge Management** Knowledge management in Health Care, Knowledge Management in Human Resource Management and other areas of Business Applications.
Text Books	1. "Innovation Management A Business Development Approach - Anil Gaikwad , Rajesh Kanthe –Lambert Academic Publication Dec 2019. 2. Honey Cutt : "Knowledge Management Strategies", PHI, NewDelhi.
Reference Books	**References (Books, Websites etc.):** 1Madhukar Shukla:Competing Through Knowledge-Building a learning Organization (Response Books, NewDelhi. 2.Awad, KM, Pearson Edn,2007. 3. Barnes, Knowledge Management Systems, 1/e, Thomson2006. IkudiroNonka&Hirotaka Takeuchi, " The Knowledge – Creating Company", Oxford University Press, London. 4. Anil Gaikwad , JyotiBiradar (Patil) Software Project Management made Easy Lambert Academic Publication 2019
MOOC on NPTEL	Please refer these websites for MOOC"s: NPTEL / Swayamwww.edx.comwww.coursera.com

ELECTIVE GROUP (09): IOT

Subject Name	**(09) A - IoT Architecture Sensors and Fundamentals with Hands-on lab**
No. of Credits	**3**
Pre Requisite	School Level Mathematics. Basics of Programming and Networking
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Learning the concepts of IOT, Networking for IOT, Type of Sensor Network, Arduino Programming
Understanding	IOT Standards, connecting Technologies, Machine to Machine Communication
Applying	Implementing IOT with Arduino
Analyzing	Find the usability of IOT in various applications
Evaluating	Evaluate the performance of IOT solution and upgradation
Creating	Creating small applications for smart home/city using Arduino
Unit No	**Syllabus content**
1.	**IOT concepts:** • Technologies that led to evolution of IOT • IOT and SCADA • IOT and M2M • IOT and Big Data Relevance of IOT for the future • IOT in everyday life • Internet of Everything • IOT and Individual Privacy. **Sensing, Actuation, Basics of Networking:** layered architecture, important protocols (MQTT, CoAP, REST, XMPP, AMQP)
2.	**IOT Standards** : Requirement of international standard (case study) IOT standards in practice. Operating platforms /systems **connectivity Technologies:** 802.15.4, Zigbee, 6LoWPANs, RFID, HART, Bluetooth, ZWAVE, ISA 100.11-A
3.	**Sensor Networks:** components of sensor networks, deriving data from sensor nodes, different types of sensor networks and behavior of node in a sesor network, target tracking, wireless multimedia sensor network,nanonetworks, relationship between coverage and connectivity, stationary wireless sensor networks, mobile wireless sensor networks, UAV Networks
4.	**Machine-to-Machine Communications**: exchanging data between machines without human intervention, Low-end sensor nodes, mid-end sensor nodes, M2M ecosystem
5.	**Interoperability in IoT**, syntactic and semantic interoperability

	Introduction to Arduino Programming: Features of Arduino Arduino IDE Sketch Structure Arduino Function Libraries: Example : blink LED Operators, control statements, arrays, string, random number, interrupts
6.	Integration of Sensors and Actuators with Arduino: Sensor interface with Arduino, DTH Sensor Library, Type of Motor Actuators, integration of Actuator with Arduino
7.	IOT Applications: Lighting as a service (case study) Intelligent Traffic systems (case study) Smart Parking (case study) Smart water management (case study) Implement one small project
Text Books	• Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118- 47347-4, Willy Publications • Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-onApproach)", 1 st Edition, VPT, 2014.
Reference Books	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", 1 st Edition, Academic Press, 2014. 2. Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI 3. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer 46. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.htm
MOOC on NPTEL	https://nptel.ac.in/courses/106/105/106105166/

ELECTIVE GROUP (09): IOT

Subject Name	**(09) B - Internet Of Things: implementation with Python and Raspberry Pi**
No. of Credits	**3**
Pre Requisite	School Level Mathematics. Basics of Programming and Networking
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Understand IoT sensors and technological challenges faced by IoT devices
Understanding	Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved
Applying	Implementing IOT with Python and Raspberry Pi
Analyzing	Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi
Evaluating	Evaluate the performance of IOT solution and upgradation
Creating	Creating small applications for smart home/city using Python and Raspberry Pi
Unit No	**Syllabus content**
1.	**Introduction to Python Programming:**Pyton IDE (Spider, Anaconda), Data Types in Python, control statements, functions, file read/write operations, image read/write operations, Networking in Python,
2.	**Introduction to Rasberry Pi:** Basic architecture, installation, Rasberry Pi GPIO, OS setup, using GPIO pins, Taking Pictures using PiCam using Python on Rasberry Pi
3.	**Implementation of IOT with Rasberry Pi**, integration of sensors for data collection, dissemination of data for processing, visualization of data
4.	**Software Defined Networking:** **Origin of SDN** **SDN Architecture** **Rule Placement** **OpenFlow Protocol** **APIs in SDN** **Controller Placement** **Integration of SDN with IoT**
5.	Cloud Computing: Introduction, Service Model Service Management Sensor-cloud Fog Computing
6.	Smart Cites, Smart Homes, connected vehicles, Industrial IOT
7.	Data Handling and Analytics Implement one small project

Text Books	• Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118- 47347-4, Willy Publications • Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-onApproach)", 1 st Edition, VPT, 2014.
Reference Books	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", 1 st Edition, Academic Press, 2014. 2. Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI 3. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer 46. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.htm
MOOC on NPTEL	https://nptel.ac.in/courses/106/105/106105166/

ELECTIVE GROUP (10): BIG DATA

Subject Name	**(10) A - Introduction to Big Data**
No. of Credits	3 Credits
Pre Requisite	Preliminary knowledge of computer, Data Mining, Data Warehousing Concepts.
Course Objectives	To introduce learner with Big Data Concept, decision making by doing analysis on the data and managing the data using Big Data Concept like Business Intelligence Concept, decision making by Business Intelligence Tools on Applications such as Finance, Marketing, Education etc.
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	• Remember the definitions of concepts of Big Data and Business Intelligence Tools.
Understanding	• Understand the concept of Big Data and Business Intelligence Tools. • Understand decision making Theory and Strategies for Big Data. • Understand different Business Intelligence Applications. • Understanding the use of Business Intelligence for AI and Security.
Applying	• Knowledge of Decision making using analysis on the Big Data • Applying on different Big Data Applications in Industries
Analyzing	• Identify and study the Big Data Analysis by Decision Theory and Strategy. • User experience on Big Data and Business Intelligence Tools.
Evaluating	• Applying Decision Making Theory on Big Data.
Creating	• Case Studies: Knowledge about different applications used in industries. • Using Business Intelligence in AI. • Using Business Intelligence for Security
Unit No	**Syllabus content**
1	**Introduction:** Big Data History, The Big Data Business Opportunity- Business Transformation Imperative, Big Data Business Model, Business Impact of Big Data, **Big Data In Organization:** Data Analytics Lifecycle, **Data Scientist Roles and Responsibilities** – Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize, New Organizational Roles, Liberating Organizational Creativity.
2	**.Decision Theory And Strategy:** Business Intelligence Challenge, Big Data User Interface Ramifications, Human Challenge of Decision Making, **Strategy for Decision Making**-Big Data Strategy Document, Case Study.**Value Creation Process:** Understanding Big Data Value Creation, **Michael Porter's Value Creation Models:** Michael Porter's Value Chain Analysis, Case Study.
3	**Big Data User Experience:** The Unintelligent User Experience, Understanding the Key Decisions to Build a Relevant User Experience, Using Big Data Analytics to Improve Customer Engagement, Uncovering and Leveraging Customer Insights,

	Big Data can Power a New Customer Experience, **Big Data Use Cases:** 1. Research Business Intiatives, 2. Acquire and Analyze your Data, 3. Brainstorm New Ideas, 4. Prioritize Big Data Use Cases, 5. Document Next Steps, The Prioritization Process.
4	**Introduction To Business Intelligence Applications:** Introduction to Big Data, Business Intelligence Data Mining, and Data Warehousing, What are Business Intelligence Applications (BIA). Features of BIA.**Sales, Finance And Marketing:** Introduction to Sales, Finance and Marketing Concept, **Education And Learning:** Introduction to Education System, Learning Concept.
5	**Vertical AI Applications:** Overview of AI, What is Vertical AI, Features of Vertical AI, Use of Business Intelligence in Vertical AI, Case Study.
6	**Security:** Define Security, Security in Big Data, Problems with Security, Business Intelligence for Security, Case Study.
7	**Lifescience** Introduction to Life Science, Life Science Intelligence, Features of Life Science Intelligence, Use of Life Science Intelligence in Decision Making, Case Study.
Text Books	
Reference Books	1. Big Data- Understanding How Big Data Power Big Business –By Bill Schmarzo 2. Edureka lectures **Link:-**https://www.youtube.com/watch?v=A02SRdyoshM 3. Business Intelligence Strategy -By John Boyer, Bill Frank, Brain Green, Tracy Harris **Suggested MOOC :**Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com, www.coursera.com

ELECTIVE GROUP (10): BIG DATA

Subject Name	**(10) B -Business Intelligence Tools with HADOOP**
No. of Credits	3 Credits
Pre Requisite	Preliminary knowledge of computer, Big Data Analysis and Business Intelligence.
Course Objectives	To introduce learner with Big Data Concept and HADOOP tool for Business Intelligence. Using different Advance Excel Functions (like Optimization) and implementing it on Big Data for decision making. By solving Case Studies the students will get real example of using BI Tools in industry. It will also introduce learner with decision making by doing analysis on the data using HADOOP Tool and also managing the Big Data using HADOOP.
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	• Remember the concepts of Business Intelligence Tools and HADOOP.
Understanding	• Understand the Excel Tools for Business Intelligence. • Understand working with Macros. • Understand HDSF, Mapping and Reducing in HADOOP Environment. • Understanding the Clusters and Nodes in HADOOP Environment.
Applying	• Knowledge of Decision making using analysis on the Big Data using Excel Tools. • Knowledge of Decision making using HADOOP analysis on the Big Data
Analyzing	• Applying the Excel Tools or Mapping and Reducing on Big Data. • Implementing Environment Setup of HADOOP.
Evaluating	• Applying HADOOP Environment for Analysis on Big Data.
Creating	• Case Studies: for Big Data Analysis using Excel tools or HADOOP • Using features of Macros.
Unit No	**Syllabus Contents**
1	**Introduction To Big Data and Business Intelligence** Overview of - Data Mining, Data Warehousing, Big Data, How Business Intelligence is useful for Big Data, Big Data Problems. Introduction to BI, **Data Cleaning-**Editing a Workbook, Data Cleaning Using Text Functions, Using Validation To Keep Data Clean, **Working with Multidimensional Data-** Pivot Tables, Pivot Charts.
2	**Applications Of Business Intelligence and Excel Tools** CRM Domain, Banking Domain, Health Care Domain, Mobile Industry Domain, Creation of a New Product, Providing Personalized Services, **Optimization Modeling With Solver:** Introduction to MS-Excel and MS-Excel Formulas,Understanding Optimization Modeling, Setting Up a Solver Worksheet, Solving an Optimization Modeling Problem, Reviewing the Solver Reports, **Working With Solver:** Working With the Solver Options, Setting a Limit on Solver, Understanding the Solver Error

	Messages, Case Studies (Solver Problems).
3	**Advance Excel Tools:** **Using Shared Work Books-** Sharing a workbook, Opening and editing a shared workbook, Tracking changes, Resolving conflict in a shared workbook, Multiple workbooks- Linking workbooks, Editing the Link, Consolidating the workbook.
4	**Working With Macros:** Introduction to Macros? Where are Macros, Features of Macros, **Working with Macros-** Display the developer Tab, Changing Macro security Settings, Recording and running a Macro.
5	**Introduction To HADOOP:** Hadoop Architecture, MapReduce, Hadoop Distributed File System, How Does Hadoop Work?, Advantages of Hadoop. **HDFS Overview:** Features of HDFS, HDFS Architecture, Starting HDFS, Listing Files in HDFS, Inserting Data into HDFS, Retrieving Data from HDFS, Shutting Down the HDFS.
6	**MAPREDUCE:** What is MapReduce?,The Algorithm for MapReduce, Inputs and Outputs (Java a Perspective), Analyze different use-cases where MapReduce is used, Differentiate between traditional way and MapReduce way. **Introduction To Hadoop Features:** New Big Data Architecture, Introducing HADOOP Features – Apache Hive, Apache HBase, Pig.
7	**Multi Node Cluster:** Multi Node Cluster, Install Java, Creating User Account, Mapping the Nodes, Installing Hadoop, Configuring Hadoop, Start Hadoop Services, Adding New Data Node in the Hadoop Cluster, Removing New Data Node from the Hadoop Cluster. **Environment Setup:** Pre-installation Setup, Installing Java Downloading Hadoop Hadoop Operation Modes Installing Hadoop in Standalone Mode Installing Hadoop in Pseudo Distributed Mode Verifying Hadoop Installation, Implement basic Hadoop commands on terminal.
Text Books	
Reference Books	▪ Tutorials Point for advance Excel Tools. ▪ Excel 2010 Bible by John Walkenbach, John Wiley & Sons, 2010 Edition. ▪ *https://office.live.com/start/Excel.aspx* ▪ *https://www.talend.com/* ▪ www.tutorialspoint.com **Suggested MOOC :**Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com, www.coursera.com

ELECTIVE GROUP (11): CYBER SECURITY

Title of the Course	**(11) A -Introduction to Information Security**
Number of Credits	**3 Credits**
Pre-Requisites	Information about computer hardware, system and application software, and networking
	Course Outcomes as per Bloom's Taxonomy
Remember	Concepts involved in information systems
Understand	Security concerns involving information systems
Apply	Understanding of concerns to improve information security
Analyze	Real-life scenarios with respect to information systems
Evaluate	Scenarios involving information systems and security concerns
Create	Information security awareness to address real-world scenarios
Unit No	**Syllabus contents**
1	Information Security Concepts ▪ Confidentiality, Integrity and Availability of Information ▪ Identification, Authentication and Authorization ▪ Security Principles and Models
2	Physical Security ▪ Facility Requirement ▪ Perimeter Security ▪ Fire Protection ▪ Fire Suppression ▪ Power Protection ▪ General Environmental Protection ▪ Equipment Failure Protection
3	Network Security ▪ Secure Network design ▪ Firewalls ▪ WLAN Security ▪ VPNs ▪ Types and Sources of Network Threats
4	Operating System Security ▪ Windows ▪ Linux/UNIX
5	Database Security ▪ MS SQL
6	Web Application Security ▪ Web Application Vulnerabilities ▪ Secure Coding Techniques ▪ Continuous Security Testing and Assessments

7	Compliance Standards ▪ IT Act ▪ ISO 27001 ▪ ITIL Framework
Text Book	Shimonski R., *Certified Ethical Hacker - Study Guide*, Sybex
Reference Book	Lammle T., *CCNA - Routing and Switching - Complete Study Guide*, Sybex
Supplementary SWAYAM Course	Cyber Security (https://swayam.gov.in/nd2_cec20_cs15/preview)

Title of the Course	**(11) B - Information Security Threats and Mitigation Strategies**
Number of Credits	**3 Credits**
Pre-Requisites	Information about computer hardware, system and application software, and networking
	Course Outcomes as per Bloom's Taxonomy

Remember	Concepts involved information security domain
Understand	Security vulnerabilities and threats
Apply	Understanding of security threats to mitigate them
Analyze	Real-life scenarios with respect to information security
Evaluate	Scenarios involving information security threats
Create	Awareness about mitigation of information security threats in real-world scenarios
Unit No	**Syllabus contents**
1	**: Introduction to Information Security Threats** ▪ TCP/IP Fundamentals ▪ Operating System Fundamentals ▪ Web Application and Database Fundamentals ▪ Introduction to Ethical Hacking ▪ Advanced Persistent Threats
2	**: Information Gathering** ▪ Footprinting ▪ Advanced Google Hacking ▪ Nmapping the network ▪ Fingerprinting
3	**Exploitation** ▪ Hacking Networks ▪ Hacking Servers ▪ Hacking Databases ▪ Password Cracking
4	**Advanced Exploitation** ▪ Hacking WLANs ▪ Evading IDS, Firewalls ▪ Web Application Hacking ▪ Advanced Web Hacking ▪ Hacking Web Browsers
5	**: Social Engineering** ▪ Introduction to Social Engineering ▪ Common Types of Attacks ▪ Online Social Engineering
6	**: Cryptography** ▪ Introduction to Cryptography ▪ Encryption and Decryption ▪ Cryptographic Algorithms ▪ Digital Signature ▪ Cryptography Tools ▪ Cryptography Attacks
7	**: Malware Attacks** ▪ Viruses

	▪ Worms ▪ Trojans
Text Book	Shimonski R., *Certified Ethical Hacker - Study Guide*, Sybex
Reference Book	Howard M., *Writing Secure Code*, Microsoft Press
Supplementary SWAYAM Course	Introduction to Cyber Security (https://swayam.gov.in/nd2_nou20_cs02/preview)

ELECTIVE GROUP (12) : DATA MANAGEMENT

Subject Name	(12)A : Data Management Environment
No. of Credits	3
Pre Requisite	Basic Knowledge of Data in the Business
Course Objective	• To practice the application of the concepts related to data management . • To make students familiar with data management
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Able to describe the basic concepts, data management.
Understanding	Able to Interpret the data.
Applying	Able to Solve the data requirement on understanding the case.
Analyzing	Analyse the data quality.
Evaluating	Ability to judge functionality of data management
Creating	Design data management model with proper validation
Units	**Contents**
1.	**Introduction To Data Management** Meaning of data management, need of data management , data management process, big data ,data management system components.
2.	**Data governance** Data governance meaning , importance , objectives of data governance, Introduction to Data Governance Tools , concept of data asset, types of data assets, concept of data steward,
3.	**Data Warehousing and Business Intelligence Management** Business intelligence, OLAP ,Data mart, Data mining, Data movement (Extract, transform, load), Data warehouse
4.	**Document, Record and Content Management** Meaning of Document management, document management system, Record management, Meaning of content management ,content management process.
5.	**Database Maintenance** Data maintenance, its need, database administrator (DBA) ,DBA role ,data base administration system, Database management system.
6.	**Data Architecture ,Analysis and Design** Data analytics, data architecture, data modeling ,types of data modeling , data modeling techniques.
7.	**Data Quality Management** Data cleansing ,data integrity, data enrichment, data quality parameters, data quality assurance , Capability maturity management, Data maturity model(DMM), genuine capability
Reference Books	1. DAMA-DMBOK: Data Management Body of Knowledge DMBOK (2nd Edition) , Technics Publications LLC 2. Master Data Management and Data Governance by Alex Berson, Larry Dubov , McGraw-Hill Publications

Subject Name	**(12)B : Industrial Data Management and Security**
No. of Credits	3 credits
Pre Requisite	Basic idea of need of data hiding
Course Objective	To familiarize students to different types of data management and industrial data security
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Memorise remind data hiding and data security concepts
Understanding	Understanding need of data management and security
Applying	Identify data security threats and application of security tools
Analyzing	Analysis of data management
Evaluating	Evaluation of threats and application of security measures
Creating	Creation of protective environment for sharing industrial data
Units	**Contents**
1.	**Reference and master data management** Meaning of Reference data, importance of reference data management , reference data management process, reference data evaluation criteria ,data integration, master data management
2.	**Meta Data Management** Meaning of Meta-data, Need of Meta data management, Metadata discovery, Metadata publishing, Metadata registry
3.	**Contact Data Management** Business continuity planning ,marketing operations, Customer data integration, identify management ,identify theft , address(geography),postal code, email address, telephone number.
4.	**Industrial Automation of Management Processes** Management processes and its interdependence ,Need of automation of management processes in industries, ERP software ,CRM software, introduction to SAP
5.	**Industrial Data Security** Meaning of Data security ,need of industrial data security , four key issues in data security, Data access, data erasure, data privacy, data security, data security technologies , data security Vs Data privacy.
6.	**Industrial Data Security Threats and management** Threats in data security, Industrial information security threats , Data Protection Practices- operational and technical ,industrial security threats/risks and mitigations for industrial network control system.
7.	**Advanced data security tools** Wireshark, Kali linux, John the ripper,metasploit,cain and abel etc..
Reference Books	1. Master Data Management and Data Governance by Alex Berson, Larry Dubov , McGraw-Hill Publications 2. Data Mining: Concepts and Techniques, Third Edition , The Morgan Kaufmann Series in Data Management Systems 3. Data Management by Richard T Watson, Publisher eGreen Press 4.Big Data security Shibakali Gupta, Indradip Banerjee and Siddhartha Bhattacharyya , Published by De Gruyter

BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE

Faculty of Management Studies
MCA
Old Syllabus

BHARATI VIDYAPEETH

DEEMED TO BE UNIVERSITY

PUNE, INDIA

FACULTY OF MANAGEMENT STUDIES

Board of Studies in Computer Applications

Master of Computer Applications Programme

(Under Choice Based Credit System)

To be effective from 2018-19

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1. INTRODUCTION

The MCA Program is a full time 150 Credits programme offered by Bharati Vidyapeeth Deemed to be University, Pune and conducted at its management institutes in Pune, Karad, Kolhapur, Sangli, and Solapur. All the five institutes have excellent faculties, Laboratories, Library, and other facilities to provide proper learning environment. The University is reaccredited by NAAC with an 'A+' grade (3rd cycle). The expectations and requirements of the software industry, immediately and in the near future, are visualized while designing the MCA programme. This effort is reflected in the Vision and Mission statements of the MCA programme. Of course, the statements also embody the spirit of the vision of Late Dr. Patangraoji Kadam, the Founder of Bharati Vidyapeeth and Chancellor, Bharati Vidyapeeth Deemed to be University which is to usher in "Social Transformation through Dynamic Education."

2. VISION STATEMENT OF MCA PROGRAMME

To create high caliber solution architects and innovators for software development.

3. MISSION STATEMENT OF MCA PROGRAMME

To teach 'things, not just words', 'how to think', and 'how to self-learn'.

4. OBJECTIVES OF THE MCA PROGRAMME

The main objectives of MCA Programme are to prepare the youth to take up positions as system analysts, system engineers, software engineers, programmers and of course as versatile teachers in any area of computer applications. Accordingly the course curriculum aims at developing 'systems thinking' 'abstract thinking', 'skills to analyze and synthesize', and 'skills to apply knowledge', through 'extensive problem solving sessions', 'hands on practice under various hardware/software environments', 'four minor projects and 'one

semester full-time internship project'. In addition, 'social interaction skills', 'communication skills', 'life skills', 'entrepreneurial skills', and 'research skills' which are necessary for career growth and for leading quality life are also imparted.

5. LEARNING OUTCOMES FROM THE MCA PROGRAMME:

At the end of the course the student should be able to:

(a) Analyze problems and design effective and efficient software solutions.

(b) Develop software under latest Application Development Environments.

(c) Learn new technologies with ease and be productive at all times.

(d) Read, write, and contribute to technical literature.

(e) Work in teams.

(f) Be a good citizen in all respects.

6. ELIGIBILITY FOR ADMISSION TO THIS PROGRAMME:

Admission to the programme is open to any candidate (Graduate) of any recognized University satisfying the following conditions.

1. The candidate should have secured at least 50% (45% for SC/ST).
2. Mathematics as one of the subject at 12^{th} or graduation.

- **DURATION OF THE PROGRAMME**

The duration of this programme is three years divided in to six semesters or a minimum of 150 credits whichever is later. The medium of instruction and examination will be only English.

- **SCHEME OF EXAMINATION**:

For some courses there is Internal Assessment (IA) conducted by the respective institutes as well as a University Examination (UE) at the End-of-the Term. UE will be conducted out of 60 marks and IA will be conducted for 40 marks then these are converted to grade points and grades as per the Table I. For courses having only Continuous Assessment (CA) the respective institutes will evaluate the students in varieties of ways, three or four times, during

the term for a total of 100 marks. Then the marks will be converted to grade points and grades using the Table I.

- **STANDARD OF PASSING**:

For all courses, both UE and IA constitute separate heads of passing (HoP). In order to pass in such courses and to earn the assigned credits, 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. A student who fails at UE in a course has to reappear only at UE as backlog candidate and clear the Head of Passing. Similarly, a student who fails in a course at IA has to reappear only at IA as backlog candidate and clear the Head of Passing to secure the GPA required for passing.

The 10 point Grades and Grade Points according to the following table:

Range of Marks (%)	Grade	Grade Point
80≤Marks≤100	O	10
70≤Marks<80	A+	9
60≤Marks<70	A	8
55≤Marks<60	B+	7
50≤Marks<55	B	6
40≤Marks<50	C	5
Marks < 40	D	0

The performance at UE and IA will be combined to obtain GPA (Grade Point Average) for the course. The weights for performance at UE and IA shall be 60% and 40% respectively. GPA is calculated by adding the UE marks out of 60 and IA marks out of 40.The total marks out of 100 are converted to grade point, which will be the GPA.

- **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 are given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
9.5≤CGPA ≤10	O	Outstanding	80≤Marks≤100
9.0≤CGPA ≤9.49	A+	Excellent	70≤Marks<80
8.0≤CGPA ≤8.99	A	Very Good	60≤Marks<70
7.0≤CGPA ≤7.99	B+	Good	55≤Marks<60
6.0≤CGPA ≤6.99	B	Average	50≤Marks<55
5.0≤CGPA ≤5.99	C	Satisfactory	40≤Marks<50
CGPA below 5.0	F	Fail	Marks below 40

RULES OF ATKT:

1.A student is allowed to carry backlog of any number of subjects upto Semester IV.
2.A student must pass Part I (Semester I and II) to appear for Semester V.

SEMESTER WISE COURSE STRCTURE FOR MCA
(To be effective from July 2018)

SEMESTER I

Course Number	Course Title	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
101	C Programming	4	3	1	-	40	60
102	Computer Organization And Architecture	4	3	1	-	40	60
103	Database Management Systems	4	3	1	-	40	60
104	Discrete Structures	3	2	1	-	40	60
105	Management Functions	3	2	1	-	40	60
106	Web Supporting Technologies	4	2	-	4	40	60
107	C Lab	2	0	-	4	40	60
108	Soft Skills	2	2	-	-	50	0
109	Self learning-1 (Societal Related Topic)	2	0	-	-	50	0
	Total	28	17	5	8	380	420

SEMESTER II

Course Number	Course Title	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
201	Data structure and Algorithms	4	3	1	-	40	60
202	Operating Systems	4	3	1	-	40	60
203	Software Engineering	4	3	1	-	40	60
204	Statistical Techniques	3	2	1	-	40	60
205	Financial Accounting	3	2	1	-	40	60
206	Database Management Systems Lab	4	2	-	4	40	60
207	Data Structures Lab	2	0	-	4	40	60
208	Project-I	2	2	-	-	0	100
209	Self-learning-2 (Societal Related Topic)	2	0	-	-	50	0
	Total	28	17	5	8	330	520

SEMESTER III

Course Number	Course Title	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
301	Artificial Intelligence	4	3	1	-	40	60
302	Computer Networks	4	3	1	-	40	60
303	Object Oriented Analysis And Design	4	3	1	-	40	60
304	Probability and Graph theory	3	2	1	-	40	60
305	Organizational Behaviour	3	2	1	-	40	60
306	Object Oriented Programming	4	3	1	0	40	60
307	Object Oriented Programming Lab	2	0	-	4	40	60
308	Project-II	2	2	-	-	0	100
309	Self learning-3 (Societal Related Topic)	2	0	-	-	50	0
	Total	28	18	6	4	330	520

SEMESTER IV

Course Number	Course Title	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
401	Data Warehousing and Data Mining	4	3	1	-	40	60
402	Information Security	4	3	1	-	40	60
403	Design Patterns	4	3	1	-	40	60
404	Elective-I	3	2	1	-	100	-
405	Elective-II	3	2	1	-	100	-
406	Lab Elective-I	4	2	-	4	40	60
407	Linux Lab	2	0	-	4	40	60
408	Project-III	2	2	-	-	0	100
409	Self learning-4 (Computer Related Topic)	2	0	-	-	50	-
	Total	28	17	5	8	450	400

SEMESTER V

Course Number	Course Title	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
501	Data Science	4	3	1	-	40	60
502	Optimization Techniques	4	3	1	-	40	60
503	Software Project Management	4	3	1	-	40	60
504	Elective-III	3	2	1	-	100	-
505	Elective-IV	3	2	1	-	100	-
506	Lab Elective-II	4	2	-	4	40	60
507	Lab on Current Trends	2	0	-	4	40	60
508	Project-IV	2	2	-	-	0	100
509	Self learning-5 (Computer Related Topic)	2	0	-	-	50	0
	Total	28	17	5	8	450	400

List of Elective Groups:

These are the broad Elective groups and a student can select only one group for his specialization. Each group will have 4 subjects, of which a student will study first 2 in Semester IV and other 2 in Semester V.

Elective Group
Cloud Computing
Data Analytics
Linux
Open Source Technologies
Mobile Computing
Dot Net Technologies
Net Centric Technologies
Information Systems
IOT
Big Data
Cyber Security

Elective No.	Elective Group	Course No	Course Name
01	Cloud Computing	404-01-A	Virtualization
		405-01-B	Cloud Computing Concepts
		504-01-C	Cloud Solutions
		505-01-D	Cloud Computing
02	Data Analytics	404-02-A	Algorithms for Advanced Analytics
		405-02-B	Machine Learning Techniques
		504-02-C	Weka
		505-02-D	Statistical Computing
03	Linux	404-03-A	Linux Desktop Environment and Shell Programming
		405-03-B	Linux System Administration
		504-03-C	Linux Network Administration
		505-03-D	Linux Internals and Network
04	Open Source Technologies	404-04-A	Python
		405-04-B	Perl Scripting
		504-04-C	PHP
		505-04-D	Ruby
05	Mobile Computing	404-05-A	HTML 5
		405-05-B	Java Script Programming
		504-05-C	Android
		505-05-D	Hybrid Application Development
06	Dot Net Technologies	404-06-A	C# Programming
		405-06-B	ASP .NET with C#
		504-06-C	C# Windows Programming
		505-06-D	MVC
07	Net Centric Technologies	404-07-A	HTML 5
		405-07-B	Java Script Programming
		504-07-C	Ajax Programming
		505-07-D	Web Services

08	Information Systems	404-08-A	Enterprise Resource Planning
		405-08-B	E Commerce
		504-08-C	Recommender System
		505-08-D	Knowledge Management
09	IOT	404-09-A	IoT Architecture And Protocols
		405-09-B	Sensors and Fundamentals with Hands-on lab Node.js/Raspberry PI/Python
		504-09-C	Internet Of Things: Sensing And Actuator Devices
		505-09-D	Smart city use case, MQTT, Integrating on Cloud
10	Big Data	404-10-A	Business Intelligence Applications
		405-10-B	Business Intelligence Tools
		504-10-C	Introduction to Big Data
		505-10-D	Hadoop
11	Cyber Security	404-11-A	Cyber Security
		405-11-B	Information Security Concepts
		504-11-C	Information Security Threats
		505-11-D	Information Security Administration

SEMESTER VI

Course Number	Course Title	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
601	Internship Project	10	-	-	-		100

Practical Examinations:

For course Nos. 106,107,206,207,307,406,407,506 and 507 there will be practical examination.

For course No 507 Lab on Current Trends, Every center can decide the Programming Language to be taught depending upon the current industry demand and students interest.

Project Viva:

For course Nos. 208,308,408,508 there will be University Project Dissertation Viva carrying 100 marks.

Self Learning:

For Self Learning- 1 (109), Self Learning- 2 (209), Self Learning- 3 (309), Self Learning- 4 (409), Self Learning- 5 (509), students should select any one recent/upcoming topic related to Societal Concerns (SEM I to SEM III) and on computer science (SEM IV and V), study it thoroughly and submit a project report at the end of the semester.

SEMESTER I

Course Number	Course Name	L-T-P- Credits	Year of Introduction
101	C Programming	3 L + 1 T +0P = 4 C	2018-19

Course Objective :

This is a first course in programming. The objective of this paper is to teach the Programming Language C. However, the process of learning a computer language will also be emphasized. Emphasis is also on semantics and problem solving.

Expected Outcome :

At the end of the course a student should be able:

- To solve a given problem using C Program C
- Understand and use C libraries,
- Trace the given C program manually
- Effectively use of Arrays and functions
- Write C program for simple applications of real life using structures and Unions.

References (Books, Websites etc) :

1. Let us C - Y.Kanetkar, BPB Publications4. YashawantKanetkar, let Us C, BPB Publication
2. Programming in C - Gottfried B.S., TMH 2.
3. The 'C' programming language - B.W.Kernighan, D.M.Ritchie, PHI
4. Programming in ANSI C - Balaguruswami, TMH
5. C- The Complete Reference - H.Sohildt, TMH
6. A Structured Programming Approach using C – B.A. Forouzan& R.F. Gillberg, THOMSON Indian Edition
7. Computer fundamentals and programming in C – PradipDey& ManasGhosh, OXFORD

Suggested MOOC :

Please refer these websites for MOOCS:
NPTEL / Swayam
www. edx.com
www.coursera.com

Course Plan	
Unit	**Contents**
1	**Basics to learn a Programming Language:** Evolution of programming languages, structured programming, the compilation process, object code, source code, executable code, operating systems, interpreters, linkers, loaders, compilers, fundamentals of algorithms, flow charts. Concepts of a Program and subprogram, Procedures and functions, Syntactic, Semantic, and Logical Errors in a program; Program Correctness-Verification and Validation, Concept of Test Data
2	**C Language Fundamentals:** Origins of C, Characters and Character Set of C, Variables and Identifiers, Built-in Data Types, Variable Definition, Constants and Literals, Simple Assignment Statement, Operators and operands, Unary and Binary Operators, Concept of Expression, Arithmetic Expressions,

	Relational Expressions, Assignment Expressions. Evaluation of Expressions, Concepts of Precedence and Associativity, Table of Precedence and Associativity. Basic Input/Output Statement, The function main()
3	**Control Statements:** Control Structures, Decision Making within a Program, Conditions, Relational Operators, Logical Connectives, Decision Making and Branching: If Statement, If-Else Statement, Switch Statement Decision Making & Looping: While Loop, Do While, For Loop. Nested Loops, Infinite Loops, Structured Programming
4	**Arrays:** One Dimensional Arrays: Array Manipulation; Searching, Linear Search, Binary Search; Finding The Largest/Smallest Element in an Array; Two Dimensional Arrays: Addition/Multiplication of Two Matrices, Transpose of a Square Matrix; Strings as Array of Characters
5	**Functions:** User defined and standard functions, Formal and Actual arguments, Functions category, function prototypes, parameter passing, Call-by-value, Call-by-reference, Recursion, Storage Classes. Strings in C and String manipulation functions, Input, output of string statements
6	**Pointers:** Address Operators, Pointer Type Declaration, Pointer Assignment, Pointer Initialization, Pointer Arithmetic, Passing parameters by reference, pointer to pointer, linked list, pointers to functions, Arrays and Pointers, Pointer Arrays, Dynamic memory allocation
7	**Structures, Unions:** Declaration of structures, declaration of unions, pointer to structure & unions. **Additional Features in C**: Command line arguments, bit wise operators, enumerated data types, type casting, macros, the C preprocessor, more about library function

Course Number	Course Name	L-T-P- Credits	Year of Introduction
102	Computer Organization and Architecture	3 L+1 T+0 P=4 C	2018-19

Course Objectives :

Main objective of this paper is to learn structure and functioning of various hardware components of digital computer. Also study the interactions and communication among these hardware components

Expected Outcome :

At the end of this course, student should be able to understand

- Simple machine architecture and the reduced instruction set computers.
- Memory control, direct memory access, interrupts, and memory organization
- Basic data flow through the CPU (interfacing, bus control logic, and internal communications).
- Number systems, instruction sets, addressing modes, and data/instruction formats.

References (Books, Websites etc) :

1. M Morris Mano Computer systems Architecture third edition Prentice Hall of India Publication
2. Anita Goel : Computer Fundamentals Pearson Publications

Suggested MOOC :

Please refer these websites for MOOCS:

NPTEL / Swayam

www. edx.com

www.coursera.com

Course Plan

Unit	Contents
1	**Introduction To Computer Hardware & Computer security:** Computer: Block diagram, Generations, types, Applications, Interconnecting the units of computer, performance of computer. Computer Security: threats and security attack, Malicious software, Hacking, Security services, Firewall.
2	**Introduction To Digital Computer –** Data Representation – Data Types – Complements – Arithmetic Operations – Representations – Fixed –Point, Floating – Point , Decimal Fixed – Point – Binary Codes- Logic Gates, Boolean Algebra, Map Simplification – Combinational Circuits: Half-Adder, Full Adder- Flip Flops - Sequential Circuits
3	**Introduction To Digital Components And Micro Operations** ICs – Decoders – Multiplexers – Registers – Shift Registers – Binary Counters – Memory Unit – Register Transfer Language – Register Transfer – Bus And Memory Transfers – Arithmetic, Logic And Shift Micro Operations , Arithmetic Logic Shift Unit.

4	**Computer organization And Programming –** Instruction Codes – Computer Registers – Computer Instructions – Timing And Control – Instruction Cycle – Memory Reference Instructions – I/O And Interrupt – Machine Language – Assembly Language – Assembler - Program Loops – Programming Arithmetic And Logic Operations – Subroutines – I/O Programming.
5	**Memory Organization And CPU –** Memory Hierarchy – Main Memory – Auxiliary Memory – Associative Memory – Cache Memory – Virtual Memory – Memory Management Hardware – CPU: General Register Organization – Control Word – Stack Organization – Instruction Format – Addressing Modes – Data Transfer And Manipulation – Program Control, RISC
6	**Input – Output Organization** Peripheral Devices – Input-Output Interface – Asynchronous Data Transfer – Modes Of Transfer – Priority Interrupt – DMA – IOP – Serial Communication
7	**Pipeline And Vector Processing –** Parallel processing – Pipelining - Arithmetic pipeline - Instruction pipeline - RISC pipeline, - Vector processing - Array processor

Course Number	Course Name	L-T-P- Credits	Year of Introduction
103	Database Management Systems	3L + 1T + 0P = 4C	2018-19

Course Objective:

The goal of this course is to teach the fundamentals of the database systems at a master level. A variety of topics will be covered that are important for modern databases in order to prepare the students for real life applications of databases. The course aims to impart knowledge of the concepts related to database and operations on databases. It also gives the idea how database is managed in various environments with emphasis on security measures as implemented in database management systems.

Expected Outcome :

After going through this course a student should be able to:

- Understand the concept of database and techniques for its management.
- Design different data models at conceptual and logical level and translate ER Diagrams to Relational Data Model.
- Normalize the database.
- Write queries using Relational Algebra.
- Describe the file organization schemes for DBMS.
- Describe and use features for Concurrency and Recovery.
- Understand data security standards and methods.
- Understand the fundamentals of Distributed Database Systems.

References :

Books:

1. "Fundamentals of Database Systems" Global Edition ByRamezElmasri, Shamkant B. Navathe
2. “Database System and Concepts”A Silberschatz, H Korth, S Sudarshan,McGraw-Hill.

Suggested MOOC :

Please refer these websites for MOOCS:
NPTEL / Swayam
www. edx.com
www.coursera.com

Course Plan

Unit	Contents
1	**Introduction to DBMS:** Difference between Data, Information, Data Processing & Data Management. File Oriented Approach, Database oriented approach to Data Management, Need for DBMS, Characteristic of Database, Database Architecture: Levels of Abstraction, Database schema and instances, 3 tier architecture of DBMS,Data Independence. Database users, Types of Database System. Database Languages, DBMS interfaces.
2	**Data Modeling in Database :** Data Models, Logical Data Modeling: Hierarchical Data Model, Network Data Model, Relational Data Model. Conceptual Data Modeling: Entity Relationship Model, Entities, Attributes, Types of Attributes, Relationships, Relationship set, Degree of relationship Set, Mapping Cardinalities, Keys, ER Diagram Notations, Roles Participation: Total and Partial,

	Strong and Weak Entity Set.The extended entity relationship (EER) model, Subclass, Superclass, generalization, specialization, Attribute Inheritance. **Relational Data Model** Codd's Rules for RDBMS, Translating ER Diagram to Relational Database.
3	**Normalization and Relational Algebra:** Normalization Vs De-Normalization, Decomposition, Lossy and Lossless Decomposition,Functional Dependencies,Normal forms1NF, 2NF, 3NF, BCNF, Case Studies on Normalization. **Relational Algebra:** Keys: Composite, Candidate, Primary, Secondary, Foreign,Relational Relational Algebra Operators: Select, Project, Divide, Rename. Set Operations: Union, Intersect, Difference, And Product,Joins: Outer Joins, Inner Joins with example.
4	**File Structures and Data Administration:** File Organization, Overview of Physical Storage Media, Magnetic Disk, RAID, Tertiary Storage, Storage Access, Data Dictionary Storage, Organization of File (Sequential, Clustering), Indexing and Hashing, Basic Concepts, indices, B+ Tree index file, B- tree index file, Static hashing, Dynamic Hashing.
5	**Concurrency Control And Recovery Techniques:** **Concurrency Control:** Single User and Multiuser systems, Multiprogramming and Multiprocessing, Basic Database access operations, Concept of transaction, transaction state, ACID properties, Schedules, Serializability of schedules., Concurrency Control, Need for Concurrency control, lock based protocols, timestamp based protocols, Multiple granularity, Multiple Version Techniques, Deadlock and its handling, Wait-Die and Wound-Wait, Deadlock prevention without using timestamps, Deadlock detection and time outs, Starvation **Recovery Techniques:** Database Recovery, Types of Failures, Storage Structure: Volatile, Non Volatile and stable storage, Data access. Recovery and atomicity, Recovery Techniques / Algorithms: Log Based Recovery, Check points, Shadow Paging
6	**Data Administration And Security:** Data administration, Role and Responsibility of DBA, Creating/Deleting/Updating table space, Database Monitoring, User Management, Basic data security principles – user privileges, data masking, encryption and decryption. Data Security Implementation, revalidation of user, role, privileges. Data Quality Management, Basic quality principles, data quality audit, data quality improvement
7.	**Introduction to Advance Databases:** **Distributed Database:** Heterogeneous and Homogeneous Databases, Distributed database features and needs, Advantages and Disadvantages, Distributed DatabaseArchitecture. Levels of distribution, transparency, replication. Fragmentation. **Data Warehouse:** Data Warehouse defined, Need for Data Warehouse, Characteristics of Data Warehouse, Multidimensional Data Model, OLTP vs. OLAP, A three tier Data Warehouse Architecture, Data Mart Vs. Data Warehouse.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
104	Discrete Structures	2L + 1T + 0P = 3C	2018-19

Course Objective:

1.To learn basic mathematical course ,eg. Sets, Functions, Graph.
2. To be familiar with formal mathematical reasoning eg. Logic proofs.
3.To improve problem solving skills.
4. To see the connections between Discrete structure Computer Science

Expected Outcome :

a)Apply standard Mathematical methods.
b)Write code to implement solution procedures.
c)Search for information in tacking advanced problems.
d)Formulate AI problems mathematically.

Reference Books:

Kenneth H.Rosen,Discrete Mathematics and its Applications Edition 6 th Tata McGraw Hil
Schaum's outlines Discrete Mathematics
Discrete Mathematics N CH S N Lyneger and K.A. Venkatesh

Suggested MOOC :

Please refer these websites for MOOCS:
NPTEL / Swayam
www. edx.com
www.coursera.com

Course Plan

Unit	Contents
1	**Propositional logic**: Proposition logic, basic logic, logical connectives, truth tables, tautologies, contradiction , normal forms(conjunctive and disjunctive), modus ponens and modus tollens, validity, predicate logic, universal and existential quantification. Notion of proof: proof by implication, converse, inverse, contrapositive, negation, and contradiction, direct proof, proof by using truth table, proof by counter example.
2	**Set and Relation** **Set Theory**: Definition of Sets, Venn Diagrams, complements, Cartesian products, power sets, counting principle, cardinality and count ability (Countable and Uncountable sets), Partition of set , proofs of some general identities on sets, Fuzzy set ,Fuzzy set operation, rough set concept **Relation**: Definition, types of relation, composition of relations, domain and range of a relation, pictorial representation of relation, properties of relation, partial ordering relation ,Equivalence Relation, Relation Matrices
3	**Function**: Definition and types of function (one to one, onto, Inverse) composition of functions, Graph of Functions, Some Functions in Computer Science, Growth of Functions recursively functions.
4	**Algorithm, the Integers and Matrices**: Algorithm, growth of function, Complexity of algorithm, Primes and Greatest Common Divisors, Integers algorithm

5	**Partial Order and Structure: Partially Ordered,** Sets ,Lexico graphics Order, Hasse Diagram, Maximal and Minimal elements of a Poset, Concept of Lattice, Boolean Functions, Logic Gates, Minimization of Combinational circuit
6	**Combinatories :** Mathematical induction, recursive mathematical definitions, basics of counting, permutations, combinations, inclusion-exclusion, recurrence relations (nth order recurrence relation with constant coefficients, Homogeneous recurrence relations, Inhomogeneous recurrence relation), generating function (closed form expression, properties of G.F., solution of recurrence relation using G.F, solution of combinatorial problem using G.F.)
7	**Modelling Computation:** Language and Grammar, Finite State Machine with output**,** , Finite State Machine with no output, Language Recognition

Course Number	Course Name	L-T-P- Credits	Year of Introduction
105	Management Functions	2L + 1T + 0P = 3C	2018-19

Course Objective:

1. To orient the students to principles of management
2.To make them comprehend the process of management
3.To internalize the principles through rigorous assignments where they shall observe, analyze and infer the presence of principles transformed into practice.

Expected Outcome :

At the end of the course, the students shall acquire
1. Understanding of functions of management
2. Understand the principle of management woven in to the process of management
3. Understand how they are modified in to practice to suit the requirements
4. How IT influences the process of management

References :

Books:

1.H.Welrcih, Mark Cannice, H. Koontz, Management , A Global and Entrepreneurial Perspective , Mcgraw-Hill Companies, 12th edition.
2.P.C.Tripathi, P.N.Reddy, Principles and Practice of Management , Tata Mcgraw Hill , Third Edition
3. L.M. Prasad, Principles and Practice of Management, Seventh Edition
4. Stephan Robbins, Mary Coutler, Management

Suggested MOOC :

Please refer these websites for MOOCS:
NPTEL / Swayam
www. edx.com
www.coursera.com

Course Plan

Unit	Contents
1	The need of Management Study , Process of Management , Characteristics of Professional Management , Brief Review of Management Thought Social Responsibility of Management
2	Decision Making Process , Planning and Steps in Planning , Types of Plan Making Planning Effective , Case Study on Planning, MBO
3	Organization, Meaning and Process , Departmentalization,, Organization Structure , Authority and Delegation , Centralization verses Decentralization , Team Work , Case Study
4	Co-ordination – meaning and need , Techniques of establishing Co-ordination Difficulties in establishing co-ordination , Case Study
5	Formal and Informal Organization, Manpower Planning , Recruitment and Performance Appraisal, Compensation and Incentives , issues related to Retention Case study
6	An overview of Communication, Supervision and Direction , Leadership Styles , Control – need and types and control techniques . In addition there shall be tutorials of written examination type, field study and presentation.
7.	**Case Studies**

Course Number	Course Name	L-T-P- Credits	Year of Introduction
106	Web Supporting Technologies	**2L-0T-2P = 4C**	2018-19

Course Objectives :

- To understand the basic concepts of the World Wide Web
- To understand and practice HTML as markup language
- To understand and practice embedded dynamic scripting on client side Internet Programming
- To understand and practice web development techniques on client-side
- To understand and practice server-side scripting

Syllabus Outline:

- Understanding of internet and intranet- working of WWW, types Protocols and working of HTTP and types of servers
- UI Design - Markup Language: Introduction to HTML5 - Cascading Style Sheet: Introductionto CSS3.
- Client Side Scripting using JAVASCRIPT - Introduction to JavaScript - Document Object Model -Event Handling - Controlling Windows & Frames and Documents - Browser Management andMedia Management - Object-Oriented Techniques in JavaScript - JQuery.
- Server SideScripting using PHP - Introduction to PHP - Programming basics - Reading Data in WebPages - Embedding PHP within HTML - Establishing connectivity with MySQL database.

Expected Outcome :

Upon successfully completing this course the student will be able to

- Understand concept of internet and how it functions
- Use HTML tag to format contents of web page
- Use Cascading Style Sheets (CSS) to apply user defined look and feel
- Apply Java Script to validate form data and generate dynamic contents
- Make use of PHP to generate server side response using MYSQL as databse

References (Books, Websites etc) :

1. Thomas Powell, Web Design The complete Reference, Tata McGrawHill
2. Thomas Powell, HTML and XHTML The complete Reference, Tata McGrawHill
3. Thomas Powell and Fritz Schneider JavaScript 2.0 : The Complete Reference, Second Edition
4. PHP : The Complete Reference By Steven Holzner, Tata McGrawHil
5. Ivan Bayross (2006) Web Enabled Commercial Application Development Using HTML, DHTML, JavaScript, Perl CGI, BPB Publications.
6. Luke Welling, PHP and MySQL Web Development, Pearson Education; Fifth edition

Suggested MOOC :

Please refer these websites for MOOCS:
NPTEL / Swayam
www. edx.com
www.coursera.com

Syllabus/Course Outline

Unit	Contents
1	Understanding internet and intranet, Introduction toWWW, WWW Architecture, Concept of protocol ant its types: SMTP,POP3,File Transfer, Overview of HTTP, HTTP request and response. Various web server, using Apache as web server, Installation of Apache, Apache Directory Structure, apache configuration, creating application folder, storing and accessing files from server
2	Types of Markup Language and HTML as markup language, basic structure of HTML, Head Section and elements of head section, Meta tags and external link tags HTML body content tags: header tags, Paragraph, span and pre tags, text formatting tags, Ordered and unordered list tag, Table tag, div tag, Frames and framesets, Anchor Links and named anchors, image tag and using image mapping for hotspot, working with forms: Form tag, POST and GET methods, working with Text input, Text Area, Checkbox and radio and other form elements;
3	Introducing CSS, Types of style sheets: inline, embedded and external style sheets, working with CSS properties: text properties, color and background properties, border and shading, box and block properties, positioning with CSS, various types of CSS selectors: universal, class, ID, child, descendent, adjacent sibling, attribute and query.
4	Client Side Scripting: Introduction to JavaScript, data types, Operators, conditional and iterative Statements, Introduction to arrays, arrays with methods, Math, String and Date objects, working with DOM: Window, Navigator, History, Location, Link, Anchor and form elements, functions and objects, methods, handling events and form validations
5	Advanced JavaScript: Browser Management and Media Management – Classes – Constructors – Object-Oriented Techniques in JavaScript – Object constructor and Prototyping - Sub classes and Super classes – JSON - JQuery and AJAX.
6	Why PHP and MySQL?, Server-side web scripting, Installing PHP, Adding PHP to HTML Syntax and Variables, PHP control structures and loop, Passing informationbetween pages, Strings, Arrays and Array, Functions, Numbers, working with String and Regular Expressions
7	Concept of Cookies and sessions, when and how to use cookies and sessions, Using MySQL to create database and tables, using queries to inset and update data, using PHP to interact with MySQL, Displaying data from tables in tables, using form data to insert, update database, deleting data from table by getting criterion through forms, working with E-Mail

Course Number	Course Name	L-T-P- Credits	Year of Introduction
107	C Lab	**0L +0T + 4P= 2C**	2018-19

Course Objective :

This is companion course of C Programming

Syllabus Broad Units:

This Companion course of C programming; Practical aspects of C programming towards problem solving is covered.

Expected Outcome :

The students will develop adequate programming skills with respect to following

1. Implement a real world problem using basic constructs of C language.
2. Develop an application using Decision making and looping
3. Make use of proper operators to solve problem.
4. Make use of Arrays and pointers efficiently and handling strings.
5. Comprehend the dynamic memory allocation and pointers in C.
6. Able to define new data types using enum, structures and typedef.

References (Books, Websites etc) :

1. Let us C - Y.Kanetkar, BPB Publications4. YashawantKanetkar, let Us C, BPB Publication
2. Programming in C - Gottfried B.S., TMH 2.
3. The 'C' programming language - B.W.Kernighan, D.M.Ritchie, PHI
4. Programming in ANSI C - Balaguruswami, TMH
5. C- The Complete Reference - H.Sohildt, TMH
6. A Structured Programming Approach using C – B.A. Forouzan& R.F. Gillberg, THOMSON Indian Edition
7. Computer fundamentals and programming in C – PradipDey& ManasGhosh, OXFORD

C Lab Outline

Sr. No	Programming Exercises
1	Compilation and Executing programs Arithmetic operations Use of Symbolic constants Demonstrating the following gcc options -o, -c, -D, -l, -I, -g, -E

	Note :***Algorithm of every program should be written. Properly document the programs using comments. Author name and date, purpose of each variable and constructs like loop and functions should be indicated/ documented.*** ***gcc or an equivalent compiler is assumed***.
2	Program to demonstrate the following - Branching - Nested Branching - Looping - Selection
3	Working with functions - Writing function prototype and definition - Using functions to solve problems (Calling a function) - Using recursion - Storage classes - Using register, extern and static
4	Using debugger and Creating Libraries Important Commands - break, run, next, print, display, help Functions Creating Header file for Function Prototype Compiling and storing Function Definition in Library (archive) file
5	Arrays 1D - Linear Search, Sort 2D - Matrix operations Strings, Structure, Union
6	Pointers, Dynamic Memory Allocation Structure Pointer Array of Pointers, Ragged Arrays, Function pointer
7	Structures Making use of structures to define new types(user defined types)

Course Number	Course Name	L-T-P- Credits	Year of Introduction
108	Soft Skills	2L+0T+0P=2C	2018-19

Course Objective :

1. To provide Confidence building and soft skills development.
2. To develop decision making and analytical skills.
3. To let students make a transition from the academic mode to the corporate and entrepreneurial mode

Expected Outcome :

- This course would be handy for those who are attending interviews at the company premises, even if it is arranged by the institute. You need to differentiate yourself as a better candidate than others, which is the key to get a job.
- This will go a long way in improving your career prospects by developing skills required by a practicing manager. Thus, you will be able to handle challenging corporate assignments.
  Being a fresher, you will be closely monitored by your superior. This course will give you confidence to impress them with your professional attitude.
- Industry expects to spot out people for better positions, with the qualities of leadership. This is where this program will help you acquire some of the qualities of leadership.

Suggested MOOC :
Please refer these websites for MOOCS:
NPTEL / Swayam
www. edx.com
www.coursera.com

Course Plan

Sr. No	
1	**Business Communication Skills – Email correspondence:** E-mail etiquette and Writing Skills, Features of Business Correspondence, Tips for writing Business E-mails, Do's and Don'ts of Business Communication, Examples and Exercises
2	**The Art of Effective Communication:** Communication skills: the importance of removing barriers, Source, Encoding, Channel, Decoding, Receiver, Feedback, Johari's Window, Public Speaking and Presentation tips, Body Language Tips, Listening skills, Common Grammatical mistakes in Written and spoken communication, Negotiation
3	**Time Management:** Importance of setting Tasks, Applying basic principles of Time management; identify productivity cycles, and set goals and priorities, Create a time management plan and a daily plan, Effectively utilize time by using technology and reducing time wastage. Manage interruptions, increase meeting productivity, overcome personal time wasters, and prevent personal work overloads, Screen and organize information to reduce information overload

4	**How to create a winning CV:** Designing an Impressive CV, Defining the objective, Customizing the CV for each job, Identifying and Highlighting the right set of strengths, Presentation of academic and professional achievements, Formatting Styles, Do's and Don'ts and common mistakes, Examples and Exercises
5	**How to prepare for Interview:** Introspection: Knowing yourself, your comfortable areas or subjects, Companies, sectors, functions, Employer Research, Skill set and competency mapping, Attire and Etiquette : Greetings, posture, handshakes, manners and actions, Common Interview blunders, Frequently asked questions for Freshers and Experienced professionals, Simulated Interview Situations, Do's and Don'ts before an Interview, Common formats of Company Interview assessments, What to speak?, Latest developments about the specific sector for last 5 years, Study of regulators for sectors.
6	**Preparing for Group discussion and aptitude test:** Structure and Format of a GD, Difference between a Discussion & an Argument, Observing, Reflecting and designing responses within a group, The art of being assertive and persuasive, Defending your turf, Defining the correct Body Language and posture, Deconstructing Topics, Common Do's and Don'ts, Practice and Exercise
7	**Fear Factor: Removing Stage Fear** Presentation Skills, Public Speaking skills, Importance of Eye Contact, Audience engagement, Forms of speech, Content Preparation, Debating, Extempore, Do's and Don'ts, Sample Exercises

SEMESTER II

Course Number	Course Name	L-T-P- Credits	Year of Introduction
201	Data Structures and Algorithms	3L + 1T+ 0P= 4C	2018-19

Course Objective :

- To make familiar with linear & non linear data structures
- To develop skills to analyze the problem given and to design & develop an efficient solution to given problem
- To develop capability to choose appropriate data structures for given problems
- To imbibe programming skills & thereby making industry ready

Syllabus Broad Units :

Expected Outcome : After undergoing this course, student will

1. Have thorough knowledge about data structures
2. Ability to design& develop program using linear data structures& non linear data structures for solving problems
3. Ability to choose appropriate data structures for problem solving
4. Ability to use combination of these data structures for problem solving.

References (Books, Websites etc) :

1. Behrouz A. Forouzan and Richard F. Gilberg , 2nd Edition, Thomson, 2003, **Computer Science A Structured Programming Approach Using C**

2. Basavraj S Anami, ShanmukhappaAngadi, Sunil Kumar S Manvi, PHI Publications, 2010. A Holistic approach to learning C.

3. Andrew Tenanbaum, Thomson, 2005, Data Structures with C.Robert Kruse & Bruce Leung, Data Structures & Program Design in C, Pearson Education,

Pre-requisites

Any programming language

Suggested MOOC :

Data structures and Algorithms, Prof. SudarshanIyengar, IITRopar, 8 weeks, Rerun Feb 05, 2018 https://onlinecourses.nptel.ac.in/noc16_cs06 at NEPTEL

Course Plan	
Unit	**Contents**

1	**Elementary Data Structures** - Basic concepts such as data object, array, and record; Operations and relations on data objects; definition of data structure; Built-in data types as examples of data structures; concept of abstract data type; notation to specify an abstract data type; concepts of pre-conditions and post-conditions; Implementation of an ADT in a language; Specification and implementation of simple data structures such as Integer, Rational, Currency, Date, Temperature, distance, Pay, Marks, Grade_card etc.
2	**Linear Data Structures** (Representation in Memory and operations like insertion, deletion and traversal) – one and multidimensional array, Sparse Matrics, Pointer arrays, single link list, circular link list, double link list, applications of Linked list,: Sparse Matrix Manipulation, Polynomial Representation, Dynamic storage Management
3	**Particular Linear Data Structures**(Representation in Memory and operations like insertion, deletion and traversal) - Stacks: Applications: Evaluation of Arithmetic Expression, implementation of recursion, factorial calculation, Quick Sort, Tower of Hanoi Problem, queues, circular queue, deques; Application of queues abstract data types; Array and linked list implementations of stacks, queues, and deques;
4	File Handling: Creation, reading writing in a file. Pattern Matching and Extraction of data from a file. Reading and writing from files.
5	**Hierarchical data structures** - General trees and related concepts; depth first and breadth first traversal of trees; n-ary trees and important properties of n-ary trees; binary trees and their properties; binary tree traversal algorithms. Applications of Trees. B Trees : B Tree indexing, Operations on a B Tree, SETS: Representation of Sets, Operations on Sets, Applications of Sets
6	**The problem of search** – linear and binary search algorithms and their efficiency; binary search trees and operations on binary search trees; Improving the efficiency of search through Balanced trees – AVL trees and Red-black trees, concepts of rotation. Hash tables and related concepts in detail.
7	**The problem of sorting** – The standard sort algorithms and their efficiencies; Merge sort and quick sort algorithms and their efficiencies. The binary heaps, their array implementation; Operations on heaps and heap sort algorithm.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
202	Operating Systems	3+1+0 = 4C	2018-19

Course Objective:

The overall aim of this course is to provide a general understanding of how a computer works. This includes aspects of the underlying hardware as well as the structure and key functions of the operating system. Case studies will be used to illustrate and reinforce fundamental concepts.

Syllabus Broad Units : 7

Expected Outcome :

At the end of this course, student should be able to

- Explain the concepts of process, address space, and file
- Compare and contrast various CPU scheduling algorithms
- Understand the differences between segmented and paged memories, and be able to describe the advantages and disadvantages of each
- Compare and contrast polled, interrupt-driven and DMA-based access to I/O devices
- Understand functioning and working of Windows as well as Unix operating system.

References (Books, Websites etc) :

1. Operating systems design and implementation by Andrew Tanenbaum and Albert Woodhull
2. Operating systems concept and design by Milan Milenkovic

Suggested MOOC :

Please refer these websites for MOOCS:

www. edx.com

www.coursera.com

www.alison.com

Course Plan

Unit	Contents
1	**Unit1: Introduction to Operating system:** Definition, Importance and functions of operating systems, Types: Batch, Timesharing, Multitasking, multiprogramming, multiprocessing, Online operating system, Real time, distributed operating systems. Various Views: Command language users view, system call users view. Operating system concept: Processes, Files, The shell. Structures: Monolithic system, layered system, Virtual Machine, Client server model.
2	**Processes:** Process concept, Implicit and explicit tasking, process relationship (cooperation and competitions). Operating systems view of processes OS services for process management. Scheduling and types of Schedulers, Scheduling algorithms: First come first served, shortest remaining time next, Time slice scheduling, Priority based preemptive scheduling, multiple level queues, multiple level queues with feedback, Guaranteed scheduling, Lottery scheduling. Performance Evolution.

3	**Memory Management:** Basic Memory Management, monoprogramming without paging or swapping, multiprogramming with fixed partitions. Swapping: Memory Management with bit maps, and linked list. Virtual Memory, Page replacement algorithms: Optimal Page replacement algorithm, Not recently Page replacement algorithm, First in first out Page replacement algorithms, second chance Page replacement algorithms, clock Page replacement algorithms, least recently Page replacement algorithms, simulating LRU in software. Design issues for paging. Segmentation: Implementation of pure segmentation, segmentation with paging with example.
4	**Interprocess communication and Synchronization:** Need, Mutual Exclusion, Semaphore definition, Busy- wait implementation, characteristics of Semaphore. Queuing implementation of semaphore, Producer consumer problem. Critical region and conditional critical region, what are monitors? Need of it, format of monitor with example. Messages: Basics, issues in message implementation, naming, copying, Synchronous vs asynchronous message exchange, message length, ICS with messages, interrupt signaling via messages.
5	**Deadlocks:** Conditions to occurs the deadlock, Reusable and consumable resources, deadlock prevention, Deadlock Avoidance, resource request, resource release, detection and recovery,
6	**File systems:** Files- naming, structure, types, access, attributes, operation. Directories- system, path and operations. Implementing file and directories, disk space management, file system reliability and performance. Environment, Security flaws, Security attacks, principles for Security, user authentication. Protection domains, access control lists, capabilities.
7	**Input/ output:** Principles of I/O hardware: I/O devices, device controller, DMA, Principles of I/O software : goals, interrupt handler, device drivers, Device independent I/O software. RAM Disk Hardware and software, DISK Hardware and software.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
203	Software Engineering	3L + 1T +0P= 4C	2018-19

Course Objective:

To introduce the current methodologies involved in the design and development of Software over its entire life cycle.

Expected Outcome :

At the end of this course, student should be able to:

- Understand life cycle models**,** Requirement elicitation techniques, understand the concept of Analysis and Design of software.
- Implement software engineering concepts in software development to develop quality software which can work on any real machine.

References (Books, Websites etc):

- SOFTWARE ENGINEERING A PRACTITIONERS APPROACH seventh edition BY Roger S. Pressman McGraw Hill International Edition.
- Software Engineering by Sommerville, Pearson Education, 7th edition
- Software Engineering by K.K. Aggarwal&Yogesh Singh, New Age International Publishers.

Course Plan

Unit	Contents
1.	**Introduction to Software Engineering** Software, software characteristics, Difference between software engineering and software programming, Members involved in software development. Need of Feasibility study, types of Feasibility study, Cost Benefit Analysis. General software development life cycle with all phases. Overview of software models (Waterfall, Prototyping, Spiral and Rapid Application Development model). Agile Software Development methodologies.
2.	**Requirement Engineering Concepts and Methods** What is Requirement Engineering, Types of requirements, Requirement elicitation techniques- Traditional methods and Modern methods, Verification and validation process. Principles of Requirement Specification, Software Requirement Specification document Outline Characteristics of good SRS: - correct, complete, unambiguous, consistent, modifiable, traceable, Understandable Case study on DFD and ERD mechanism.
3.	**Design Concept and Methods** Software Design and software Engineering. Software Design process and principles, Design concepts: Abstraction, Refinement, Modularity, Architecture, Control hierarchy, Structural partitioning, Data structure, Procedure and Data hiding Modular design: Functional independence, Cohesion and Coupling concepts Architectural design process: Transform flow and Transaction flow User Interface design: - Elements of good design, design issues, Features of modern GUI, Guidelines for interface design

	Procedural design: - Structured Programming, Program Design Language Report Design
4.	**Software Quality Assurance** Quality concept: (quality, quality control, quality assurance, cost of quality), SQA activities, SQA plan. Formal Technical review: Review meeting, review reporting and review guidelines Software Configuration Management: - What is configuration management, Baseline, Software Configuration items. SCM process- Identification of objects, Version control and Change control
5	**Software Testing and Testing Strategies** Software Testing Fundamentals:-Testing Objectives and Testing Principles. White Box Testing, Black Box Testing: - Graph Based Testing Methods, Equivalence Partitioning, Boundary Value Analysis. Testing Strategies for Conventional Software: - Unit Testing, Integration Testing (Top-down and Bottom-up Integration) Validation Testing: - Validation Test Criteria, Configuration Review, Alpha and Beta Testing System Testing: - Recovery Testing, Security Testing, Stress Testing, Performance Testing, Deployment Testing The Art of Debugging – The Debugging Process.
6	**Maintenance and Reengineering** Software maintenance: - Importance and types of maintenance, Concept of Re-engineering, Software reengineering process model Reverse engineering: - to understand process, data and user interfaces Restructuring: Code and Data restructuring Forward engineering: - for client server architecture and user interfaces
7	**Computer Aided Software Engineering** What is CASE? Importance of CASE tools Various Tools: - 1) Information engineering 2) Project planning tools 3) Risk analysis tools 4) Project management and testing tools 5) Tools for Quality assurance 6) Software Configuration Management 7) Analysis and design 8) Database management 9) Interface design and programming tools

Course Number	Course Name	L-T-P- Credits	Year of Introduction
204	Statistical Techniques	2+1+0 = 3C	2018-19

Course Objective:
The main objective of this course is to acquaint students with some basic concepts in Statistics. They will be introduced to some elementary statistical methods of analysis of data.

Syllabus Broad Units :

Expected Outcome :
(i) To compute various measures of central tendency, dispersion, skewness and kurtosis.
(ii) To analyze data pertaining to attributes and to interpret the results.
(iii)Tto compute the correlation coefficient for bivariate data and interpret it.
(iv) To fit linear, quadratic and exponential curves to the bivariate data to investigate relation between two variables.
(v) To fit linear regression model to the bivariate data
(vi)They are able to construct predicate model.

Reference Books:
Fundamentals of Statistics , S.C.Gupta, Seventh Edition ,Himalaya Publishing House

Suggested MOOC :
Please refer these websites for MOOCS:
NPTEL / Swayam
www. edx.com
www.coursera.com

Course Plan

Unit	Contents
1	**Introduction to Statistics**: Meaning of Statistics as a Science, Importance of Statistics Scope of Statistics, Statistical organizations in India and their functions: CSO, ISI, NSS, IIPS (Devnar,Mumbai), Bureau of Economics and statistics,Types of data: Primary data, Secondary data , Cross-sectional data, time series data, directional data, Classification: Raw data and its classification, ungrouped frequency distribution,, grouped frequency distribution, cumulative frequency distribution, and relative frequency distribution.
2	**Measures of Central Tendency** Concept of central tendency of statistical data, Statistical averages, characteristics of a good statistical average. Arithmetic Mean (A.M.): Definition, effect of change of origin and scale, combined mean of a number of groups, merits and demerits, trimmed arithmetic mean. Mode and Median: Definition, formulae (for ungrouped and grouped data), merits and demerits, Quartiles, Deciles and Percentiles (for ungrouped and grouped data), Geometric Mean (G.M.): Definition, formula, merits and demerits. Harmonic Mean (H.M.): Definition. Formula, merits and demerits. mean Weighted Mean: weighted A.M., G.M. and H.M. Measures of Dispersion :Concept of dispersion, characteristics of good measure of dispersion. Range, Quartile deviation Mean deviation: Definition, merits and demerits, Variance and standard deviation

3	**Moments, Skewness and Kurtosis** Raw moments (m'r) for ungrouped and grouped data. , Central moments (mr) for ungrouped and grouped data, Concept of skewness of frequency distribution, positive skewness, negative skewness, symmetric frequency distribution, Karl Pearson's coefficient of skewness, Measures of skewness based on moments ($\beta 1, \gamma 1$) Concepts of kurtosis, Measures of kurtosis based on moments ($\beta 2, \gamma 2$).
4	**Theory of Attributes** Attributes: Concept of a Likert scale, classification, notion of manifold classification, dichotomy, class- frequency, order of a class, positive class frequency, negative class frequency, ultimate class frequency, relationship among different class frequencies (up to three attributes), and dot operator to find the relation between frequencies, fundamental set of class frequencies. Consistency of data upto 2 attributes. Concepts of independence and association of two attributes. Yule's coefficient of association (Q),
5	**Correlation:** Bivariate data, Scatter diagram and interpretation., Concept of correlation between two variables, positive correlation, negative correlation, no correlation. variance between two variables , Karl Pearson's coefficient of correlation (r) , Spearman's rank correlation coefficient, compute Karl Pearson's correlation coefficient between ranks
6	**Regression:** Meaning of regression, difference between correlation and regression, Concept of error in regression, error modeled as a continuous random variable. Simple linear regression model Estimation of a, b by the method of least squares. Interpretation of parameters.
7	**Times Series** Introduction, Component of a time series, Analysis of time series, Mathematical models for time series, Measurement of Seasonal Variations, Measurement of Cyclical Variations ,Measurement of Irregular Variations.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
205	Financial Accounting	2L+1T+0P=3C	2018-19

Course Objective :

1. To impart basic accounting knowledge
2. To enable the students to understand basic accounting principles, practice and its applications in modern business.

Prerequisite :

Students should know the basic principles of accounts and concepts .

Expected Outcome :

1) The knowledge of accounting and its principles at basic level.
2) Practical's in Tally and Excel for Financial Accounting assignments

References (Books, Websites etc) :

1. Anil Chowdhry , Fundamentals of Accounting & Financial Analysis (PearsonEducation)
2. M.E.ThukaramRao, Accounting for Managers.(New Age International Publishers)
3. M.G.Patkar, Book-Keeping &Accountancy.Std XI(FYJC) Commerce
4. Dr. S. N. Maheshwari , Financial Accounting For Management: (Vikas Publishing House)
5. Robert Anthony, David Hawkins , Business Accounting. (Tata McGraw –Hill)

Suggested MOOC :

Please refer these websites for MOOCS:
NPTEL / Swayam
www. edx.com
www.coursera.com

Course Plan

Unit	Contents
1	**Unit 1**: **Introduction:** Need for Accounting, Financial Accounting-definition, Scope and objectives. Accounting v/s Book Keeping. Limitations of Financial Accounting, End users of financial statements. Accounting Concepts and Conventions, Branches of accounting. Accounting Standard-Scope and Functions.
2	**Unit 2: Journal and Ledger:** Journal-importance and utility, classification of accounts, journalizing of transactions. Ledger- meaning and utility, posting and balancing of account, Trial Balance-meaning and purpose, preparation of a trial balance.
3	**Unit 3: Preparation final accounts:** Preparation of Trading and Profit & Loss Account and Balance Sheet of sole proprietary business.
4	**Unit 4: Depreciation:** Meaning, need & importance of depreciation, methods of charging depreciation.(WDV & SLM)
5	**Unit 5: Introduction to International Accounting Standards:**

	Need for International Financial Reporting Standards (IFRS), Disclosure of Accounting Policies, reporting needs of emerging economies, IFRS for Small and Medium Enterprises(SMEs).
6	**Unit 6:Computerized Accounting:** Computers and Financial application, Accounting Software packages. (Orientation level)
7	**Unit-7: Practical Applications** on Tally package for accounting and its Implementation . Accounting formulas in Excel and its implementation for practical assignments

Course Number	Course Name	L-T-P- Credits	Year of Introduction
206	Database Management Systems Lab	2L+0T+2P=4C	2018-19

Course Objective :

- The main objective is to teach the concepts related to database its techniques and Operations.
- SQL (Structured Query Language) is introduced in this subject.
- This helps to create strong foundation for application of database design.

Pre-requisites:

- Concept of Database Management Systems,
- Familiarity with data processing concepts and applications.

Expected Outcome :

At the end of this course, students should be able to:

- Understand the theoretical and physical aspect of a relational database.
- Implementation of RDBMS concepts through Oracle.
- Construct Simple and complex queries on sample datasets
- Writing PL/SQL blocks

References (Books, Websites etc.):1. IvanBayross SQL,PL/SQLTheProgramming LanguageofOracle 3rd Revised Edition BPB Publications.

Suggested MOOC :

Please refer these websites for MOOCS:
NPTEL / Swayam
www. edx.com
www.coursera.com

Course Plan

Unit	Contents
1	**Introduction to Oracle and SQL:** History, Features, Versions of Oracle, Database Structure: Logical Structure and Physical Structure, Oracle Architecture: System Global Area Processes: Server Processes, Background Processes, Tools of Oracle: SQL * Plus, PL/SQL, Forms, Reports, Pre Compilers:SQL Loader, Import, Export. **Introduction to SQL:** Keywords, Delimiters, Literals, Data Types, Components of SQL: **DDL Commands** – Defining a database in SQL, Creating table, changing table definition, removing table, Creating Tables with constraints on row level and column level, primary key, foreign key, check. Altering Constraints. **DML Commands**- Inserting, updating, deleting data, **DQL Commands**: Select Statement with all options. Renaming table, Describe Command, Distinct Clause, Sorting Data in a Table, Creating table from a table, Inserting data from other table, Table alias, and Column alias. **DCL commands**- Granting and Revoking Permissions

2	**Operators and Functions:** **Operators:** Arithmetic, Logical, Relational, Range Searching, Pattern Matching, IN & NOT IN Predicate, all, % any, exists, not exists clauses, Set Operations: Union, Union All, Minus, Intersect, Grouping data. **Functions:** Aggregate Functions, Numeric Functions, String Functions , Date Functions, Conversion Functions, Miscellaneous Sub queries
3	**Joins:** Relating data through join concept. Simple join, equi join, non equi join, Self join, Outer join
4	**Database Objects:** **Views:** Introduction, Creating a View, Selecting data from a view, Updateable views, Views on multiple tables, Destroying a View. **Sequences:** Introduction, Creating a Sequence, Altering a Sequence, Referencing a Sequence, Dropping a Sequence. **Index:** Introduction, Creating Index, Simple Index, Unique Index, Reverse Key Index, Dropping Index.
5	**Introduction To PL/SQL:** Introduction, Advantages, PL/SQL Block, PL/SQL Execution Environment, PL/SQL Character set, Literals, Data types, PL/SQL Block: Attributes %type, %rowtype,Variables, Constants, Displaying User Message on screen, Conditional Control in PL/SQL, Iterative Control Structure: While Loop, For Loop, Goto Statement, Commit, Rollback, Savepoint
6.	**Cursor Management and Triggers:** **Cursor**: Explicit & Implicit Cursor, Declaring Cursor Variables, Constrained & Unconstrained Cursor Variables, Opening Cursor, Fetching Cursor into Variables, Closing Cursor, Cursor For Loops, Parametric Cursors. **Triggers:** Definition, Syntax,Parts of triggers:statement, body, restricted, Types of triggers: Enabling & disabling triggers.
7	**Stored Procedures / Functions and Exception Handling:** Introduction, How oracle executes procedures/ functions, Advantages, How to createProcedures & Functions, Examples. **Error Handling in PL/SQL:** Exception Handling & Oracle Engine, Oracles Named Exception Handlers, User NamedException Handlers.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
207	Data Structures Lab	0L+0T+4P =2C	2018-19

Course Objective :

This is companion course of Data Structures and Algorithm

Syllabus Broad Units:

This Companion course of Data Structure and algorithm. Algorithms to use different data structures are covered in theory. Students will implement C Programs for these data structures.

Expected Outcome :

The students will develop adequate programming skills with respect to following

1. Implement a real world problem using appropriate data structure.
2. Implement data structures like array, stack, queue, linklist and applications of these data structures.
3. Use files for reading, writing and manipulation.
4. Make use of appropriate searching and sorting techniques appropriately.

References (Books, Websites etc) :

1. Data Structures using C - Y.Kanetkar, BPB Publications4. YashawantKanetkar, BPB Publication
2. Behrouz A. Forouzan and Richard F. Gilberg , 2nd Edition, Thomson, 2003, Computer Science A Structured Programming Approach Using C
3. Basavraj S Anami, ShanmukhappaAngadi, Sunil Kumar S Manvi, PHI Publications, 2010. A Holistic approach to learning C.
4. Andrew Tenanbaum, Thomson, 2005, Data Structures with C.Robert Kruse & Bruce Leung, Data Structures & Program Design in C, Pearson Education,

Suggested MOOC :

Please refer these websites for MOOCS:

NPTEL / Swayam

www. edx.com

www.coursera.com

DS Lab Outline

Sr. No	Programming Exercises
1	Specification and implementation of simple data structures such as Integer, Rational, Currency, Date, Temperature, distance, Pay, Marks, Grade_card etc. Use Linux environment to execute C Programme. Note :***Algorithm of every program should be written. Properly document the programs using comments. Author name and date, purpose of each variable and constructs like loop and functions should be indicated/ documented.*** ***gcc or an equivalent compiler is assumed***.
2	Program to demonstrate the following: - insertion, deletion and traversal in one and multidimensional array, single link list, circular link list, double link list, Addition of Polynomial using array/ link list
3	insertion, deletion and traversal in Stacks, queues, circular queue, deques, : Programs to demonstrate: - Evaluation of Arithmetic Expression, - implementation of recursion like factorial calculation, Quick Sort, Tower of Hanoi Problem - linked list implementations of stacks, queues, and deques;
4	Programs to demonstrate: - Creation, reading writing in a file. - Pattern Matching and Extraction of data from a file. - Reading and writing from files.
5	Programs to demonstrate: - binary tree traversal - depth first and breadth first traversal of trees
6	Programs to demonstrate: - linear and binary search algorithms and their efficiency; - The standard sort algorithms (bubble,selection,insertion) and their efficiencies; - Merge sort and quick sort algorithms and their efficiencies.

SEMESTER III

Course Number	Course Name	L-T-P- Credits	Year of Introduction
301	Artificial Intelligence	3L+1T+0P = 4C	2018

Course Objective :

Students After completion of the course will get the knowledge of area like machine learning, robotics, natural language processing, and multi-agent systems.

Students should be able to:

- Representation an AI problem or domain model, and construct domain models in that representation
- Choose the appropriate algorithm for reasoning within an AI problem domain
- Implement and debug core AI algorithms in a clean and structured manner
- Design and analyze the performance of an AI system or component
- Describe AI algorithms and representations and explain their performance, in writing and orally

Expected Outcome :

At the end of the course a student should be able:

- Understand various search methods
- Use various knowledge representation methods.
- Understand various Game Playing techniques
- Use Prolog Programming language using predicate logic

References (Books, Websites etc) :

- "Artificial Intelligence" -By Elaine Rich And Kevin Knight (2nd Edition) Tata McGraw-Hill
- Artificial Intelligence: A Modern Approach, Stuart Russel, Peter Norvig, PHI
- Introduction to Prolog Programming By Carl Townsend.
- "PROLOG Programming For Artificial Intelligence" -By Ivan Bratko(Addison-Wesley)
- "Programming with PROLOG" –By Klocksin and Mellish.

Suggested MOOC:

Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Syllabus:

Unit	Contents
1	**Introduction:** What is AI? ,The AI Problems, Background/history, What Is An AI Techniques, The Level Of The Model, Criteria For Success, Some General References, High-level overview of field, State of the art.
2	**Introduction and historical perspective, Hard and Soft AI –** disciplines and applications, Theories of Intelligence, Detecting and Measuring Intelligence, Knowledge based approach, the prepare- deliberate engineering trade-off, Procedural v/s Declarative knowledge, Criticism of symbolic AI, Knowledge representation, desirable properties of KR schemata, Use of predicate calculus in AI.

	Problems, State Space Search & Heuristic SearchTechniques:Defining The Problems As A State Space Search, Production Systems, Production Characteristics, Production System Characteristics, And Issues In The Design Of Search Programs, Additional Problems. Generate – And-Test, Hill Climbing, Best-First Search, ProblemReduction, ConstraintSatisfaction, Means-Ends Analysis.
3	**Knowledge Representation Issues:** Representations And Mappings, Approaches To Knowledge Representation.Using Predicate Logic: Representation Simple Facts In Logic, Representing Instance And Isa Relationships, Computable Functions And Predicates, Resolution. Representing knowledge Using Rules: Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning
4	**Symbolic Reasoning under Uncertainty:** Introduction To Non-monotonic Reasoning, Logics For Non monotonic Reasoning.Statistical Reasoning: Probability And Bays' Theorem, Certainty Factors And Rule-Base Systems, Bayesian Networks, Dumpster-Shafer Theory, Fuzzy Logic.Weak Slot – and-Filler Structure. Semantic Nets, Frames. Strong Slot and Filler Structures : Conceptual Dependency, Scripts, CYC
5	**Game Playing:** Overview, And Example Domain: Overview, MiniMax, Alpha-Beta Cut-off, Refinements, Iterative deepening, The Blocks World, Components Of A Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques.Understanding: What is understanding? , What makes it hard?, As constraint satisfaction
6	**Natural Language Processing:** Introduction, Syntactic Processing, Semantic Analysis, Semantic Analysis, DiscourseAnd Pragmatic Processing, Spell Checking. Connectionist Models: Introduction: Hopfield Network, Learning In Neural Network, Application Of Neural Networks, Recurrent Networks, Distributed Representations, Connectionist AI AndSymbolic AI.
7	**Introduction to Prolog :** Introduction To Prolog: Syntax and Numeric Function, Basic List Manipulation Functions In Prolog, Functions, Predicates and Conditional, Input, Output and LocalVariables, Iteration and Recursion, Property Lists and Arrays, Miscellaneous Topics, LISP and Other AI Programming Languages

Course Number	Course Name	L-T-P- Credits	Year of Introduction
302	Computer Networks	3L+1T+ 0P = 4C	2018

Course Objective:

The key objective is to acquire a foundational understanding of computer network and communication technologies. Networking concepts will be illustrated using TCP/IP networks.

Expected Outcome :

At the end of the course a student should be able:

- Students will acquire a good knowledge of the computer network, its architecture and operation.
- Student will be able to pursue his study in advanced networking courses (This knowledge will help them to create base for the Network Electives to be studied in the next semesters).
- Students will be able to follow trends of computer networks. So, students will get exposer to advanced network technologies like MANET, WSN, and 7G, IoT.

References (Books, Websites etc) :

Text Books:

- A.S. Tanenbaum, **Computer Networks** (4th ed.), Prentice-Hall of India, Latest Edition
- W.Behrouz Forouzan and S.C. Fegan, **Data Communication and Networking,** McGraw Hill, Latest Edition

Reference Books:

- Network Essential Notes GSW MCSE Study Notes
- Internetworking Technology Handbook CISCO System
- Introduction to Networking and Data Communications Eugene Blanchard
- Computer Networks and Internets with Internet Applications Douglas E. Comer

Suggested MOOC :

NPTEL: http://www.nptel.ac.in/courses/106106091/

Syllabus:

Unit	Contents
1	**Introduction to Computer Network:** What is Computer Network? Network Goals and Motivations, Application of Networks, Network Topologies, Classification of Networks, Network software: Network Protocols, Protocol Hierarchies, Design issues for the Layers, Connection Oriented and Connectionless Services, Service Primitives, Relation of services to Protocols, Network Models: The OSI Reference Model, The TCP/IP Reference Model
2	**Basics of Data Transmission / Physical Layer:** Analog and Digital Signals, Data Rate, Transmission Impairment, Signal Measurement: Throughput, Propagation Speed and Time, Wavelength, Frequency, Bandwidth, Spectrum Transmission Media& its Characteristics: Guided and Unguided Media, Synchronous and Asynchronous Transmission, Multiplexing: FDM, WDM, TDM, Switching: Circuit, Message and Packet Switching, Mobile Telephone Systems: 1G to 7G

3	**Network Layer: Network Layer Design Issues; Routing Algorithms:** Static/ Dynamic , Direct/ Indirect, Shortest Path Routing, Flooding, Distance Vector Routing , Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, **Congestion Control Algorithms:** General Principal of Congestion Control, congestion prevention polices, Load shedding, Jitter Control,
4	**IP Addressing:** IP-Protocol, IP-Address Classes (A, B, C, D, E), Broadcast address, Multicast address, Network Mask, Subnetting, Internet control Protocol-ICMP, IGMP, Mobile-IP, IPv6- packet format, addressing scheme, security, applications and limitations of IPv6. IPv4 Vs IPv6
5	**Domain Network Services (DNS) :** Domain Names, Authoritative Hosts, Delegating Authority, Resource Records, SOA records, DNS protocol, DHCP & Scope Resolution
6	**Transport and Application Support Protocols:** Transport Protocols: TCP/UDP, Remote Procedure Calls, RTP, Application Layer: Hyper Text Transfer Protocol (HTTP) HTTP request, Request Headers, Responses, MIME– Multipurpose Internet Mail Extensions, SMTP–Simple Mail Transfer Protocol, POP – Post Office Protocol, IMAP – Internet Message Access Protocol, FTP – File Transfer Protocol, Telnet – Remote Communication Protocol
7	**Advance Networks:** Concept of 7G Networks, Introduction of 802.16, 802.20, Bluetooth, Infrared, MANET, Sensor Networks. Technical Issues of Advanced Networks, Mobile Ad-hoc Networks: Introductory concepts, Destination-Sequenced Distance Vector protocol, Ad Hoc On-Demand Distance Vector protocol, Wireless Sensor Networks: Sensor networks overview: Introduction, applications, design issues, requirements. Introduction to IOT

Course Number	Course Name	L-T-P- Credits	Year of Introduction
303	Object Oriented Analysis And Design	3L + 1T + 0P= 4C	2018

Course Objective :

The course aims at developing skills to analyze and design a software system using Object Oriented Analysis and Design (OOAD) and UML. And use these skills in Unified Process (UP) environment.

Expected Outcome : At the end of the course a student should be able:

- Understand and describe the Object Oriented concepts
- Describe Object Oriented Analysis and Design(OOAD) concepts and apply them to solve problems
- Prepare Object Oriented Analysis and Design documents for a given problem using Unified Modeling Language
- Describe the activity carried out in each and every phase of Rational Unified Process(RUP)

References (Books, Websites etc) :

- Martin Fowler (2003), UML Distilled, 3rd Edition, Pearson Education.
- Applying UML and Patterns
- Roger Pressman(2009), Software Engineering: A Practitioner's Approach, Roger Pressman, ; 7th edition, McGraw-Hill
- Brett D. McLaughlin (2006), Head First Object-Oriented Analysis and Design , 1 edition, O'Reilly

Suggested MOOC :

Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Syllabus:

Unit	Contents
1	**Introduction To Object Orientation:** **Overview:** Review of SDLC, waterfall, spiral, iterative and incremental models, Iterative development and Rational Unified Process(RUP), **Object Orientation :** Introduction to Object Orientation, Principles of Object, Orientation: Abstraction, Encapsulation, Modularity, hierarchy, OO Concepts, Object Oriented Analysis (OOA) and Object Oriented Design(OOD) **Concept of Modeling:** Importance of Modeling, principles of Modeling, object oriented Modeling, object Modeling techniques.
2	**Introduction To UML:** Basics of UML: What is UML? History of UML, Goals of UML, Building Blocks of UML: Elements- structural, behavioral, grouping, annotation, relationships- links, dependency, association, aggregation, generalization, realization, Use Case modeling, conceptual modeling, behavioral modeling.

3	**Use Case Model (Requirement Modeling):** Understanding requirements, requirements types, goal and scope of use cases, levels of use cases, identifying use cases, identifying actors, naming use cases, elementary business processes, actors and actor types , Use Case Diagrams, examples, Use case relationships (include, extend and generalize); Concrete, Abstract, Base, and Addition Use Cases
4	**Activity Diagram:** Decomposing an action, partitions, signals, tokens, flow and edges, pins and transformations, expansion regions, flow final, join specification decision, fork, join, swimlanes.
5	**Domain Modeling:** Introduction to Domain Models, Domain modeling guidelines, conceptual class identification , strategies to identify conceptual classes, Adding Associations: Introduction to association, Finding and adding association, Common Associations List, Association Guidelines, Association Roles, Naming Associations, finding attribute and its types, UML Attribute Notation, attributes and foreign Keys, Multiplicity **Class Diagram :** Design Class Diagrams(DCD):When to create Class Diagrams, how to Design Class Diagrams, identify classes, class notations, stereotypes for classes, attribute and operation scope, types of classes, class relations, multiplicities, roles, class diagrams.
6	**System Sequence Diagram :** moving from inception to elaboration, system behavior, introduction to system sequence diagrams, Example of system sequence diagrams, Inter- System Sequence Diagram, system sequence diagrams and Use Cases, System Events and the System Boundary, Example of System Sequence Diagrams. **State Chart Diagram:** Modeling behavior in state chart diagram, events, states, and transitions in state chart Diagrams.
7	Illustration of Collaboration diagram, component diagram, Deployment diagram with suitable examples.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
304	Probability and Graph Theory	2L + 1T +0P = 3C	2018

Course Objective:

- Learn and become comfortable with a body of results and definitions,
- Practice creative problem solving and improve skills in this area,
- Practice and improve writing skills.
- Understand some applications of graph theory to practical problems and other branches of mathematics.
- Learn about how graph theory developed via a creative organic historical process.
- See that the simplicity of graph theory (a) makes them ubiquitous, and (b) makes it easier to be creative in these fields then in others.

Expected Outcome : At the end of the course a student should be able:

- To perform Simple random experiment.
- Analysis the data from Simulation experiments using appropriate Statistical Methods.
- Aware of some important applications of probability and statistics in the analysis of information systems.

Text/Reference Books:

- Kenneth H. Rosen, "Discrete Mathematics and its Applications", Mc.Graw Hill, 2002.
- S.C.Gupta ," Fundamentals of Statistics seven Revised Editions"
- Desgin and Analysis of Algorithms, Prentice –Hall of India private Limited New Delhi -2008
- Discrete Mathematics Schaum's outlines
- Discrete Mathematics and its Applications VII Edition Kenneth Rosen
- Discrete Mathematics N Ch SN Iyengar
- Narsing Deo- Graph Theory with Applications to Computer Science and Engineering ; Prentice Hall, India
- Ron Clark and Derek Holton- Graph Theory, Narosa

Suggested MOOC :

NPTEL: http://www.nptel.ac.in/courses/106106091/

Syllabus:

Course Plan	
Unit	**Contents**
1	**Theory of Probability:** Introduction, Permutation and Combination concept, types of probability, Mutually Exclusive and Mutually Exhaustive concept ,Independent event, Conditional probability ,Addition theorem of Probability, Multiplication Theorem, Bayes's Theorem.
2	**Random Variable ,Probability distribution and Mathematical Expectation:** Random Variable, probability distribution of a Discrete Random variable, Probability distribution of a continuous random variable, Distribution function or cumulative probability function moments, Mathematical Expectation, Theorem on Expectation.

3	**Theoretical Distributions:** Introduction, Binomial Distribution, probability functions of Binomial distribution, constant of Binomial distribution, mode of binomial distribution, Fitting of Binomial distribution. Poisson distribution, utilities or Importance, constant of Poisson distributions, mode, fitting of Poisson's distribution. Normal distribution, equation, curve, properties, importance, relation between binomial and normal distribution, relation between Poisson and Normal distribution.
4	**Sampling Theory :** Introduction, Population, Sampling, principles, Limitations, Types of Sampling, Simple random Sampling, Stratified random Sampling System sampling, Cluster sampling, Multistage sampling, Quota sampling.
5	**Testing of Hypothesis:** Introduction, Student's t distribution, properties, critical values of t, application of t – distribution, Fisher's transformation, critical values of F – distribution, Applications of F-distribution, chi square test.
6	**Basic Concept of Graph:** Introduction, Graphs and Multi graphs, sub graphs, Isomorphic Graphs, Homomorphism Graphs, Paths, Connectivity ,labeled Graphs, Weighted Graphs ,Complete graphs, Planer Graphs, Introduction, Directed Graphs, Rooted Trees, Represented of Directed Graphs, Incidence and Adjacency Matrices, Eulerian and Hamiltonian Graphs, Tree Traversing, Prims Algorithm ,Hufmann Algorithm
7	**Graph Applications and Algorithm:** Bridges of Konigsberge, Travelling Salesmen Problem, Seating Arrangement problem ,Crossing of river problem, Sheep cabbage problem, Utilities problem Shortest Algorithms: Warshall's Algorithm, Dijkstra's Algorithm, Travelling Salesman problem, Depth First search, Breadth First Search

Course Number	Course Name	L-T-P- Credits	Year of Introduction
305	Organizational Behavior	2L+1T+ 0P = 3C	2018

Course Objective :

To understand the dynamics of individual and group behaviour in organisational setting to achieve optimum utilization of human resources.

Expected Outcome:

At the end of the course, a learner should be able to

- To understand the implications of different models of Organizational Behavior
- To learn the effect of attitudes, values, group dynamics in organization
- To utilize motivation and leadership theories for delivering best results for organization.

References (Books, Websites etc) :

- Stephen Robbins, Organizational Behaviour
- Ashwathappa, Organizational Behaviour
- Uma Sekaran, Organizational Behaviour
- Ricky W. Griffin, Gregory Moorhead, OB, Cengage Publication

Syllabus:

Unit	Contents
1	**Introduction to OB:** Definition, importance & scope of Organization Behaviour, Multi-disciplinary approach to OB, Models of OB-Autocratic, Custodial, Supportive, Collegial, SOBC, Recent developments and challenges in OB
2	**Individual Behaviour in Organizations:** Attitude - Definition, Components, Sources, Job satisfaction, Perception – Definition, Process, Implications for Management, Perceptual Errors, Values – Definition and meaning, Types of value, Personality – Determinants, Traits theory, BIG FIVE, MBTI
3	**Foundation of Group Behaviour:** Group- Definition, Stages of Group Development, Classification of Groups, Advantages of Group Decision Making, Team – Difference between Group and Team, Creating Effective Team
4	**Conflict and Stress Management:** Conflict – Definition, Conflict Process, Types – Constructive and Destructive Conflicts, Levels of Conflicts and conflict Management, Stress – Definition, Causes or Sources of stress, Symptoms of stress, Management of Stress, Quality of Work-Life
5	**Motivation and Leadership:** Motivation – Definition, Process, Theories – Maslow Hierarchy Theory of Needs, Herzberg's Two Factor Theory, Equity Theory, Vroom's Expectancy Theory
6	**Leadership:** Leadership- Definition, Traits of good leader, Difference between Leader & Manger, Types of Leadership Style, Likert's 4-M management styles, Managerial Grid and its application
7	**Organization Change Management:**

	Need for Change, Reasons for Resistance of Change, Building Support for Change, Role of Change Agent, Process of Change Implementation, Learning organization – characteristics, Creating Learning Organization

Course Number	Course Name	L-T-P- Credits	Year of Introduction
306	Object Oriented Programming	3L+1T+0P= 4C	2018

Course Objectives :

- To understand the concepts of object-oriented programming paradigms and develop skills in these paradigms using Java.
- To provide an overview of characteristics of Java and make them familiarize to use JDK and Java API for concurrent programming, input/output, Java Collections

Syllabus Outline:

Introduction to Object Oriented concepts - Java Basics - Arrays and Strings -Inheritance – Polymorphism – Interface – Packages - Exception Handling –Multithreaded Programming – Streams and collections

Expected Outcome :

At the end of this course, student should be able to

- Design interfaces, abstract and concrete classes needed, given a problem specification
- Implement classes designed using object oriented programming language
- Learn how to test, verify, and debug object-oriented programs and create programs using
- Make them comfort to muse Java API for Input/output and Java Collections and utility classes
- Able to achieve object persistence using object serialization and write modules to take advantages of concurrent programming

References (Books, Websites etc) :

- Herbert Schildt, Java: The Complete Reference, McGraw-Hill Osborne Media; Seventh Edition, 2007
- Cay S. Horstmann and Gary Cornell ,Core Java-Volume-I, Sun Core Series, Eighth Edition, 2008
- Bruce Eckel , Thinking In Java – Printice Hall, Fourth Edition

Suggested MOOC :

Please refer these websites for MOOCs:
NPTEL/Swayam
www.edx.com
www.coursera.com

Syllabus/Course Outline

Unit	Contents
1	**Introduction to Java:** Introduction: Need for OOP paradigm, Procedural approach vs. Object-Oriented approach. Object Oriented concepts Java Basics: Features of Java, History of Java, Java features, data types, variables, operators, expressions, control statements, type conversion and casting, Java compiler, JVM,

	Garbage collection, Data types, concept of class and object, java naming conventions wrapper classes, control structures in java,
2	**Class and Object Concepts:** Defining a class, creating objects from class, adding attributes and methods to the class, using constructors, Passing values to the functions – pass by value, pass by reference, Function overloading. Modifiers – public, private, protected, default, static, final
3	**Arrays and Strings:** One dimensional arrays, Multidimensional arrays, exploring String class and methods, String Buffer class. Packages - creating and accessing a package, importing, packages, creating user defined packages, Concept of package, Introduction to Exception Handling.
4	**Inheritance and Polymorphism:** Concept and importance of inheritance, is-a relationship, types of inheritance, Polymorphism – function overriding, dynamic method dispatch. Throws keyword and method overriding. Using abstract and final keywords with class declaration, Concept of interface, Compression of Interface and class. Access modifiers and data accessibility in derived classes, method access modifier and method overriding.
5	**Concurrent Programming** Concept of threads, lifecycle of threads, creating threads, Thread class, Runnable interface, Thread synchronization, inter thread communication – wait(), notify(), notifyAll() methods
6	**Java Input/Output** Concept of streams, types of streams – byte streams, character streams, The Console: System.out, System.in, and System.err InputStream class, OutputStream class, File class, FileInputStreams, FileOutputStream, Reader class, Writer class, FileReader, FileWriter. Buffered streams – BufferedInputStream, BufferedOutputStream, BufferedReader, BufferedWriter. Object Streams, issue of 'Serialization'
7	**Java Collections and Utility Classes** Collection Basics- A Collection Hierarchy, Using ArrayList and Vector, LinkedList, Using a Iterator, Set: HashSet, LinkedHashSet, TreeSet , Comparable and Comparator interfaces, Map, Hashmap, HashTable, TreeMap, LinkedHashMap Generics – Basics, class parameters, bounded types, erasures.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
307	Object Oriented Programming Lab	0L+0T+4P = 2C	2018

Course Objective :

This is companion course of Object Oriented Programming

Syllabus Broad Units:

This Companion course of OO programming, Practical aspects of OOP towards problem solving is covered.

Expected Outcome :

The students will develop adequate programming skills with respect to following

- Write simple programs to use basic programming language constructs
- Design interfaces, abstract and concrete classes needed, given a problem specification
- Implement classes designed using object oriented programming language
- Learn how to test, verify, and debug object-oriented programs and create programs using
- Make them comfort to muse Java API for Input/output and Java Collections and utility classes
- Able to achieve object persistence using object serialization and write modules to take advantages of concurrent programming

References (Books, Websites etc) :

- Herbert Schildt, Java: The Complete Reference, McGraw-Hill Osborne Media; Seventh Edition, 2007
- Cay S. Horstmann and Gary Cornell ,Core Java-Volume-I, Sun Core Series, Eighth Edition, 2008
- Bruce Eckel , Thinking In Java – Printice Hall, Fourth Edition

OOP Lab Outline

Sr. No	Programming Exercises
1	**Writing, compiling and Executing Java programs using basic language constructs as bellow :** - Using Operators : arithmetic, relational, logical and bitwise - Control structures (if, if-else, switch) - Iterative statements (while, do-while, for)
2	**Programming with Classes :** Wring a class, creating objects and using it Using constructors to initialize object Programs to demonstrate parameter passing

	Making use of access modifiers
3	**Working with Arrays and Strings:** - Programs to work with single dimensional and multidimensional arrays - Searching and sorting - Programming with string and operations on it - Programs to understand and study string literal pool
4	**Inheritance and Polymorphism:** - Defining classes as generic types ; using it to write new class/classes - Need and example of method overriding - Writing abstract class and interface - Using abstract classes to write concrete classes - Using interface as base type to write new interface and implementing it to write new concrete class/classes - Anonymous and inner classes
5	**Concurrent Programming :** - Designing and using Thread class and Runnable interface - Thread synchronization - Program to demonstrate Thread priorities, thread join and making use of yield - Programs with classes making use of thread and inter communication between them.
6	**Java Input/Output :** - Programs to make using InputStream and OutStream classes. - Reading and Writing data into files - Making use to console to read data. - Using readers and writers to write data into Files - Making use of Buffered Streams and reader and writer - Programs to take advantages of serialization
7	**Java Collections and Utility Classes:** - Programs to make use collections (ArrayList, Vector, Set and Maps) - Writing user defined data generic types - Programs to illustrate bounded types and erasures

SEMESTER IV

Course Number	Course Name	L-T-P- Credits	Year of Introduction
401	Data Warehousing and Data Mining	3L+1T+0P=4C	2018

Course Objective:

This course will enable to expose the students to Study various design and implementation issues and techniques in data warehousing and data mining including, Basic concepts on knowledge discovery in databases process and tasks, Concepts, model development, schema design for a data warehouse, Data extraction, transformation, loading techniques for data warehousing, Concept description: input characterization and output analysis for data mining, Core data mining algorithms, implementation and applications, Data mining tools and validation techniques.

Pre-requisites:

Thorough understanding of: Relational database normalization techniques , Physical design of a database, Concepts of algorithm design and analysis, Basic understanding of: Software engineering principles and techniques, Probability and statistics – Bayesian theory, regression, hypothesis testing

Expected Outcome : After going through this course a student should be able to understand :

- The Fundamentals concepts of Data warehouse and Data Mining
- Differences between a data warehouses OLAP and operational databases OLTP
- Multidimensional data model design and development
- Techniques for data extraction, transformation, and loading
- Learning schemes in data mining
- Mining association rules (Apriori)
- Classification and prediction (Statistical based: Naïve Bayes, regression trees and model trees; Distance based: KNN, Decision tree based: 1R, ID3, CART; Covering algorithm: Prism)
- Cluster analysis (Hierarchical algorithms: single link, average link, and complete link; Partitional algorithms: MST, K-means; Probability based algorithm: EM)
- Use of data mining tools: C5, Cubist, Weka

References (Books, Websites etc.):

- Bing Liu, " Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data (Data-
- Centric Systems and Applications)", Springer; 2nd Edition 2009
- 2.. Alex Berson, Stephen J. Smith, Data Warehousing, Data Mining and OLAP,McGrawHill, 2004
- D. Hand, H. Mannila, and P. Smyth, Principles of Data Mining, MIT Press, 2011
- Jiawei Han, MichelineKamber, Data Mining: Concepts and Techniques, Harcourt India Pvt., 2011.

Suggested MOOC :

Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Syllabus

Unit	Contents
1	**Data Warehousing:** Introduction, Definition, data transformation, ETL (Extract, Transform, Load) processes, OLAP operations, Differences between Operational Database Systems and Data Warehouses; Difference between OLTP & OLAP, Overview of Multi-dimensional Data Model, and the basic differentiation between "Fact" and "Dimension"; Multi-dimensional Cube, Concept Hierarchies of "Dimensions" Parameters: Examples and the advantages, Star, Snowflakes, and Fact Constellations Schemas for Multi-dimensional Databases, Measures: Their Categorization and Computation, Pre-computation of Cubes, Constraint on Storage Space, Possible Solutions, OLAP Operations in Multi-dimensional Data Model: Roll-up, Drill-down, Slice & Dice, Pivot (Rotate), Indexing OLAP Data; Efficient Processing of OLAP Queries, Type of OLAP Servers: ROLAP versus MOLAP versus HOLAP.
2	**Data Warehouse Architecture:** Steps for Design & Construction of A Data Warehouse, A 3-Tier Data Warehouse Architecture, Data warehouse implementation **Data Pre-processing overview:** The need for Pre-processing, Data Cleaning: Missing Values, Noisy Data, Data Cleaning as a Process, Data Integration & Transformation, Data Cube Aggregation; Attribute Subset Selection, Dimensionality Reduction: Basic Concepts only, Numerosity Reduction: Regression & Log-linear Models, Histograms, Clustering, Sampling, Data Discretization & Concept Hierarchy Generation, For Numerical Data, For Categorical Data
3	**Introduction Data Mining** : Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.
4	**Mining Association Rules :** Basic Concepts, Market Basket Analysis, Mining Multi-Level and single , Association Rules From Transaction Mining Multi-Dimensional Association Rules From Relational Databases & Data Warehouses, From Association Mining To Correlation Analysis, Constraint Based Association Mining, Association Rules: Apriori Algorithm, Partition, Pincer search, Incremental, Border, FP-tree growth algorithms, Generalized association rule.
5	**Classification & Prediction:** Introduction to Classification and Prediction; Basics of Supervised & Unsupervised Learning; Preparing the Data for Classification and Prediction; Comparing Classification and Prediction Methods, Classification by Decision Tree Induction, Attribute Selection Measures; Tree Pruning; α –β pruning Scalability and Decision Tree Induction, Rule-based Classification: Using IF-THEN Rules for Classification; Rule Extraction from a Decision Trees; Rule Induction Using a Sequential Covering Algorithm, Bayesian Classification: Bayes' Theorem, Naïve Bayesian Classification; Bayesian Belief Networks.
6	**Cluster Analysis:** Introduction to Cluster Analysis; Types of Data in Cluster Analysis; A Categorization of major. Unsupervised Learning - K-means Clustering -Hierarchical Clustering –Partially Supervised Learning.

	Applications of Cluster Analysis-Clustering analysis in market research, pattern recognition, data analysis, and image processing. **Requirements of Clustering in Data Mining:** Scalability, Ability to deal with different kinds of attributes, Discovery of clusters with attribute shape, High dimensionality, Ability to deal with noisy data, Interpretability. **Clustering Methods:** Classification of clustering methods-Partitioning Method, Hierarchical Method, Density-based Method, Grid-Based Method, Model-Based Method, Constraint-based Method
7	**Web Structure Mining:** Web Link Mining – Hyperlink based Ranking – Introduction -Social Networks Analysis- Co-Citation and Bibliographic Coupling - Page Rank -Authorities and Hubs -Link-Based**,** Similarity Search -Enhanced Techniques for Page Ranking - Community Discovery – Web Crawling -A Basic Crawler Algorithm- Implementation Issues- Universal Crawlers- Focused Crawlers- Topical Crawlers Evaluation- Crawler Ethics and Conflicts - New Developments **Web Usage Mining:** Web Usage Mining – sources of data- Applications -Click stream Analysis -Web Server Log Files - Data Collection and Pre-Processing- Cleaning and Filtering- Data Modeling for Web Usage Mining – Issues- Discovery and Analysis of Web Usage Patterns – Used tools in Web Usage mining.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
402	Information Security	3L+1T+0P=4C	2018

Course Objectives :-

To Create awareness about important issue of Information Security, understand the concept of Information Security in Business Organizations, security measures and procedures at different levels within your IT environment. Procedure to manage the security issues in systematic and scientific way.

Expected Out Come :

- The expected outcome of this course is to understand security policy, Information security management at all functional levels of organization. The basic background of Security and its implementation is required to undertake this course.

- The course will provide the student with an understanding of the principles *of information security for IT Industry and management of important resources of the organization. Students will come to know i*nterrelationship between the various elements of *information security* and its role in protecting organizations information at all level.

Reference Book(s) :

- Information Security Management Handbook, Sixth Edition, Volume 5-2012 Amazon Books Edited by - Micki Krause Nozaki, Harold F. Tipton.
- Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives Nina Godbole and Sunit Belpure, Publication Wiley.
- Information Security: Principles and Practice 1st , Kindle Edition -2005 Amazon Books Author - Mark Stamp
- "Cryptography and information Security" V.K. Pachghare, PHI Learning Private Limited, Delhi India.
- Analyzing Computer Security by Charles P. Pfleeger, Shari Lawerance Pfleeger, Pearson Education India,
- Practical Information Security Management: A Complete Guide to Planning and Implementation-Dec-2016 Amazon Books . Tony Campbell
- Managing Risk and Information Security :- Protect to Enable A-Press Open Access Book (Free) at http://www.freetechbooks.com/managing-risk-and-information-security-protect-to-enable-t1150.html

Suggested MOOC :

Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Unit	Contents

1	**Introduction and Background**: Information, Information Characteristics, sources of Information, Types of Information, and Generating Information in Organizations. Business Application of Information and Information System, What is Information security? Need for Information Security , Types of Organization , Functions of Business organization , Levels of Organization , How Organizations manage the information , flow of information , IT Policy for Information protecting.
2	**Basics of Networking for Security Purpose** – Network Installations , Types of Networks and their security issues , Types of Network of OS. Functions of Information security officer. Different measures to safe guard the important information in the organization . Network policy for protecting important resources of the Network. Basic concept of MIS and Organization flow of Information.
3	**Importance of Information Security** - Improvement in corporate reputation based on the height of the level of information security, threat to business continuity due to accidents related to information systems, cyber space, information assets, threats, vulnerabilities. Information Security Measures. **Threats** :- Ty p e s of threats: physical threats (accident, disaster, fault, destruction, theft, unauthorized intrusion, etc.), technical threats (unauthorized access, eave S dropping , spoofing, alteration, error, cracking, etc.), man-made threats (operational error, loss, damage, peep, unauthorized use, social engineering, etc.), cyber-attack, information leakage, intent, negligence, mistake, fraudulent behavior, sabotage, DoS attack, rumor, flaming, SPAM e-mail, file sharing software [Malware / malicious programs] computer virus, macro virus, worm, bot (botnet, remote operated virus), Trojan horse, spyware, ransom ware, key logger, root kit, backdoor, fake anti-virus software
4	**Information security technology (cryptography)-CRYPTREC** ciphers list, cryptography (encryption key), decryption (decryption key), decoding, symmetric cryptography (common key), public key cryptography (public key, private key)), AES (Advanced Encryption Standard), S/MIME (Secure MIME), PGP (Pretty Good Privacy), hybrid encryption, hash function (SHA-256, etc.), key management, disk encryption, file encryption, compromise. digital signature (signature key, verification key), timestamp (time authentication), message authentication, MAC (Message Authentication Code), challenge-response authentication.
5	**Information security Management:** management of information based on the information security policy, information, information assets, physical assets, software assets, human assets (people, and their qualifications, skills, and experience), intangible assets, service, risk management (JIS Q 31000), monitoring, information security events, information security incidents. **Risk analysis and evaluation (Information asset review / Classification)** information assets review, classification and management by importance of information assets, information assets ledger Risk analysis and evaluation (Risk type)loss of property, loss of responsibility, loss of net earnings, human cost, operational risk, supply chain risk, risk involved in usage of external service, risk involved in distribution of information by SNS, moral hazard, estimated annual loss, scoring method, cost factor .
6	**Information security regulations:** (Company regulations including information security policy)organizational operation according to the information security policy, information security policy, information security purpose, information security measures criteria, information management regulations, security control regulations, documentation control regulations, regulations on measures to be taken against

	computer virus infection, regulations on measures against accidents, information security education regulations, privacy policy (personal information protection policy), employment agreement, office regulations, penal provisions, outward explanation regulations, regulations for exceptions, regulations for updating rules, procedure for approving regulations.
7	**Management of Information Asset:** Security Incidents management, reducing risk in Information loss and keeping the information safe from unauthorized users and threats. **Information Technology Act:** Cyber Crimes and Cyber Laws. -What are cyber-crimes? Types of cyber-crimes. Categories of Cyber Crime, Online business threats, Online business frauds Safety tips for online business.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
403	Design Patterns	3L+1T+0P=4C	2018

Course Objective:

The objective of the course to emphasize how to use design patterns as general reusable solution to a commonly occurring problem. Understand the Design patterns that are common in software applications and how these patterns are related to Object Oriented design.

Pre-requisites:

This course assumes students should have following knowledge:

- OOAD and UML.
- Software Engineering, Java Programming

Learning Outcomes:

After completing this course, students will be able to:

- Understand meaning and types of design Patterns
- Identify structure and describe structure of Design Pattern
- Given a problem able to decide which design Pattern is used
- Understand the Design patterns that are common in software applications
- Understand how these patterns are related to Object Oriented design.

Text Book(s) :

- Design Patterns Elements of Reusable Object-oriented Software- Erich Gama, Richjard Helm, Ralph Jonson and Jon Vlissides.
- Design Patterns- Vhristopher G. Lasater, BPB Publications, 1st Indian Edition 2007.
- Head First Design Patterns, Eric Freeman, Elisabeth Freeman, Kathy Sierra, Bert Bates,
- Ben Shneiderman, Designing the User Interface, Pearson Education, 1998

Syllabus

Unit	Contents
1	**Introduction to Design Patterns:** Reusable design Patterns: Meaning & Use of Design Patterns, Organizing the Patterns, Describing pattern, how to use the patterns while solving the problem, Applications of different design patterns in various cases. Selection of a Design Pattern
2	**Creational Patterns:** **Intent, Motivation, Applicability, Structure, Participants, Collaborations, Consequences and Implementation of following Creational Patterns :-** Factory Method, Abstract Factory, Builder, Prototype, Singleton**.** **Tutorial:** Tutorials should be conducted in LAB using JAVA for implementing Creational design pattern.
3	**Structural Patterns:** Intent, Motivation, Applicability, Structure, Participants, Collaborations, Consequences, Implementation of Following Structural Patterns **Adapter (class**), **Adapter (object), Bridge, Composite, Decorator. Façade.**

	Flyweight, **Proxy.** **Tutorial:** Tutorials should be conducted in LAB using JAVA for implementing Structural design patterns.
4	**Behavioral Patterns:** Intent, Motivation, Applicability, Structure, Participants, Collaborations, Consequences, Implementation of following Behavioral Pattern **Interpreter, Template Method, Chain of Responsibility, Command, Iterator, Mediator, Memento, Observer, State, Strategy, Visitor** **Tutorial:** Tutorials should be conducted in LAB using JAVA for implementing Behavioral Design Pattern.
5	**Introduction to Human Computer Interface:** Need & Importance of HCI, HCI & human diversity, Goals and Objectives of HCI. **Models of HCI:** Conceptual, semantic, Syntactic and Lexical Model,GMOS Model, Object-Action Interaction model, Action-Object Interaction model.
6	**Principles of Design:** Recognition and Diversity, Eight golden rules of interface design, Error Prevention. **Interaction style of Design:** Guidelines for Data Display and Data Entry**,** Direct and Menu selection, Form filling, Command Language.
7	**Computer Supported co-operation:** Goals of co-operation, Synchronous Interactions, asynchronous and face to face Interactions. **Application to education and social issues:** Future Applications of HCI. Tutorials should be conducted in LAB using JAVA for implementing design patterns of Creational, Structural and Behavioral design pattern.

Course Number	Course Name	L-T-P-Credits	Year of Introduction
407	Lab on Linux Operating System	0L+1T+4P=2 C	2018

Course Objective:

The student would be able

- To obtain knowledge of how to manage files in Linux system.
- To understand Linux commands and write shell programming.
- To grasp the concepts of User Management in Linux.
- To control the system running Ubuntu operating system.

Expected Outcome :

The course is to provide the knowledge of the Linux Operating System. This course intends to teach various features that will help the students to use and learn the working of Ubuntu /Red Hat operating system

Prerequisite:

Students should have basic knowledge of working on an operating system.

- Linux for beginners : An introduction to the linux operating system and command line
- Linux: the complete reference, sixth edition paperback by Richard Petersen, McGraw Hill education
- Unix shell Programming: by yashwant Kanitkar
- UNIX Concepts and Applications - by Sumitabha Das

Course Plan

Unit	Contents
1	Introduction to Linux Operating system, various flavors of Linux O.S., Learning to use and Install Linux, Booting Any one flavor of Linux like ubuntu, red hat etc, Starting up ,Logging in, Exploring the desktop ,Working with virtual desktops, Getting Everything up and running ,Viewing your hardware , Getting online Using an Ethernet Card ,Joining wireless network ,Configuring Email and instant messaging, Adding a Printer , Configuring a local printer, Configuring a network printer, Setting up digital imaging devices, Transferring photos from digital camera, Configuring scanner, Configuring Bluetooth.
2	**General Purpose Utilities:** banner (display a blown-up message), cal (The calendar), date-display the system date, who-Login detail tty-knowing your terminal uname-know your machine name passwd-change your password lock-lock your terminal echo-display message bc-the calculator. who am i,- display login name

3	**Navigating the file system:-** pwd-checking your current directory, cd-changing directories, mkdir-Making directories rmdir-moving directories ls-listing files **Handling Ordinary files:** cat-displaying and creating files, touch-creating empty file cp-copying a file rm-deleting files mv-renaming files more-paging output lp-printing a fiile file-know the file type wc-line, word and character counting split-splitting file in to multiple files cmp-comparing two files comm.-finding common chmod-changing file permission files searches using find command, locate command, mount and unmount command. Understanding vi modes, Using vi to edit the file, Creating a new text file using vi, Searching through files.
4	**Filters:** pr- paginating files head-displaying the beginning of a file, tail- displaying the end of file cut- slitting a file vertically paste- pasting file sort- ordering file uniq- locating repeated line nl- line numbering tr-translating characters. regular expressions and grep to find text ps-process status kill-terminate process Other process related commands
5	sh command, pattern matching- the wild cards, escaping-the backslash(\), quoting, redirection, pipes, tees
6	What is Shell, Different types of shells, Shell as command processor, shell variables, creating command substitution, various shell scripts using functions, conditionals, loops, customizing environment

SEMESTER V

Course Number	Course Name	L-T-P- Credits	Year of Introduction
501	Data Science	3L+1T+0P= 4C	2018-19

Course Objective :

You will learn data science basics, statistics, R programming fundamentals of big data, hadoop and mapreduce, and Machine Learning Basics. By the end of this students should be able to handle and program on machine learning techniques using R-tool

References (Books, Websites etc) :

Refer web sources

Suggested MOOC :

Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Syllabus:

Unit	Contents
1	**Introduction To Data Science:** What is data science, relation to data mining, machine learning, big data and statistics, Several data science settings, Introduction to the WEKA tool
2	**Data analysis:** **From data to features:** Interactive group discussion, Representing problems with matrices, Representing problem with relations, Examples **Computing simple statistics:** Means, variances, standard deviations, weighted averaging, modes, quartiles, Examples **Simple visualizations:** Histograms, Boxplots, Scatterplots, Time series, Spatial data **Case studies:** X & Y examples, Medical data ,Hands-on R-Tool
3	**Exploratory Data Mining:** Introduction to Exploratory Data Mining, **Association discovery**

	What is association discovery? What are the challenges? , In detail: Apriori **Clustering** What is clustering? , What are the challenges? ,In detail: agglomerative clustering Hands-on: clustering in WEKA
4	**Evaluation And Methodology Of Data Science:** **Experimental setup** Training, tuning, test data, Holdout method, cross-validation, bootstrap method **Measuring performance of a model** Accuracy, ROC curves, precision-recall curves, Loss functions for regression **Interpretation of results** Confidence interval for accuracy Hypothesis tests for comparing models, algorithms
5	**Data Engineering:** **Attribute selection** Filter methods, Wrapper methods **Data discretization** Unsupervised discretization, Supervised discretization **Data transformations** PCA and variants Exercises
6	**Introduction To Machine Learning:** **Linear Regression** Learn to implement linear regression and predict continuous data values **Classification** Understand and implement algorithms like K-NN*, Naive Bayes and Logistic Regression **Clustering** Learn how to create segments based on similarities using K-Means and Hierarchical clustering
7	**Big Data Analytics:** **Introduction to Big Data And Hadoop:** Understand the basic concepts of Big Data and Hadoop as processing platforms for Big Data **Managing Big Data:** Learn and Use Hadoop Ecosystem tools for data ingestion, extraction and management. Hadoop ecosystem tools namely Sqoop, Hive will be covered in this Module

Course Number	Course Name	L-T-P- Credits	Year of Introduction
502	Optimization Techniques	3L+1T+0P=4C4	2018

Course Objective:
Operations Research is a method of mathematically based analysis for providing a quantitative basis for analytical decisions in management. It provides different techniques based on logic and mathematics, and hence form the backbone of computer science.

Expected Outcome :
This module helps to introduce students to use quantitative methods and techniques for effective decisions–making model formulation and applications that are used in solving business decision problems.

References (Books, Websites) :
Books:
Operations Research Theory and Applications by J. K. Sharma
Operations Research: An Introduction (Pearson Publication, 8th edition) by H. A. Taha
Web Resources :
For video lectures refer to site – http://mech19.blogspot.in/2015/08/operation-research-video-lectures.html

Suggested MOOC :
Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Syllabus

Unit	Contents
1.	**Introduction to OR and Linear Programming Problem:** **Operation Research** – Introduction, Models, Areas of Application, Basic terminologies in OR. **Introduction to LPP** Mathematical Formulation of L.P.P. **Solution to LPP using** – Graphical Method (Minimization and Maximization). Simplex Method – Concept of slack, surplus & artificial variables. Manual solutions of L.P.P. (up to 3 iterations).

	Solution using Big M method Duality and sensitivity Analysis in LPP **Variations of LPP –** Alternative optimal, Unbounded solutions & Infeasible solutions to be shown graphically & also by simplex method.
2.	**Transportation** Definition and mathematical formulation of the transportation model. **Finding initial basic feasible solution using –** North-West Corner Rule Least cost method Vogel's approximation method Checking for Optimality & obtaining of optimal solution using MODI method. **Variations of Transportation Problem-** Unbalanced problems Maximization. Degenerate Solutions
3.	**Assignment Model** Definition and mathematical formulation of Assignment Problem. Finding BFS and optimal solution for Assignment Problem using Hungarian method. **Variations of Assignment Problem –** Unbalanced problems Maximization Travelling Salesman Problem
4.	**Network Analysis** Introduction to project management and significance of PERT/CPM in project management. Components of network. Construction rules and precautions Network of phases of project. Critical Path Analysis (CPM): Calculating Earliest Time and Latest Time for events, finding critical path for project, Calculating floats (Total, free and independent float), Calculating probability for completion of projects.
5.	**Simulation** Introduction to simulation, types of simulation, advantages and disadvantages of simulation Steps in solving problem using simulation **Monte Carlo Method for Simulation for –** Inventory, Queuing, PERT, Investment Applications of Simulation
6.	**Decision Theory and Decision Tree** Introduction to terminologies in Decision Making (Decision alternatives, States of alternatives, payoff table) and steps in Decision Making. Types of Decision Environments – Decision making under Uncertainty & Decision making under Risk. Criteria for Decision making under uncertainty- Minimin or Maximax criteria, Miximin or Minimax Regret criterion,

	Laplace criterion, Hurwicz criterion. Criteria for Decision making under Risk- Expected Monetary Value criterion, Expected Opportunity Loss (E.O.L.) Expected Value of Perfect Information (E.V.P.I.) Decision Tree introduction and building decision tree for Simple problems.
7.	**Queuing Theory** Introduction, structure of queuing System, Performance measures of a Queuing System, Probability Distributions in Queuing Systems of – Arrivals, Interarrival Times, Departures, Service times, Single Server Queuing Models, Multi Server Queuing Models

Course Number	Course Name	L-T-P- Credits	Year of Introduction
503	**Software Project Management**	3L+1T+0P=4C	2018

Course Objective :

To provide basic project management skills with a strong emphasis on issues and problems associated with delivering successful high quality IT projects.

Expected Outcome :

- Evaluate project to develop scope of work, provide accurate cost estimation and to plan the various activities.
- Identify resources required for a project and to produce a work plan and resources schedule

References (Books, Websites etc) :

- Software Project Management – Bob and Huges
- Software Project Management in Practice, Pankaj Jalote, Pearson Education,2002
- Software Engineering by Pressman
- Basic of Software Management ,NIIT, Prentice-Hall India ,2004
- S0FTWARE REQUIREMENTS - MS project 2007 onward , CoStar 7 Onwards

Syllabus:

Unit	Contents
1	**Introduction to project management -** Project, project management, software project management, characteristics of project, how software projects are diff. Than other projects, Problems with software projects, All parties (stakeholders) involved in project. Role of Project Manager. Phases of project management life Cycle.
2	**Project Management Body of Knowledge** – Project management institute, PMBOK. Role of PMBOK , Knowledge area's identified by PMBOK, Various certifications provided by PMBOK with their importance, Association for project management , project planning, importance.
3	**Project planning –** Various plans to be prepared in SPM , Stepwise project planning , Importance of Project scheduling, project and activities, sequencing and scheduling activities , Importance of resource allocation, nature of resources , Identifying resource requirement , Scheduling resources , Work breakdown structure , Gantt chart, Network Planning models, formulating network model , Critical path analysis , PERT, Hands on experience with Microsoft Project.
4	**Cost and effort estimation –** Where estimation done?, problem with over and under estimation , Cost to be considered during estimation, factors affecting cost estimation , cost estimation methods-non algorithmic , COCOMO model, Function point analysis model , Hands on experience with Costar or other estimation software's.
5	**Project risk management -**

	The importance, top risk in projects , Classic mistakes, Elements of risk management – Risk identification, risk analysis , Elements of risk management – Risk prioritization, risk control.
6	**Managing Contract –** Types of contract, Contract management and Acceptance Managing people and organizing teams - Organizational behavior, understanding behavior, Selecting Right person for right job, Motivation, Becoming a team and decision Making, Leadership styles, Organizational structures **.**
7	**Software quality –** Place of software quality in planning, Defining software quality and importance of it, Software quality measures, ISO standards, CMM standards, Quality Assurance document.

ELECTIVES

Elective Group:(01) Cloud Computing

Course Number	Course Name	L-T-P- Credit	Year of introduction
404-01-A	Virtualization	2L+1T+0P=3C	2018

Course Objective:
Students will learn an an overview of the field of Cloud Computing Students will gain hands-on experience solving relevant problems through projects that will utilize existing public cloud tools. It is our objective that students will develop the skills needed to use cloud computing technique

Course Outcome:
student will be able to:

- Study core concept of cloud computing.
- Study virtualization and outline its role in enabling the cloud computing system model.
- Analyze various cloud computing models.

References:

- "Virtulization" – A Manager's Guide, By Dan Kusnetzky, O'reilley Publications,
- "Virtulization for Dummies", 1st Edition, Kindle Edition, by Bernard Golden.

Suggested MOOC :
Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Unit	Contents
1	**Overview Of Virtualization :** Introduction to Virtualization, Virtualization Approaches, Virtualization for Server Consolidation and Containment, Hardware Support for Virtualization, Para-Virtualization, vmWare's Virtualization Solutions
2	**Understanding Virtualization :** The Roots of Virtualization, Making Better Use of Your Systems with Virtualization, Approaches to Virtualization, Understanding the Virtualization Ecosystem, Reasons to Invest in Virtualization Hardware.
3	**Hypervisor:** What is Hypervisor, Type 1 Hypervisor, Type 2 Hypervisor, Types of Hardware Virtualization : Full Virtualization, Emulation Virtualization Para virtualization., Installing Hyper-V In Windows Server 2012,
4	**Types Of Virtualization :** Server Virtualization, Client & Desktop Virtualization Services and Applications Virtualization, Network Virtualization, Storage Virtualization
5	**Tools For Virtualization:** Virtualization with Xen, Virtualization with Bochs and QEMU, Virtualization with Lguest, Virtualization with KVM

6	**Virtualization For Businesses:** Need for Virtualization in a Business, Implementation of Virtualization in a Business, Cost-Benefit Analysis of Virtualization,
7	**Openstack And Its Role In Virtualization :** Understanding Openstack, nine Core key components of openstack. CASE STUDIES OF VIRTULIZATION : Xen Hypervisor, OpenVZ Hypervisor, MS Virtual Server 2005 R2, Oracle VM

Elective Group :(01) Cloud Computing

Course Number	Course Name	L-T-P- Credit	Year of introduction
405-01-B	Cloud Computing Concepts	2L+1T+0P=4C	2018

Course Objective:
Students will learn an an overview of the field of Cloud Computing Students will gain hands-on experience solving relevant problems through projects that will utilize existing public cloud tools. It is our objective that students will develop the skills needed to use cloud computing technique.

Course Outcome:
student will be able to:

- Study core concept of cloud computing.
- Study cloud application with various service providers services
- Analyze various cloud computing models.

References:

- Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
- Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011

Suggested MOOC :
Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Unit	Contents
1	**Cloud Computing Fundamentals:** Definition of Cloud Computing , private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public Vs private clouds
2	**Virtualization And Cloud Computing:** Role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications, Visualizing Virtualization, Managing Virtualization, Taking Virtualization into the Cloud
3	**Service Oriented Architecture And The Cloud :** Defining Service Oriented Architecture, Understanding the Coupling, Implementation of Service Oriented Architecture (SOA), Understanding Services in the Cloud, Serving the Business with SOA and Cloud Computing
4	**Cloud Applications :** Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages
5	**Management Of Cloud Services:** Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics: Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization, based on application requirements,

	economic constraints and business needs (e.g Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat)
6	**Application Development:** Service creation environments to develop cloud based applications. Development environments for service development; Amazon, Azure, Google App.
7	**Cloud It Model:** Analysis of Case Studies when deciding to adopt cloud computing architecture. How to decide if the cloud is right for your requirements. Cloud based service, applications and development platform deployment so as to improve the total cost of ownership (TCO)

Elective Group :(01) Cloud Computing

Course Number	Course Name	L-T-P-Credit	Year of Introduction
504-01-C	Cloud Solutions	2L+1T+0P=3C	2018

Course Objective:
Students will learn different cloud solutions available.

Course Outcome:
student will be able

- Design their cloud solution for organization.
- Implement the cloud solutions. And
- Analyze various cloud computing models.

Reference Books:

- "AWS System Administration: Best Practices for Sysadmins in the Amazon Cloud" by Mike Ryan , Federico Lucifredi. ,
- "Expert AWS Development: Efficiently develop, deploy, and manage your enterprise apps on the Amazon Web Services platform" Kindle Edition, by Atul Mistry.
- "VMware vSphere 6.5" Cookbook, 3rd Edition Kindle Edition

Suggested MOOC :
Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Unit	Contents
1	**Coriolis Technologies :** About Coriolis Technologies, storage, virtualization, security,The Colama suite of products, benefits of colama suite, Virtualization of Computer Laboratories, Colama Powered Virtual Computer Laboratory
2	**vmWare :** what is VmWare, Virtulization with Vmware, VmWare Products,Data Center and Cloud Infrastructure, Networking and Security, SDDC Platform, Storage and Availability, The vmWare Approach to the Cloud, vmWare vSphere 4, Server Consolidation and Containment
3	**Microsoft :** Exploring Platform as a Service, Putting Platform as a Service Pedestal
4	**Microsoft :** Integrated Lifecycle Platform, Anchored Lifecycle Platform as a Service Enabling Technologies as a Platform
5	**Google :** Google App Engine, Details of Google app engine.
6	**Amazon :**

	Infrastructure as a Service, Tracing IaaS to ISP, Amazon EC2
7	**Other Solutions :** Infrastructure as a Service, Other IaaS Companies, IaaS-Enabling Technology, Issues related to Trust in Cloud, Infrastructure as a Service in a Business Organization

Elective Group: Cloud Computing

Course Number	Course Name	L-T-P-Credit	Year of introduction
505-01-D	Cloud Computing	2L+1T+0P=3C	2018

Course Objective:
Students will learn how to use Amazon web service portal and its services

Course Outcome:
Student will be able. Design their cloud solution using AWS. Implement the cloud solutions Using AWS. Practice of AWS applications

Reference Books:

- "AWS System Administration: Best Practices for Sysadmins in the Amazon Cloud" by Mike Ryan , Federico Lucifredi. ,
- "Expert AWS Development: Efficiently develop, deploy, and manage your enterprise apps on the Amazon Web Services platform" Kindle Edition, by Atul Mistry.

Suggested MOOC :
Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

1	**Getting Started with Amazon Cloud :** Introduction to AWS, AWS history, AWS Infrastructure, AWS ecosystem, Setting up AWS accounts Evaluating Service Level Agreements (SLA) Various AWS Services AWS Management Console The AWS CLI
2	**Identity Access Management (IAM) :** Introduction to IAM, IAM users and their access, IAM roles and their permission Active Directory Federation Web Identity, Federation IAM Best Practices. Assignment: Configuring IAM users, groups and policies, AWS CLI/SDK access to manage services using Credentials and Roles lab. Programming, management console and storage on AWS Basic Understanding APIs - AWS programming interfaces, Web services, AWS URL naming, Matching interfaces and services, Elastic block store - Simple storage service, Glacier - Content delivery platforms
3	**Elastic Load Balancing & Auto Scaling :** Components and types of load balancing Auto scaling and its benefits Life cycle of auto scaling Components and policies of auto scaling Assignment - Configure Load Balancer, Auto scaling as per utilization in different situations
4	**Amazon EC2 :** EC2 Overview Amazon Machine Images(AMI) AMI creation Security groups Key pairs Assigning elastic IP address Elastic IP v/s Public IP Bootstrap Scripts Overview of Amazon EBS , Various login ways from different OS, putty and putty keygen use, Assigning EIP, AMI assignment, Creating and restoring snapshot, snapshot to AMI, EC2 Bootstrapping, Cloudformation & CloudWatch assignments.
5	**Amazon Simple Storage Service(S3) :** Introduction to S3 Creating an S3 bucket S3 Version Control S3 Lifecycle Management & Glacier S3 Uploading & Downloading S3 durability & redundancy Cloud front overview Create a CDN Security & Encryption Storage Gateway Import & Export using Snowball Cross

	region replication Static website using S3 Assignment - Creating S3 bucket, S3 ACL, S3 permissions, hosting static website on S3, Cross region replication assignment, S3 lifecycle assignment
6	**Database Services:** Database overview Amazon Relational Database Service (RDS) AMI databases Amazon Redshift DynamoDB Amazon ElastiCache AWS Database Migration Service(DMS) Amazon Aurora Assignment - Creating RDS instance, DB backups, RDS Read Replica
7	**AWS identity services, security and compliance Users, groups, and roles –** Understanding credentials, Security policies, IAM abilities and limitations, AWS physical security - AWS compliance initiatives, Understanding public/private keys, Other AWS security capabilities.

Elective Group: (02) Data Analytics

Course Number	Course Name	L-T-P- Credits	Year of Introduction
404-02-A	Algorithms For Advanced Analytics	2L+1T+0P = 3C	2018

Prerequisite:
Knowledge in basic analytical algorithms

Course Objective :

1. Learn concepts and techniques and how to find useful knowledge.
2. Understanding of the topics that can create an ideal analytic environment that is better suited to the challenges of today's analytics demands.
3. Harness the power of high performance computing architectures and data mining, text analytics, and machine learning algorithms.

Expected Outcome :

At the end of the course a student should be able:

This course gives a comprehensive coverage of algorithms specially meant for analyzing data at an in-depth level. Decision trees, Support Vector machines and Neural networks are considered to be highly effective in analyzing complex data.

References (Books, Websites etc) :

1. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers, 3rd ed, 2010.
2. Lior Rokach and Oded Maimon, "Data Mining and Knowledge Discovery Handbook", Springer, 2nd edition, 2010.
3. Ronen Feldman and James Sanger, "The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data", Cambridge University Press, 2006.
4. Vojislav Kecman, "Learning and Soft Computing", MIT Press, 2010.
5. Jared Dean, "Big Data, Data Mining, and Machine Learning: Value Creation for Business Leaders and Practitioners", Wiley India Private Limited, 2014.

Suggested MOOC:

Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Syllabus:

Unit	Contents
1	**Predictive Analytics:** Predictive modeling and Analyisis - Regression Analyisis, Multicollinearity , Correlation analysis, Rank correlation coefficient, Multiple correlation, Least square, Curve fitting and goodness of fit.
2	**Classification Algorithms:** Issues regarding classification and prediction, Bayesian Classification, Classification by back propagation, Classification based on concepts from association rule mining, Other Classification Methods, Classification accuracy.

3	**Decision Trees:** Introduction to Decision trees - Classification by decision tree induction – Various types of pruning methods – Comparison of pruning methods – Issues in decision trees – Decision Tree Inducers – Decision Tree extensions.
4	**Text Analytics:** Introduction, Core text mining operations, Preprocessing techniques, Categorization, Clustering, Information extraction, Probabilistic models for information extraction, Text mining applications.
5	**Support Vector Machines:** Learning and Soft Computing: Rationale, Motivations, Needs, Basics: Examples of Applications in Diverse Fields, Basic Tools of Soft Computing: Neural Networks, Fuzzy Logic Systems, and Support Vector Machines,
6	**Computing:** Basic Mathematics of Soft Computing, Learning and Statistical Approaches to Regression and Classification - Support Vector Machines - Risk Minimization Principles and the Concept of Uniform Convergence, The VC Dimension, Structural Risk Minimization, Support Vector Machine Algorithms.
7	**Neural Networks:** Single-Layer Networks: The Perception, The Adaptive Linear Neuron (Adaline) and the Least Mean Square Algorithm - Multilayer Perceptions: The Error Back propagation Algorithm – The Generalized Delta Rule, Heuristics or Practical Aspects of the Error Back propagation Algorithm.

Elective Group:(02) Data Analytics

Course Number	Course Name	L-T-P- Credits	Year of Introduction
405-02-B	Machine Learning Techniques	2L+1T+0P = 3C	2018

Prerequisite:
Knowledge in basic analytical algorithms.

Course Objective :

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques.
- To study the various probability based learning techniques.
- To understand graphical models of machine learning algorithms.

Expected Outcome : Upon completion of this course, the students will be able to:

- Distinguish between, supervised, unsupervised and semi-supervised learning
- Apply the appropriate machine learning strategy for any given problem
- Suggest supervised, unsupervised or semi-supervised learning algorithms for any given
- Problem Design systems that uses the appropriate graph models of machine learning
- Modify existing machine learning algorithms to improve classification efficiency

References (Books, Websites etc) :

- Ethem Alpaydin, ―Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)‖, Third Edition, MIT Press.
- Jason Bell, ―Machine learning – Hands on for Developers and Technical Professionals‖, First Edition, Wiley.
- Peter Flach, ―Machine Learning: The Art and Science of Algorithms that Make Sense of Data‖, First Edition, Cambridge University Press.
- Stephen Marsland, ―Machine Learning – An Algorithmic Perspective‖, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series,.
- Tom M Mitchell, ―Machine Learning‖, First Edition, McGraw Hill Education.

Suggested MOOC:
Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Syllabus:

Unit	Contents
1	**Introduction:** Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants – Perceptron – Linear Separability – Linear Regression.
2	**Linear Models :** Multi-layer Perception – Going Forwards – Going Backwards: Back Propagation Error – Multilayer Perception in Practice – Examples of using the MLP – Overview – Deriving

	Back Propagation – Radial Basis Functions and Spines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines.
3	**Tree And Probabilistic Models:** Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Probability and Learning – Data into Probabilities.
4	**Basic Statistics:** Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms – Vector Quantization – Self Organizing Feature Map
5	**Dimensionality Reduction And Evolutionary Models :** Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares
6	**Optimization:** Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting Lost Example – Markov Decision Process.
7	**Graphical Models** : Markov Chain Monte Carlo Methods, Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods

Elective Group:(02) Data Analytics

Course Number	Course Name	L-T-P- Credits	Year of Introduction
504-02-C	**Weka**	2L+1T+0P = 3C	2018

Prerequisite:
Knowledge in basic analytical algorithms

Course Objective :

- To introduce the basic concepts and various techniques of machine learning
- To give idea about supervised and unsupervised learning techniques.
- The purpose of machine learning is to discover patterns in your data and then make predictions based on those often, complex patterns to answer business questions, and help solve problems. Machine learning helps analyze your data and identify patterns

Expected Outcome :

- After Completion of this course students will be able to understand the difference between supervised, unsupervised and semi supervised learning.
- To apply appropriate machine learning algorithms using weka tool to given problem.
- To as per data result requirement to modify existing algorithms for better result.

References (Books, Websites etc) :

- Data Mining Concepts and Techniques By Jiawei Han & Micheline Kamber
- Data Mining: Practical Machine Learning Tools and Techniques (The Morgan Kaufmann Series in Data Management Systems) 3rd Edition, Kindle Edition
- An Introduction to Machine Learning Hardcover by Miroslav Kubat (Author)
- An Introduction to weka: Machine Learning in Java by Giorgio Sironi

Suggested MOOC:
Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Syllabus:

Unit	Contents
1	**Machine Learning and Weka basics:** Overview about machine learning concepts, Data Cleaning by weka, Major issues of machine learning, core algorithm type, Overview about weka basics , File type, Experimenter and explorer. Bayesian network, neural network, Trees, Rule concepts
2	**Creating Dataset for Weka:** Creating ARFF, CSV file format, Data Types, Class enumeration, filtering algorithms based on feature type in weka, Interpreting and refining results
3	**Linear Model:** Classification concepts, how classification works in data sample, Classifying data in weka using classification rules.Concept of Regression, Choose algorithm for regression. Multilayer perception –forward and backward propagation. Support vector machine classification and regression for predictive analysis
4	**Decision Tree and model:**

	Decision tree concepts, Attribute selection measures, visual mining for decision tree, rule based classification, Ensemble methods- Bagging and boosting, Random forest method, cross validation concept.
5	**Dimensionality Reduction And Evolutionary Models:** Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis ,parametric and nonparametric method
6	**Cluster Analysis using different methods:** Concept of cluster analysis, methods of clustering with constraints, dimensional reduction methods, biclustering, probabilistic model based clustering.
7	**Knowledge Data Flow:** Create knowledge data flow on data sample, Analysis data flow, Interpret results with weka , Generate the rules on the basis of result.

Elective Group:(02) Data Analytics

Course Number	Course Name	L-T-P- Credits	Year of Introduction
505-02-D	Statistical Computing	2L+1T+0P = 3C	2018

Course Objective :

The main objective of this course is to acquaint students with some basic concepts in Statistics. They will be introduced to some elementary statistical methods of analysis of data.

Expected Outcome :

- To compute various measures of central tendency, dispersion, skewness and kurtosis.
- To analyze data pertaining to attributes and to interpret the results.
- To compute the correlation coefficient for bivariate data and interpret it.
- To fit linear, quadratic and exponential curves to the bivariate data to investigate relation between two variables.
- To fit linear regression model to the bivariate data
- They are able to construct predicate model.

References (Books, Websites etc) :

Fundamentals of Statistics , S.C.Gupta, Seventh Edition ,Himalaya Publishing House

Suggested MOOC:

Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Syllabus:

Unit	Contents
1	**Random Number:** Concept of random number generator, congruential method of generating uniformvariate, Generation of Binomial, Poisson, Geometric, Negative Binomial& Multinomial variate. Proofs of related results. Generation of continuous random variables covering Exponential, Normal, Gamma, Chi-square, Bivariate exponential, Bivariate Normal distributions, and mixture of distributions.
2	**R – Language:** Introduction to R, elementary programming, application to data analysis, Descriptive statistics, Fitting of Distributions, Cross Tables, Correlations and Regression, Hypothesis Testing, ANOVA.
3	**Simulation Technique:** Concept of Simulation, advantage, Disadvantage, Phases of Simulation ,Application of Simulation Models, Types of Simulation Models, Random Numbers, Monte-Carlo(Computer) Simulation Procedure for Monto-Carlo Simulation.
4	**Queuing and Forecasting:** Concept of Queuing, Queuing models, Forecasting techniques, forecasting methods: Subjective For casting, Structural and Economic Model, Determination Models, Moving Average, Regression Average, Least Square Method of curve fitting.
5	**Statistical Decision Theory:** Concept, state of Nature or Events, Payoff table, Opportunity Loss, Decision Making Environment, Decision Making Under Certainty, Decision Making Under Uncertainty,

	Maximax, Minimin, Minimax, Laplace Criterion, Hurwicz ,EMV,EOL, EVIP, Bayes Decision rule
6	**Statistical Applications:** Regression analysis, Paired test, T-test,F-test, Chi test, Decisions Tree, Probability distributions
7	**Programming in C++:** Concept of OOP, Data types, Variables, Statements, Expressions, Control structures, Looping, Functions, Pointers. Programming for problems based on all Unit .

Elective Group: (03) Linux Environment

Course Number	Course Name	L-T-P- Credit	Year of introduction
404-03-A	Linux Desktop Environment and Shell Programming	2L+1T+0P=3C	2018

Course Objective:
The purpose of this course is to have understanding of Linux operating system and environment

Expected Outcome :

At the end of the course a student should be able:

To use Linux operating system for configuring the environment.

Textbook:

- Red Hat Linux Bible: Fedora and Enterprise Edition - by Christopher Negus
- UNIX Concepts and Applications - by Sumitabha Das

Suggested MOOC :
Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Unit	Contents
1	**Using Shell Interface:** ▪ Introduction to Linux ▪ Internal and external commands ▪ General purpose utilities ▪ Navigating the file system ▪ Handling ordinary files **Using GUI Environments:** ▪ GNOME desktop environment ▪ KDE desktop environment
2	**Using open source office suite** ▪ Word processor application ▪ Spreadsheet application ▪ Presentation application ▪ Desktop database application **Using the Internet** ▪ World wide web ▪ FTP ▪ Telnet
3	**Using Multimedia** ▪ Graphics ▪ Audio ▪ Video
4	**Introduction to shell** ▪ Introduction to 'bash' shell

	▪ Redirection ▪ Pipes ▪ Tees ▪ Command substitution ▪ Introduction to other shells: Korn shell, C Shell etc. **Shell environment** ▪ Shell variables ▪ Handling the command line arguments ▪ Login scripts ▪ Terminal characteristics ▪ Aliases
5	**Text editors** ▪ 'vi' editor ▪ 'emacs' editor
6	**Shell commands** ▪ General purpose utilities ▪ File management ▪ Process management ▪ Communication management **Regular expressions** ▪ Pattern matching ▪ Wild cards ▪ Regular expressions ▪ Utilities: grep, egrep, fgrep etc. **Filters** ▪ Introduction to filters ▪ Utilities: pr, head, tail, cut, paste, sort, uniq, nl, tr etc.
7	**Shell scripting** ▪ Introduction to shell scripting ▪ Programming constructs ▪ Mathematical operators ▪ Logical operators ▪ String manipulation ▪ Interactive scripts ▪ Handling command line arguments

Elective Group :(03) Linux Environment

Course Number	Course Name	L-T-P- Credit	Year of introduction
405-03-B	Linux System Administration	2L+1T+0P=3C	2018

Course Objective:
The purpose of this course is to have understanding of Linux operating system and system administration

Expected Outcome :
At the end of the course a student should be able:

1.To use Linux administration for user management and security.

Reference books :
UNIX Concepts and Applications - by Sumitabha Das

Suggested MOOC :
Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Unit No	Contents
1	**Linux installation:** ▪ Introduction to Linux distributions ▪ Normal installation
2	**Linux installation:** ▪ Dual boot installation ▪ Virtual installation ▪ Troubleshooting an installation
3.	**Understanding system administration:** ▪ Introduction to the routine activities in system administration ▪ Shell commands for system administration ▪ Administrative tools ▪ Managing file systems and disk space
4.	**Setting up and supporting users:** ▪ Managing user accounts ▪ Providing support to the users
5.	**Automating system tasks:** ▪ Aut System initialization ▪ System startup and shutdown ▪ Scheduling system tasks omating system tasks:
6.	**Backing up and restoring files:** ▪ Backup and restore strategy ▪ Backup and restore tools
7.	**Computer security issues:** ▪ Password protection ▪ Firewalls

Elective Group :(03) Linux Environment

Course Number	Course Name	L-T-P- Credit	Year of introduction
504-03-C	Linux Network Administration	2L+1T+0P=3C	2018

Course Objective:
The purpose of this course is to have understanding of Linux operating system and Network administration.

Expected Outcome :
At the end of the course a student should be able
1. To use Linux administration for creation of server and management.

Reference books :
1. Linux Administration : A Beginner's Guide, Shah, TMH
2.LINUX: The Complete Reference, Petersen, TMH
3.LINUX Network Administrator's Guide, Kirch,SPD/O'REILLY

Suggested MOOC :
Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Unit No	Contents
1	**Setup And Manage a Local Area Network:** Basic Networking, Introduction to networking, OSI Model,IP addressing (IPV4, IPV6) & LAN establishment with Linux , Configuring internet in Linux through broadband, dial-up, data card & through mobile (gprs).
2	**Setup And Manage Proxy Server :** Basics of proxy services, Configuring proxy services, Creating ACL's for controlling access to internet, SQUID: Proxy server setup, Blocking Websites, content filtering, Bandwidth Management
3.	**Setup And Manage FILE Server:** NFS: network file sharing & resource sharing across Linux environment. YUM server: Setting up local YUM, FTP YUM, HTTP YUM, EPEL, REMI & RPMForge like YUM configuration, DHCP:Dynamic Host Configuration Protocol setting up, Allocating IP, Subnet mask, default gateway and hostname, communication with DNS and other protocols.
4.	**Setup And Manage FTP Server**: Basics of File Transfer Protocol., Configuring vsftpd for anonymous ftp service. FTP:Setting up file transfer protocol,user management for FTP,hands on with ftp clients, FTP security (file,user, host,network based). Remote Services:SSH, Telnet & VNC (remote access services) with security(file,user, host,network based). Network Installation: NFS, HTTP, FTP, Kickstart, TFTP SAMBA: Linux to window data sharing along with security (file,user, host,network based) & managing SAMA graphically. Ticket Server: (OS-Ticket & ORTS) installing, configuring and managing.
5.	**Setup And Manage Web Server :** Basics of Web Services, Introduction to Apache, Configuring Apache for main site, Configuring Apache for multiple sites using IP-based, port based and name-based, Web Server: Apache installation, configuring dedicated server, shared server, user based authentication, load balancing and apache tuning. NIS, LDAP: (user's liberty to sit into remote machine) MAIL Server: knowing MUA,MTA& MDA, setting up and configuring POSTFIX,PO3s v/sIMAPs, Squirrel mail,

	accessing via Outlook, Thunderbird and evolution. Multi/virtual domain management, email security. Postfix Administration.
6.	**Setup And Manage boot Server :** What is booting and boot process of Linux?, Init Process or Run levels
7.	**Setup And Manage DNS Server :** Basics of Internet, Basics of DNS and BIND 9, Configuring DNS primary server, DNS:master DNS, slave DNS with forward & reverse zone, one DNS resolving multiple domain, dynamic DNS etc

Elective Group: (03) Linux Environment

Course Number	Course Name	L-T-P- Credit	Year of introduction
505-03-D	Linux Internals and Network	2L+1T+0P=3C	2018

Course Objective:

- To get acquainted with Linux kernel and system calls
- To get knowledge about Process and managing process life.
- Build deeper view IPC and its applications.
- To make able to use Signals and threads and using thread library.
- Make them understanding network communications and using API to write socket programs.
- Make them understand about scheduling and memory management.

Expected Outcome :

At the end of the course a student should be able:

1.To use programming for kernel management and networking.

Suggested MOOC :

Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Unit No	Contents
1	**Introduction** Architecture of Linux, User and Kernel Space, Introduction to System Calls, System Calls in Detail, trace – Tracing system calls.
2	**Process management** Introduction to Process and process attributes, process vs. Program, Process States, Creating Process, Process termination, process commands Special case of processes.
3.	**Inter Process Communication** Introduction to IPC, Pipe, FIFO, Shared Memory, Advantages and Disadvantages of various IPC mechanisms, Application of IPC
4.	**Working with Signals and Threads** Introduction to Signals, Default disposition of Signals, Handling the Signals, Signal Related Functions Introduction to Threads, Creating Thread, Data handling with Thread , Types of Threads – Thread Attributes, Thread Cancellation , Threads vs. Process
5.	**Thread and Process Synchronization** Threads and resources management, Race condition in multi-threaded applications,writing thread safe code,Mutex, POSIX Semaphores, Usage of Binary semaphores and Mutex Race condition in multi-process applications, Limitations of shared memory, Semaphore Implementation.
6.	**Linux Networking** OSI and TCP/IP models, Addressing in TCP/IP, IPv4 and IPv6 differences, TCP three-way handshake, Network packet analysis in Linux, Networking commands in Linux, Using socket API to implement client server communication, Working with TCP and UDP sockets, Synchronous I/O

7.	**Process and Memory Management** Need of Process scheduler, scheduling algorithms, Memory Management Unit (MMU) introduction, Concept of Virtual memory, using Paging & Page fault, other MMU concepts: Relocation, Protection, Sharing, Logical and physical organization.

Elective Group:(04) Open Source Technologies

Course Number	Course Name	L-T-P- Credits	Year of Introduction
404-04-A	Python	2L+1T+0P=3C	2018

Course Objective :

Main objective of this paper is to learn functioning of various commands of Python language. Also study the practical applications in the field of Software development.

Expected Outcome :

At the end of this course, student should be able to understand

- Basic familiarity with Python
- Development tools used for the Python programming
- Implementation of OO concepts.

References (Books, Websites etc) :

A Python Book: Beginning Python, Advanced Python, and Python Exercises : Dave Kuhlman

Suggested MOOC :

Swayam

Course Plan

Unit	Contents
1	**Introduction to Python:** Etc, Lexical matters : Lines, Comments, Names and tokens, Blocks and indentation, Doc strings, Program structure, Operators, Code evaluation
2	**Built-in Data types :** Numeric types, Tuples and lists, Strings, 1 The new string. format method, Unicode strings, Dictionaries, Files, Other built-in Types, The None value/type, Boolean values, Sets and frozen sets
3	**Statements:** Assignment statement, import statement, print statement, if: elif: else: statement, for: statement., while: statement., continue and break statements, try: except: statement., raise statement.., with: statement, del, case statement
4	**Functions, Modules, Packages, and DebuggingFunctions :** The def statement Returning values, Parameters, Arguments, Local variables, Other things to know about functions, Global variables and the global statement, Doc strings for functions, Decorators for functions, lambda Iterators and generators, Modules, Doc strings for modules, Packages
5	**Classes:** A simple class, Defining methods, The constructor, Member variables, Calling methods, Adding inheritance, Class variables, Class methods and static methods, Properties, Interfaces, New style Classes, Doc strings for classes, Private members
6	**Extending and embedding Python:** Introduction and concepts, Extension modules, SWIG, Pyrex, SWIG vs. Pyrex, Cython, Extension types, Extension classes
7	**GUI Applications:** Introduction PyGtk, EasyGUI, Guidance on Packages and Modules, End Matter,

Elective Group:(04) Open Source Technologies

Course Number	Course Name	L-T-P- Credits	Year of Introduction
405-04-B	Perl Scripting	2L+1T+0P=3C	2018

Course Objective :

To introduce the basic concepts of Perl Programming and write, modify, and run simple Perl scripts and study working with files and using perl as an object oriented language

Expected Outcome :

At the end of this course, student should be able to understand

- The syntax and semantics of the Perl language
- how to develop and implement various types of programs in the Perl language
- various forms of data representation and structures supported by the Perl language
- the appropriate applications of the Perl language

References (Books, Websites etc) :

- Mastering Perl : Brian, O'Reilly
- www.tutorialspoint.com/perl/index.htm

Suggested MOOC :

Swayam

Course Plan

Unit	Contents
1	**Perl ─ Introduction :** What is Perl? Perl features , Perl ─ Syntax Overview, Perl ─ Data Types , Numeric Literals String Literals , Perl ─ Variables , Creating Variables, Perl─ Scalars, Scalar Operations Perl ─ Arrays Perl ─ Hashes
2	**Control Flow and Looping Statement:** if statement ,if else statement, if elsif else statement, unless statement, switch statement, The ? : Operator **Perl ─ Loops :** while loop , until loop for loop, For each loop do while loop nested loops, next statement, last statement, continue statement, redo statement, go to statement, Infinite Loop
3	**Perl ─ Operators** : What is an Operator? Perl Arithmetic Operators, Perl Equality Operators, Perl Assignment Operators, Perl Bitwise Operators, Perl Logical Operators, Quote-like Operators Perl ─ Date and Time, GMT Time Format, Date & Time, Epoch time, POSIX Function strftime()
4	**Perl ─ Subroutines :** Define and Call a Subroutine, Passing Arguments to a Subroutine, Passing Lists to Subroutines, Passing Hashes to Subroutines, Returning Value from a Subroutine, Private Variables in a Subroutine, Temporary Values via local(), State Variables via state() Subroutine, Call Context **Perl ─ References :** Create References Dereferencing Circular References, References to Functions

	Perl ─ Formats Define a Format Using the Format, Define a Report Header Number of Lines on a Page, Define a Report Footer
5	**Perl ─ File I/O :** Opening and Closing Files, Open Function, Sysopen Function, Close Function, The Operator getc Function, read Function, print Function, Copying Files Renaming a file, Deleting an Existing File Positioning inside a File **Perl ─ Directories :**Display all the Files, Create new Directory, Remove a directory, Change a Directory
6	**Perl ─ Regular Expressions** : Pattern Matching, Match Operator Match Operator Modifiers Matching Only Once Regular Expression Variables. The Substitution Operator Substitution Operator Modifiers. The Translation Operator Translation Operator Modifiers More Complex Regular Expressions Matching Boundaries Selecting Alternatives Grouping Matching. The \G Assertion Regular-expression Examples
7	**Introduction to Object Oriented Programming in Perl :** Object Basics, Defining a Class Creating and Using Objects, Defining Methods, Inheritance Method Overriding , Default Auto loading, Destructors and Garbage Collection, Object Oriented Perl Example

Elective Group:(04) Open Source Technologies

Course Number	Course Name	L-T-P- Credits	Year of Introduction
504-04-C	PHP	2L+1T+0P=3C	2018

Course Objective:
To make students able to design and develop the web based applications and systems.

Expected Outcome:
After completion of this course students will able to develop static and dynamic web applications through Word press, PHP and Joomala.

References (Books, Websites etc) :

- PHP and MySQL Web Development by Welling Thomson Fourth Edition, Pearson publication
- Teach Yourself PHP, MySQL and Apache by Julie C. Meloni Pearson publication

Suggested MOOC :
SWAYAM

Unit	Contents
1	**Introduction To PHP:** Installing and configuring PHP, **Building blocks of PHP:** PHP tags, variables, data types, operators, expressions, constants, **Control Structures:** conditional statements, loops, switch statement
2	**Working With Functions And Arrays:** **Working with functions:** What is a function? Function declaration and definition, Calling function, user-defined functions, variable scope, **Working with arrays:** Creating, sorting and reordering arrays, PHP classes. **Working with strings, dates and time:** Formatting, investigating and manipulating strings with PHP, using date and time functions in PHP, **Working with forms:** Creating a simple input form
3	**Working With Files:** Saving data, storing and retrieving Bob's order, processing files, opening file, writing to a file, closing a file, reading from a file, uses other useful file functions.
4	**Working With Cookies And Sessions:** **Working with cookies:** Introducing cookies, setting and deleting cookies with PHP **Working with session:** starting a session, working with session variables, passing session IDs in the query string, destroying sessions and unsetting variables, using sessions
5	**MYSQL:** Creating web database: Using MySQL monitor, logging into MySQL, creating databases and users, setting users and privileges, column data types **Working with MySQL database:** Inserting data into database, retrieving data from the database, retrieving data with specific criteria, retrieving data from multiple tables, retrieving data in particular order, grouping and aggregate data, using sub queries, updating records, deleting records from databases, dropping table and database

6	**Accessing My-SQL Database From Web With PHP** : Web database architecture **Querying database from the web:** checking and filtering input data, setting up connection, Choosing database to use, querying database, retrieving the query result, disconnecting from the database.
7	**WORDPRESS AND JOOMLA:** **WORDPRESS -** Word press Theme, Integration Adding Pages and posts Manage Widgets, Plug - In Project in Word press **JOOMLA –** Joomla Installation, Template Integration, Adding content (articles management) Adding content (articles management) Project in Joomla

Elective Group:(04) Open Source Technologies

Course Number	Course Name	L-T-P- Credits	Year of Introduction
505-04-D	Ruby	2L-1T-0P=3C	2018

Course Objective:

Main objective of this paper is to learn, object-oriented programming with Ruby, Rails fundamentals and how to create basic online applications. How to work with HTML controls, use models in Rails applications, and work with sessions. Details on working with databases and creating, editing and deleting database records, Methods for handling cookies and filters and for caching pages.

Expected Outcome:

At the end of this course, student should be able to understand

- Programming experience in an object-oriented language.
- Basic familiarity with HTML important for Rails project.

References (Books, Websites etc.):

- Programming Ruby: The Pragmatic Programmers' Guide, Second Edition
- Agile Web Development with Rails, Third Edition
- www.webtechlearning.com

Suggested MOOC :

SWAYAM

Unit	Contents
1.	**Introduction to Ruby :** Creating a first web application, getting started with Ruby, Checking the ruby documentation, working with numbers in ruby, working with strings in ruby.
2.	**Variables and Constants in Ruby :** Storing data in variables, creating constants, interpolating variables in Double-Quoted strings, reading text on the command line, creating symbols in ruby, working with operators, Handling operator precedence, working with Arrays, using Two Array Indices, working with Hashes, working with ranges.
3.	**Conditional Loops, Methods and Blocks:** If Statement, Using the case statement, using loops, creating and calling a method, making use of Scope, working with Blocks
4.	**Classes:** Encapsulation, creating a class, creating an object, basing one class to another,
5.	**Objects:** Understanding Ruby's object Access, overriding method, creating class variables, creating class methods, creating Modules, creating Mixins
6.	**Rails:** Putting Ruby to Rails, introducing Model View Controller Architecture, giving the view something to do, mixing ruby code and HTML inside the view, passing data from an action to a view, escaping sensitive text, adding a second action.
7.	**Building Simple Rails Applications :** Accessing data the user provides, using rails shortcuts for HTML controls, working with models, tying controls to models, initializing data in controls, storing data in sessions

Elective Group: (05) Mobile Computing Technologies

Course Number	Course Name	L-T-P- Credits	Year of Introduction
404-05-A	HTML 5	2L+1T+0P= 4C	2018-19
Objectives:			
Expected Outcome :			
References (Books, Websites etc) :			
Suggested MOOC : Please refer these websites for MOOC's: NPTEL / Swayam www.edx.com www.coursera.com			
Syllabus:			
Introduction to HTML	▪ History and Evolution of HTML Types ▪ Introduction to HTML5 ▪ Differences between types of HTML(HTML,XHTML,HTML5)		
Features of HTML5	▪ Detection of HTML5 Support ▪ Modernizr: An HTML5 Detection Library ▪ Canvas ▪ Canvas Text ▪ Video ▪ Video Formats ▪ Local Storage ▪ Web Workers ▪ Offline Web Applications ▪ Geolocation ▪ Input Types ▪ Placeholder Text ▪ Form Autofocus ▪ Microdata		
Elements of HTML5	▪ The Doctype ▪ The Root Element ▪ The <head> Element ▪ New Semantic Elements in HTML5 ▪ Headers ▪ Articles ▪ Dates and Times ▪ Navigation ▪ Footers		
HTML Media	▪ Adding Media to Web Page ▪ Video Tag and its attributes ▪ Audio Tag and its attributes		

HTML Graphics	▪ Introduction to Canvas ▪ Simple Shapes ▪ Canvas Coordinates ▪ Paths ▪ Text ▪ Gradients ▪ Images
Geolocation	▪ Geolocation API ▪ Handling Errors ▪ geo.js Library
Local Storage for Web Applications	▪ Evolution of Local Storage ▪ Introduction to HTML5 Storage
Offline Web Application	▪ Introduction to Offline Web application ▪ The Cache Manifest
Web Forms	▪ Introduction to Web Forms and its elements ▪ Placeholder Text ▪ Autofocus Field ▪ e-Mail Addresses ▪ Web Addresses ▪ Numbers as Spinboxes ▪ Numbers as Sliders ▪ Date Pickers ▪ Search Boxes ▪ Color Pickers
CSS3	▪ Introduction ▪ Basic designs (Color, Background, Padding, Margin, Height/Width) ▪ CSS Box-Model ▪ CSS Positions ▪ CSS Selectors ▪ Advanced CSS • Media queries • Transitions • Animations • Flex-box • Gradients
Miscellaneous	Introduction to CSS Preprocessors ,SASS & LESS, CSS framework, Bootstrap, Cross browser compatible CSS

Elective Group: (05) Mobile Computing Technologies

Course Number	Course Name	L-T-P- Credits	Year of Introduction
405-05-B	**JavaScript Programming**	2L+1T+0P= 4C	2018-19
Objectives:			
Expected Outcome :			
References (Books, Websites etc) :			
Suggested MOOC : Please refer these websites for MOOC's: NPTEL / Swayam www.edx.com www.coursera.com			
Syllabus:			
Introduction to Javascript	▪ JavaScript Overview ▪ JavaScript Programming Basics		
Variables and Operators	▪ Variables and Data Types ▪ Operators ▪ Array		
Control Statements	▪ Controlling the Flow: JavaScript Control Statements		
Functions	▪ Functions		
The Window Object	▪ The Window Object ▪ Dialog Boxes ▪ Window functions		
The Document Object	▪ The Document Object ▪ Writing to Documents ▪ Document related functions		
Forms and Forms-based Data	▪ The Form Object ▪ Working With Form Elements and Their Properties ▪ Event related with form		
Form Validation	▪ Form Validation: A Process ▪ Testing Data ▪ Preparing Data for Validation and Reporting Results ▪ Validating Non-text Form Objects		
Frames	▪ HTML Frames Review ▪ Scripting for Frames		
The String and RegExp Objects	▪ The String Object ▪ Properties and methods of String Object ▪ Using String Object Methods to Correct Data Entry Errors ▪ The RegExp Object		
Dates and Math	▪ The Date Object ▪ Properties and methods of Date Object ▪ The Math Object		

	▪ Properties and methods of Math Object
Animation	▪ Frequently used Animation function ▪ Manual and Automated animation.
AJAX	▪ Introduction to AJAX ▪ Interacting with the Web Server using XMLHttpRequest Object ▪ Need of Web server ▪ Need of JSON ▪ RESTful API with JSON
JS Frameworks & Libraries	▪ jQuery • Intro • Effects and animations • DOM/HTML Updates • jQuery and Ajax

Elective Group: (05) Mobile Computing Technologies

Course Number	Course Name	L-T-P- Credits	Year of Introduction
504-05-C	**Android**	2L+1T+0P= 4C	2018-19
Objectives:			
Expected Outcome :			
References (Books, Websites etc) :			
Suggested MOOC : Please refer these websites for MOOC's: NPTEL / Swayam www.edx.com www.coursera.com			
Syllabus:			
Introduction to Android	▪ Evolution of Android ▪ Advantages of Android ▪ SDK Tools for Android		
Overview of Android Platform	▪ Android Development IDE Understand the Working of Android ▪ The Android Application Framework ▪ Screen Layout Design ▪ User Interface Design ▪ Introduction to Graphics and Animation Design ▪ Interactivity ▪ Introduction to Content Providers ▪ Intent and Intent Filters		
Setting up the Android Development Environment	▪ Installing Android Development Environment ▪ Updating the Android SDK ▪ Setting up AVDs and Smartphone Connections		
Introduction to the Android Software Development Platform	▪ Understanding Java SE and Dalvik Machine ▪ The Directory Structure of an Android Project ▪ Android XML ▪ Android Application Resources ▪ Launching an Android Application ▪ Creating first Hello Application		
Overview of Android Framework	▪ Overview of Object Oriented Programming ▪ Overview of XML ▪ The Anatomy of an Android Application ▪ Components of an Android Application ▪ Android Intent Objects ▪ Android Manifest XML		
Screen Layout Design	▪ Android View Hierarchies ▪ Activity Lifecycle ▪ Defining Screen Layouts (Screen size, pixel density)		

User Interface Design	▪ Using Common UI Elements ▪ Using Menus in Android ▪ Adding Dialogs(Date picker, Time picker, Custom Dialog, Alert Dialog)
Introduction to Graphics Resources	▪ Introduction to Drawables ▪ Using Bitmap Images ▪ Using Transitions ▪ Creating 9-Patch Custom Scalable Images ▪ Playing Video in Android Apps
Handling User Interface Events	▪ An Overview of UI Events ▪ Handling onClick Events for all Views ▪ Android Touch-screen Events: onTouch ▪ Touch-screen's Right-Click Equivalent: onLongClick ▪ Keyboard Event Listeners: onKeyUp, onKeyDown ▪ Context Menus: onCreateContextMenu ▪ Controlling the Focus
Understanding Content Providers	▪ An Overview of Android Content Providers ▪ Defining a Content Provider ▪ Working with a Database
Intents and Intent Filters	▪ Understanding the Intents ▪ Android Intent Messaging via Intent Objects ▪ Intent Resolution ▪ Using Intents with Activities ▪ Android Services ▪ Using Intents with Broadcast Receivers
Bars and Views	▪ Action Bar, Toolbar, Navigation Drawer, TextView, EditView, Button, WebView, ImageView ,ListView etc

Elective Group: (05) Mobile Computing Technologies

Course Number	Course Name	L-T-P- Credits	Year of Introduction
505-05-D	Hybrid Application Development	2L+1T+0P= 4C	2018-19

Objectives:

Expected Outcome :

References (Books, Websites etc) :

Suggested MOOC :
Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Syllabus:

Introduction to Mobile App Development (Warm-up)	▪ Introduction ▪ Introduction Types of mobile apps • Web Apps • Native Apps • Hybrid Apps ▪ Intro to Web Apps • Concept • Single Page Apps • Progressive Web Apps • Accelerated Mobile Pages • PWA vs AMP ▪ Intro to Native Apps • Concept • Pros and Cons ▪ Intro to Hybrid Apps • Concept • Pros and Cons • Native vs Hybrid apps ▪ Web Or Native Or Hybrid?
Getting Started with React Native (Getting in action)	▪ Introduction to React Native ▪ Installing dependencies ▪ Installing Node, Python2, JDK ▪ The React Native CLI ▪ Android development environment

	▪ Creating a new application ▪ Preparing the Android device ▪ Running your React Native application
More Details (Diving deep)	▪ Native modules ▪ Components ▪ ActivityIndicator, Button, Image, ListView, Modal, ProgressBarAndroid, RefreshControl, ScrollView, Slider, StatusBar, Switch, Text, TextInput, ToolbarAndroid, WebView ▪ API's ▪ Alert, AppState, CameraRoll, Clipboard, DatePickerAndroid, Keyboard, PermissionsAndroid, Settings, Share, StyleSheet, TimePickerAndroid, ToastAndroid, Vibration

Elective Group: (06) Dot Net Technologies

Course Number	Course Name	L-T-P-Credits	Year of Introduction
404-06-A	C# Programming	2L+1T+0P=4C	2018

Course Objective :

The objectives of the course is to introduce Object Oriented Programming using C#, make student to use C# for implementing object- oriented concepts. Make student to create, compile and run object-oriented C# programs using Visual Studio.

Expected Outcome :

At the end of this course, student should be able to

- Design classes using inheritance and polymorphism.
- Design interfaces, abstract and concrete classes.
- Design Console Based Applications.
- Design applications using event driven programming.
- Write basic LINQ programs.

References (Books, Websites etc) :

- C#: The Complete Reference, McGraw-Hill Osborne Media- Herbert Schildt.
- C # Programming- Wrox publication.
- Programming in C# -A Primer. E. Balaguruswamy.

Suggested MOOC : 1) Coursera (www.coursera.org)
2) mymooc (www.my-mooc.com)
3) Class Central (www.class-central.com)
4) edX *(*www.edx.org*)*
5) Mooc List (www.mooc-list.com

Syllabus:

Unit No.	Contents
1.	**Introduction to C#** The Dot Net Framework, CLR, CLS, CTS, MSIL, Managed Code, Programming Features of C#, Compile and Execution of C# Program, Keywords in C#, Namespaces, Data Types, Declaration and Initialization of Variables, Operators, Type Conversions, If, If…else, switch, The '?:' Operator, The while Loop, The do….while Loop, The for Loop, 'var' Variable.
2.	**Methods and Arrays:** Define Method, Declaring and Calling a Method, Passing Method Parameters (Pass By Value, Pass by Reference), Method Overloading, Define Array, One Dimensional Array (Declaration, Creation and Initialization), Two Dimensional Array, Multidimensional Array, ArrayList Class, Jagged Array, Manipulating Strings, String Methods, Regular Expressions, foreach Loop.

3.	**Class and Objects:** Basic Principles of OOP, Define a Class, Member Access Modifiers, Constructors, Types of Constructors (Default Constructor, Overloaded Constructor, Static Constructor, Private Constructor and Copy Constructor), Destructors, 'this' Reference, Constant Members, Properties, Auto Implemented Properties, Object Initializer, Collection Initializer, Anonymous Types, Extension Methods, Partial Class, Partial Methods, Indexers.
4.	**Inheritance and Polymorphism** Define Inheritance, Types of Inheritance, Method Overriding, Abstract Class, Abstract Methods, Sealed Class and Methods, Define Polymorphism, Static Polymorphism: Function Overloading Operator Overloading, Overloadable and Nonoverloadable Operators, Dynamic Polymorphism, Defining Interface, Extending interface, Interface and Inheritance, Explicit Interface.
5.	**Errors and Exception Handling** Types of Errors, Exceptions, Syntax for Exceptions Handling Code, Multiple catch Statements, finally Statement, Nested try Blocks, Throwing Our Own Exception.
6.	**Delegates, Events and LINQ** Define Delegate, Singlecast Delegate, Multicast Delegate, Events, Declaring Events, Introduction to LINQ, LINQ Query Operators, LINQ-SQL, LINQ-Objects, LINQ-Dataset.
7.	**Professional Techniques for C#** Runtime Type Identification, Reflection, Attributes, Generics, Generic Structure, Unsafe code, Iterators Examples.

Elective Group: (06) Dot Net Technologies

Course Number	Course Name	L-T-P-Credits	Year of Introduction
405-06--B	ASP.Net with C#	3L+1T+0P=4C	2018

Course Objective:

The objective of the course is to introduce web programming using C#, make student to use C# for implementing different controls of ASP.Net. To introduce designing and interacting tools such CSS and JavaScript.

Expected Outcome :

At the end of this course, student should be able to

- Design websites using C# platform
- Work with various controls of ASP.Net
- Work with different states, cookies, themes etc.
- Work with data access controls using different databases.

References (Books, Websites etc) :

- ASP.Net: The Complete Reference, Matthew MacDonald
- Professional ASP.Net (4/4.5) in C #- Wrox publication.

Suggested MOOC: 1) Coursera (www.coursera.org)
2) mymooc (www.my-mooc.com)
3) Class Central (www.class-central.com)
4) edX (www.edx.org)
5) Mooc List (www.mooc-list.com

Syllabus

Unit	Contents
1.	**Introduction of ASP.Net:** Introduction to ASP.Net, ASP.Net Architecture, ASP.Net Page Life Cycle, Page Life Cycle Events, ASP.Net Directives.
2.	**Using ASP.Net Rich, Validation, and Navigation Controls:** FileUpload Control, Calendar Control, AdRotator Control, MultiView Control, and Wizard Control Examples. RegularFieldValidator, RegularExpressionValidator, RangeValidator, CompareValidator, CustomValidator, ValidationSummary, Menu, SiteMapPath, TreeView Control.
3.	**Master Pages, CSS, and JavaSricpt:**

	Working With Master Pages, Nested Master Pages, CSS Overview, Adding Style Sheets into, Web Pages, Editing Styles, Applying Styles to Master Pages, Applying Styles to Web Page, JavaScript Overview, Adding JavaScript files into ASP.Net, Editing JavaScript Files, Applying JavaScripts to Master Pages, Applying JavaScripts to Web Page.
4.	**State Management:** View State, Hidden Field, Session State, Application State, QueryString, HttpContext, Cookies, Caching, Types of Caching
5.	**Personalization and Security:** Configuration Overview, Concept of Theme, Applying Themes, Types of Themes- Page Theme and Global Theme, Skins, Security in ASP.Net, Authentication and Authorization Membership and Roles.
6.	**Data Access in ASP.Net:** Data Source Controls, DataList, DataPager, GridView, DetailsView, FormView, Object Data Sources, ListView, DataPager, Repeater
7.	**Publishing and Testing Website:** IIS, Configuration of IIS, Setting Application Pool, Publish Website, Testing Website.

Elective Group: (06) Dot Net Technologies

Course Number	Course Name	L-T-P-Credits	Year of Introduction
504-06-C	C# Windows Programming	3L+1T+0P=4C	2018

Course Objective:

The objective of the course is to introduce windows programming using C#, make student to use C# for implementing basic and advanced controls of windows applications. To introduce ADO.Net, XML, and Report Wizards with windows applications.

Expected Outcome :

At the end of this course, student should be able to

- Design Windows forms applications
- Work with advanced controls of windows forms application
- Work with ADO.Net classes and XML
- Generate reports

References (Books, Websites etc) :

- C#: The Complete Reference, McGraw-Hill Osborne Media- Herbert Schildt.
- C # Programming- Wrox publication.
- Programming in C# -A Primer. E. Balaguruswamy.

Suggested MOOC:

1) Coursera (www.coursera.org)
2) mymooc (www.my-mooc.com)
3) Class Central (www.class-central.com)
4) edX (www.edx.org)
5) Mooc List (www.mooc-list.com

Syllabus

Unit	Contents
1	**Introduction to Windows Programming:** Overview of Windows Forms, Windows Forms Class Hierarchy, Windows of Visual Studio IDE (Start Page, Menu Bar, Solution Explorer Window, Properties Window, Server Explorer Window, Toolbox, Forms Designer), Dynamic Controls.
2	**Working with Windows Forms Controls:** Properties, Events and Examples of: Button, Label, LinkLabel, TextBox, RichTextBox, ListBox, ListView, ComboBox, RadioButton, CheckBox, CheckedListBox, DateTimePicker, PictureBox, Timer, ProgressBar, TrackBar, HScrollBar, VScrollBar
3	**Dialog Controls:** ColorDialog, FolderBrowserDialog, FontDialog, OpenFIleDialog, SaveFileDialog. Examples.

4	**Menus, MDI and Containers:** ContextMenuStrip, MenuStrip, StatusStrip, ToolStrip, SDI and MDI, Visual Inheritance, GroupBox, Panel, TreeView, SplitContainer, TabControl Examples.
5	**File Handling using C#:** FileStream, BinaryReader, BinaryWriter, StreamReader, StreamWriter, StringReader, StringWriter, DirectoryInfo, FileInfo Examples.
6	**Data Access and Data Binding:** ADO.NET Overview, .NET Data Providers, ADO.Net Objects, Connections, Commands, Data Adapters, Data Readers , Data Sets , Data Tables , Data Views , Data Binding, Reports.
7	**XML with Windows Forms Applications:** XML file, Create XML file, Write data into XML, Read Data from XML file using C#. Update, Filter, and Delete data form XML File.

Elective Group: (06) Dot Net Technologies

Course Number	Course Name	L-T-P-Credits	Year of Introduction
505-06--D	Advanced ASP.Net with MVC	2L+1T+0P=3C	2018

Course Objective:

The objective of the course is to introduce advanced ASP.Net using C#, make student to use C# for implementing advanced features of ASP.Net such JQuery and MVC framework.

Expected Outcome :

At the end of this course, student should be able to

- Work with web parts and AJAX controls.
- Create and consume web services using C#.
- Work with WPF and WCF.
- Work with JQuery and MVC framework.

References (Books, Websites etc) :

- ASP.Net: The Complete Reference, Matthew MacDonald
- Professional ASP.Net (4/4.5) in C #- Wrox publication.
- *Microsoft ASP.NET Step by Step (Microsoft Press)* - G. Andrew Duthrie

Suggested MOOC:

1) Coursera (www.coursera.org)
2) mymooc (www.my-mooc.com)
3) Class Central (www.class-central.com)
4) edX *(*www.edx.org*)*
5) Mooc List (www.mooc-list.com

Syllabus

Unit	Contents
1	**ASP.Net Web Parts:** Introduction, Advantages of Web Parts, WebPartsManager, CatalogPart, PageCatalogPart, EditorPart, WebPartZOne, EditorZone, CatalogZone Controls.
2	**ASP.Net AJAX:** AJAX control toolkit, Building a ASP.NET Page with Ajax ScriptManager Control, UpdatePanel Control, UpdateProgress Control, Timer Control.
3	**ASP.Net Web Services:** Introduction to Web services, Creating Web Services, Setting the Web Service Attributes, Test and Run Web Services, Consuming Web Services.
4	**Windows Presentation Foundation:** Overview of WPF, Creating Simple Program in WPF, WPF-Command line, WPF-Data Binding, WPF-Resources, and WPF-Templates.

5	**Windows Communication Foundation:** Overview of WCF, WCF-architecture, Creating WCF Service, Hosting WCF Service, Types of Hosting WCF Service, Consuming WCF Services. Difference between WCF and Web Services.
6	**JQuery:** Introduction to JQuery, Features, JQuery Selectors, Working of JQuery, JQuery UI Library, Document Ready Event, Events Handling, Effects Methods.
7	**Working with MVC:** Introduction to .Net MVC Framework, MVC Framework Features, MVC Architecture, MVC Components, MVC Application Folders, Configuration files- global.asax, packages.config, web.config, Working with Views, Woking with Controls.

Elective Group: (07) Net Centric Technologies

Course Number	Course Name	L-T-P- Credits	Year of Introduction
404-07-A	**HTML5**	3L+1T+0P=4C	2018

Course Objective:

- Understand the Concepts of HTML 5 & the Applications of HTML 5 to Website Development.
- Design and Develop Websites for various Business Applications.
- Check information inputted into a Database and validate it.

Pre-requisites:

Basic concepts of Languages and HTML tags with functions.

Expected Outcome :

After going through this course a student should be able to understand :

- The Learners will be able to write HTML 5 code for developing website applications.
- The websites developed can be uploaded and implemented for the business areas .

References (Books, Websites etc.):

- Bruce Lawson, Remy Sharp –Introducing HTML 5.0 –Google Books 2010.
- Jeffrey Zeldman and Jeremy Keith "HTML 5 for Webdesigners –Google Books-2010.
- Book by Brian Albers, Frank Salim, and Peter Lubbers "Pro HTML 5.0 Programming
- Christopher Murphy, Divya Manian, and Richard Clark :Beginning HTML5 and CSS3.2012.

Suggested MOOC:

Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Syllabus

Unit	Contents
1	**Introduction to HTML:** MIME Types, Standards for the Internet, Evolution of HTML, Introduction to XHTML, Introduction to Working Group, W3C
2	**Features of HTML5:** Detection of HTML5 Support, Modernizr: An HTML5 Detection Library, Canvas, Canvas , Text, Video, Video Formats, Local Storage, Web Workers, Offline Web Applications, Geolocation, Input Types, Placeholder Text, Form Autofocus, Microdata
3	**Elements of HTML5:** The Doctype, The Root Element, The <head> Element, New Semantic Elements in HTML5, Handling of Unknown Elements by the Browsers, Headers, Articles, Dates and Times, Navigation, Footers
4	**Drawing Surface:** Introduction to Canvas, Simple Shapes, Canvas Coordinates, Paths, Text, Gradients, Images

5	**Video on the web** Video Containers, Video Codecs, Audio Codecs
6	**Geolocation and Local Storage for Web Applications** Geolocation API, Handling Errors, geo.js Library, Evolution of Local Storage, Introduction to HTML5 Storage
7	**Web Forms and Offline Web Application** Introduction to Web Forms, Placeholder Text, Autofocus Field, e-Mail, Addresses, Web Addresses, Numbers as Spinboxes, Numbers as Sliders, Date Pickers, Search Boxes, Color Pickers, Introduction to Offline Web application, The Cache Manifest

Elective Group: (07) Net Centric Technologies

Course Number	Course Name	L-T-P-Credits	Year of Introduction
405-07-B	JavaScript Programming	2L+1T+0P=3C	2018

Course Objective:

- Understand the JavaScript language & the Document Object Model.
- Alter, show, hide and move objects on a web page.
- Check information inputted into a form.
- Javascript allows programming to be performed without server interaction.
- Javascript can respond to events, such as button clicks.
- Javascript can validate data before sending out a request.
- Javascript can adjust an HTML document for special effects

Pre-requisites:

Computer. Pre-requisite / Target Audience: An intermediate knowledge on Java and Advanced Java Technology.

Expected Outcome :

After going through this course a student should be able to understand :

- The Learners will be able to write Java Script code for developing website applications.
- The websites developed can be uploaded and implemented for the business areas in java Script Code.

References (Books, Websites etc.):

1. 1. Danny Goodman Michael Morrison Paul Novitski Tia GustaffRayl, "Javascript Bible" , 7th Edition Wiley India Pvt Ltd.
2. Kogent Learning Solutions Inc, "Web Technologies Black Book: HTML, JavaScript, PHP, Java, JSP, XML and AJAX , " Dreamtech Press.
3. Fritz Schneider,Thomas Powell ,"JavaScript : The Complete Reference", 2nd Edition Tata McGraw - Hill Education

Suggested MOOC:

Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Syllabus

Unit	Contents
1	**Introduction to Javascript:** JavaScript Overview , Comparison between Java, JavaScript & VB Script, JavaScript Programming Basics
2	**Variables and Operators:** Variables and Data Types , Using Variables and Literals , Operators

3	**Introduction to Objects, Methods and Events** Objects, Methods, and Events, Events and Program Flow, Jumping Right In, Running Scripts.
4	**Control Statements** Controlling the Flow: JavaScript Control Statements
5	**Understanding Functions** Built in Functions , Standard Date and Time Functions
6	**The Window Object** The Window Object, Dialog Boxes , Status Bar Messages , Window Manipulations **The Document Object** The Document Object, Writing to Documents, Dynamic Documents **Dates and Math Objects** The Date Object , Using and Manipulating Dates , The Math Object , Doing Math with JavaScript
7	**Frames , Forms and Forms-based Data and Form Validation .** HTML Frames Review, Scripting for Frames, The Form Object , Working With Form , Elements and Their Properties, Form Validation: A Process , Testing Data , Preparing Data for Validation and Reporting Results , Validating Non-text Form Objects **The String and RegExp Objects** The String Object , Using String Object Methods to Correct Data Entry Errors , Creating Dynamic Effects with Substring Methods , The RegExp Object

Elective Group: (07) Net Centric Technologies

Course Number	Course Name	L-T-P- Credits	Year of Introduction
504-07-C	AJAX Programming	2L+1T+0P=3C	2018

Course Objective:

- Understand the Concepts of AJAX Programming & the Applications of AJAX to Website Development.
- Design and Develop Websites for various Business Applications using AJAX Programming.
- Check information and handle database in websites.

Pre-requisites:

Computer. Pre-requisite / Target Audience: An intermediate knowledge on Programming Languages and its structure for developing professional websites.

Expected Outcome :

After going through this course a student should be able to understand :

- Concepts of AJAX Programming and its Applications to website Development.
- Design and develop professional web applications in the business domain.

References (Books, Websites etc.):

- Ajax: The Definitive Guide: Interactive Applications by Anthony T. Holdener -2014.
- Kris Hadlock "Ajax for Web Developers Amazon Books 2012.
- Ajax: The Complete Reference by Thomas A. Powell-Amazon Books 2013
- Website :- https://www.amazon.com/Learn-JavaScript-Ajax-w3Schools-W3Schools/dp/0470611944/

Suggested MOOC:

Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Syllabus

Unit	Contents
1	**Introduction to AJAX:** Introduction to Web Architecture, Traditional Web Communication Processes and Technologies , Introduction to AJAX
2	**Interacting with the Web Server using XMLHttpRequest Object:**

	Introduction to Interaction with Web Server, Create an XMLHttpRequest Object, Interact with the Web Server
3	**Working with PHP and AJAX:** Introduction to PHP , Process Client Requests , Accessing Files Using PHP
4	**Manipulating XML Data:** Basics of XML , Create an XML Document Using DOM , Retrieve Data from XML
5	**Working with XSLT and AJAX:** Basics of XSLT , Transform Responses Using XSLT
6	**Working with JSON:** Introduction to JSON Format, Create Data in JSON Format , Implement JSON on the Server Side
7	**Using Frameworks in AJAX:** Understand AJAX Frameworks , Use Prototype and Script.aculo.us , Use jQuery **Applying Basic AJAX Techniques** Download Images Using AJAX, Auto-Populate Select Boxes **Implementing Security and Accessibility in AJAX Applications** Create Secure AJAX Applications , Create Accessible Rich Internet Applications

Elective Group: (07) Net Centric Technologies

Course Number	Course Name	L-T-P- Credits	Year of Introduction
505-07-D	Web Services	2L+1T+0P=4C	2018

Course Objective:

- Understand the Concepts of Web services the Applications for Website Development.
- Design and Develop Websites for various Business Applications using XML
- Check and Validate information inputted into a Database and validate it.

Pre-requisites:

Computer. Pre-requisite / Target Audience: An intermediate knowledge on XML

Expected Outcome :

After going through this course a student should be able to understand :

- Learners will be able to write code in XML and Understand the basic concepts of web services .
- The programmes written can be implemented for business applications using XML and apply web services in different areas of business .

References (Books, Websites etc.):

- Book by Ethan Cerami Web Services Essentials Amazon Books 2014.
- Book by Eric Newcomer Understanding Web Services: XML, WSDL, SOAP, and UDDI-Amazon Books 2013.
- Erik T. Ray "Learning XML Google Books 2015.
- **Website :- https://www.w3schools.com/xml/default.asp**

Suggested MOOC:

Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Syllabus

Unit	Contents
1	**XML Technology Family:** Introduction to XML, Advantages of XML, EDI, Databases for Web, XML Based Standards, Structuring with Schemas: DTD, XMLSchemas , XML Processing: DOM, SAX , Presentation Technologies: XSL, XFORMS, XHTML Transformation: XSLT, XLINK, XPATH, XQuery
2	**Architecting Web Services:** Business Motivations for Web Services , Technical Motivations for Web Services, Limitations of CORBA and DCOM, Service Oriented Architecture (SOA), Architecting Web Services, Implementation View: Web Services Technology Stack, Logical view: Composition of Web Services, Deployment View: From Application Server to Peer to Peer, Process View: Web Service Lifecycle

3	**Building Blocks of Web Services:** Transport Protocols for Web Services, Messaging with Web Services, Protocols for Web Services, SOAP, WSDL, UDDI
4	**Creation of Web Services:** Web Services using .Net, Web Services using J2EE
5	**Implementing XML in e-Business:** B2B Applications, B2C Applications, Different types of B2B Interactions, Components of e-Business XML Systems, ebXML, RosettaNet, Applied XML in Vertical Industry: Web Services for Mobile Devices
6	**XML Content Management:** Semantic Web, Role of Metadata in Web Content, Resource Description Framework: RDF Schema, Architecture of Semantic Web, Content Management Workflow: XLANG, WSFL
7	**Security in Web Services:** Meeting Security Requirements, XML Encryption, Client / Server Security Issues

Elective Group:(08) Information Systems

Course Number	Course Name	L-T-P-Credits	Year of Introduction
404-08-A	Enterprise Resource Planning	2L+1T+0P=3C	2018

Course Objective:
The objective of the course is to enable students in learning basic concepts of Enterprise Resource Planning so that they can understand how to use the organizational resources effectively.

Pre-requisites:
Knowledge of Business Process , Business Functions and MIS

Expected Outcome :
After going through this course a student should be able to understand :

- Will be able to understand the concepts of ERP.
- Can be able to design and develop ERP systems for Business applications .
- Implementation of ERP for various areas of Interest in Business Organizations .

References (Books, Websites etc.):
1. Alexis Leon, ERP (Demystified Hrs), 5/E, Tata McGraw-Hill, 2006.
2. David L Olson, Managerial Issues of Enterprise Resource Planning Systems, McGraw Hill, International Edition-2006.
3 Sinha; Enterprise Resource Planning , Cengage Learning, New Delhi,

Suggested MOOC:
Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Syllabus

Unit	Contents
1	**Introduction to ERP:** Overview of ERP, MRP, MRPII and Evolution of ERP, Integrated Management Systems, Reasons for the growth of ERP , Business Modeling , Integrated Data Model , ERP Market.
2	**ERP Technologies:** Business Process Re-engineering (BPR), BPR Process, Clean Slate Re-engineering Technology Enabled Re-engineering , Myths regarding BPR , Business Intelligence Systems- Data Mining, Data Warehousing, On-Line Analytical Processing (OLAP), Supply Chain Management, Best Practices in ERP.
3	**ERP Modules :** **(a)** Finance, Accounting Systems, Manufacturing and Production Systems, Sales and Distribution Systems, Human Resource Systems, Plant Maintenance System, Materials Management System, Quality Management System **(b)** ERP System Options and Selection

	(c) ERP proposal Evaluation.
4	**ERP Implementation:** Implementation Strategy Options, Features of Successful ERP Implementation, Strategies to Attain Success
5	**Maintenance and Benefits of ERP:** Improvement opportunities , IT Maintenance, Business Needs , Business Priority , Maintenance Cost , User Training, ERP Solutions
6	**ERP & Information System:** Reduction of Lead Time, On-Time Shipment , Reduction in Cycle Time, Improved Resource Utilization, Better Customer Satisfaction, Improved Supplier Performance , Increased Flexibility , Reduced Quality Costs, Improved Information Accuracy and Decision Making Capabilities.
7	**Case Studies on ERP :** ERP for Finance , Manufacturing , Supply Chin and Quality Management for any Business Organization

Elective Group:(08) Information Systems

Course Number	Course Name	L-T-P- Credits	Year of Introduction
405-08-B	E-Commerce	2L+1T+0P=3C	2018

Course Objective:
This course explores the basics of working with internet including WWW, Email, Browsing, Chatting etc., and understands the potential of secured electronic transactions, E-mail security and electronic publishing.

Pre-requisites:
Knowledge of Internet and Internet Technologies , Programming knowledge and Network Technology basics.

Expected Outcome :

- Will be able to understand the concepts of E-Commerce.
- Can be able to design and develop E-Commerce facilities for Business applications . Implementation of E-Commerce Websites for Business firms.

References (Books, Websites etc.):

1. Web Commerce Technology Handbook, byDanielMinoli, EmmaMinoli, McGraw-Hill.
2. Frontiers of electroni commerece by Galgotia.
3. E-Commerce fundamentals and applications Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, John Wiley.
4. E-Commerce, S.Jaiswal – Galgotia.
5. E-Commerce, Efrain Turbon, Jae Lee, David King, H.Michael Chang.
6. Electronic Commerce – Gary P.Schneider – Thomson.
7. E-Commerce – Business, Technology, Society, Kenneth C.Taudon, Carol Guyerico Traver.

Suggested MOOC:
Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Syllabus

Unit	Contents
1	**Introduction and Concept** What is E-Commerce? Types of E-Commerce and Applications of E-Commerce, E-Commerce Basic Requirements, Internet and Concepts of Internet.
2	**Approaches to Safe Electronic Commerce:** Secure Transport Protocols, Secure Transactions, Secure Electronic Payment Protocol (SEPP), Secure Electronic Transaction (SET), Certificates for authentication Security on web Servers and Enterprise Networks, Electronic Cash and Electronic Payment Schemes: Internet Monetary, Payment & Security Requirements. Payment and Purchase Order Process,On-line Electronic cash.

3	**Internet/Intranet Security Issues and Solutions:** The need for Computer Security, Specific Intruder Approaches, Security Strategies, Security Tools, Encryption, Enterprise Networking and Access to the Internet, Antivirus Programs, Security Teams.
4	**Master Card/Visa Secure Electronic Transaction:** Introduction, Business Requirements Concepts, payment Processing, E-Mail and Secure E-mail , Technologies for Electronic Commerce: Introduction, The Means of Distribution, A model for Message Handling, E-mail working, Multipurpose Internet Mail Extensions, Message Object Security Services, Comparisons of Security Methods, MIME and Related Facilities for EDI over the Internet.
5	**Internet Resources for E-Commerce** Introduction, Technologies for web, Servers, Internet Tools Relevant to Commerce, Internet Applications for Commerce, Internet Charges, Internet Access and Architecture, Searching the Internet, Advertising on Internet: Issues and Technologies, Advertising on the Web, Marketing creating web site, Electronic Publishing Issues, Approaches and Technologies: EP and web based EP.
6	**E-Commerce Website Development** Website Development , Online Transactions and Payments , Security Issues in E-Commerce website
7	**Case Studies on E-Commerce :-** Amazon , Flip kart , Myantra

Elective Group:(08) Information Systems

Course Number	Course Name	L-T-P-Credits	Year of Introduction
504-08-C	Recommender System	2L+1T+0P=3 C	2018

Course Objective:

Pre-requisites:
Knowledge about Business Organizations and its functions , Theory of Recommender Systems and Decision Making process .

Expected Outcome :
After going through this course a student should be able to understand :

- Will be able to understand the concepts of Decision Making Process.
- Can be able to design and develop Recommender for Business applications.
- Implementation of Recommender System for various areas of Interest in Business Organizations .

References (Books, Websites etc.):

1. "Recommender systems An Introduction" by Dietmar Jannach, Markus Zanker, Alexzander Felfering, Gerhard friedrich by Cambridge university press 2011
2. **recommender systems handbook [book] by francesco ricci, lior rokach, paul b. kantor in books**

Suggested MOOC:
Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Syllabus

Unit	Contents
1	**Introduction to Basic Concepts:** Collaborative Recommendation: User Based Nearest Neighbor recommendation, Item Based Nearest Neighbor recommendation, model based and pre-processing based approaches. Recent practical approaches and systems. Content based Recommendation: content representation and content similarity, similarity based retrieval, other text classification methods, Knowledge Based Recommendation: Knowledge representation and reasoning, interacting with constraint based recommenders, interacting with case based recommenders,
2	**Hybrid recommendation approaches:** Opportunities for hybridization, Monolithic hybridization design, parallelized hybridization design, pipelined hybridization design,
3	**Evaluating recommender systems :** General properties of Evaluation research, popular evaluation designs, evaluation on historical datasets, alternate evaluation design

4	**Recent developments:** Attacks on collaborative recommender systems, Online consumer decision making
5	**Recommender systems and the next-generation web** Recommendations in ubiquitous environments.
6	**Explanations in recommender systems** Explanations in constraint-based recommenders, explanation in case based recommenders, explanation in collaborative filtering recommenders.
7	**Case studies on Recommender System.**

Elective Group:(08) Information Systems

Course Number	Course Name	L-T-P- Credits	Year of Introduction
505-08-D	Knowledge Management	2L+1T+0P=3C	2018

Course Objective:
The objective of the course is to provide the basic skills of managing knowledge in organizations. Knowledge is an asset for retaining the competitive advantage of the organization. This course develops the capabilities of towards managing students to manage knowledge in organizations.

Pre-requisites:
Knowledge about Information System and MIS with Implementation of MIS

Expected Outcome :
After going through this course a student should be able to understand :

- Will be able to understand the concepts of Knowledge and knowledge management .
- Can be able to design and develop Knowledge management systems for Business applications .
- Implementation of KM to various areas of Interest in Business Organizations .

References (Books, Websites etc.):

1. Madhukar Shukla:Competing Through Knowledge-Building a learning Organisation(Responsce Books, New Delhi.
2. Tiwana, The Knowledge Management Toolkit: Practical Techniques for building a Knowledge Management Systmes, 2/e, Pearson Edu.
3. Honey Cutt : "Knowledge Management Strategies", PHI, New Delhi.
4. A wad, KM, Pearson Edn, 2007.
5. Barnes, Knowledge Management Systems, 1/e, Thomson 2006.
6. Ikudiro Nonka & Hirotaka Takeuchi, " The Knowledge – Creating Company", Oxford University Press, London.

Suggested MOOC:
Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Syllabus

Unit	Contents
1	**Introduction:** Definition, Scope and Significance of Knowledge Management , Difficulties of Knowledge Management, Techniques of KM – Implementation of KM, Organizational knowledge, Characteristics and Components of Organizational Knowledge

2	**Drivers of knowledge Management:** Pillars of knowledge Management, KM framework , Supply Chain of KM , Formulation of KM strategy.
3	**Technology and KM:** Technology components of KM – IT & KM , Ecommerce and KM
4	**Total Quality Management and KM:** TQM and KM , Bench marking and KM.
5	**Implementation of KM:** Discussion on Roadblocks to success, Implementing a KM programme , Critical Success Factors in KM , Implementation of KM
6	**KM and Organizational Restructuring:** The Mystique of Learning, Organization:- Outcomes of learning, Learning and Change – Innovation, continuous Improvements, Corporate Transformation.
7	**Case studies in Knowledge Management** Knowledge management in Health Care, Knowledge Management in Human Resource Management

Elective Group:(09) Internet Of Things

Course Number	Course Name	L-T-P- Credits	Year of Introduction
404-09-A	IoT Architecture And Protocols	2L+1T+0P=3C	2018

Course Objective:
The purpose of this course is to impart knowledge on IoT Architecture and various protocols, study their implementations

Expected Outcome :

At the end of the course a student should be able:

1.To Understand the Architectural Overview of IoT
2. To Understand the IoT Reference Architecture and Real World Design Constraints
3. To Understand the various IoT Protocols (Datalink, Network, Transport, Session, Service)

References:

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", 1 st Edition, Academic Press, 2014.
2. Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI
3. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer 46.

http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.htm

Text Books:

- Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118- 47347-4, Willy Publications
- Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-onApproach)", 1 st Edition, VPT, 2014.

Suggested MOOC:
Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Course Plan

Unit	Contents
1	IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management
2	Architecture of IoT 1. Hardware 2. Software

	Reference Model and architecture, IoT reference Model - IoT Reference ArchitectureIntroduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints-Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.
3	IOT DATA LINK LAYER & NETWORK LAYER PROTOCOLS (12 hours) PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15),
4	WirelessHART,Z-Wave,Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP
5	Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS)
6	Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT
7	SERVICE LAYER PROTOCOLS & SECURITY - Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC 802.15.4 , 6LoWPAN, RPL, Application Layer

Elective Group: (09) Internet Of Things

Course Number	Course Name	L-T-P- Credits	Year of Introduction
405-09-B	Sensors and Fundamentals with Hands-on lab Node.js/Raspberry PI/Python	2L+1T+0P=3C	2018

Course Objective:
The purpose of this course is to impart knowledge on IoT Architecture and various protocols, study their implementations

Expected Outcome :

At the end of the course a student should be able:

1.To Understand the basics of Python and node js to interface with sensors

REFERENCES:

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", 1 st Edition, Academic Press, 2014.
http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.htm

Text Books:

- Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118- 47347-4, Willy Publications

Suggested MOOC :

Please refer these websites for MOOC's:
NPTEL / Swayam
www.edx.com
www.coursera.com

Course Plan

Unit	Contents
1	Sensing and Measurements 0-5 Voltage Analog I/O Pulse Width Mode I2C Communication
2	Sensor Types, Classification Visual, Fleet Tracking sensors Wiring Basics
3	Practical: Working with Temperature, Humidity, Light & Motion Detector, Promity Sensor
4	Edge Devices & Gateway Devices With hands-on using Raspberry PI using Node.js/Python Introduction to Edge Devices Wired, Wireless Communications Serial Port/UART

	BLE/WIFI Introduction to Arduino [Serial port communication] Introduction to ESP32 [WIFI/BLE Device] (Micro Controller for Edge Devices) Hands-on using C [Arduino], Embedded JavaScript [ESP]
5	Actuators and Controllers with Hands-on using Raspberry PI with Node.js/Python Actuators and Controllers Controllers Introduction Buzzer Relay Switches Servo Motors
6	Gateway with Raspberry PI Gateway Introduction Needs for Gateway, Roles of Gateway Edge/Gateway Connectivity
7	Raspberry PI, Single Board Linux Computer WIFI/BLE Communication with Edge Devices Hands on using Node.js/Java/C#/Python based on training needs

Elective Group:(09) Internet Of Things

Course Number	Course Name	L-T-P- Credits	Year of Introduction
504-09-C	Internet Of Things: Sensing And Actuator Devices	2L+1T+0P=3C	2018

Course Objective:

The purpose of this course is to impart knowledge on Internet of Things (IoT), which relates to the study of sensors, actuators, and controllers, among other Things, IoT applications and examples overview (building automation, transportation, healthcare, industry, etc.) with a focus on wearable electronics

Expected Outcome : At the end of the course a student should be able:

1. Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved
2. Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, RF and sensing modules
3. Market forecast for IoT devices with a focus on sensors
4. Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi

REFERENCES

1. Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024',Yole Développement Copyrights ,2014
2. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015
3. Editors OvidiuVermesan Peter Friess,'Internet of Things – From Research and Innovation to Market
4. Deployment', River Publishers, 2014 5. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014.

http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.htm

Text Books:

- Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118- 47347-4, Willy Publications
- Vijay Madisetti and ArshdeepBahga, “Internet of Things (A Hands-onApproach)”, 1 st Edition, VPT, 2014.

Suggested MOOC :

Please refer these websites for MOOC’s:
NPTEL / Swayam
www.edx.com
www.coursera.com

Course Plan	
Unit	**Contents**
1	Internet of Things Promises–Definition– Scope–Sensors for IoT Applications–Structure of IoT– IoT Map Device
2	SEVEN GENERATIONS OF IOT SENSORS TO APPEAR Industrial sensors – Description & Characteristics–First Generation – Description & Characteristics–Advanced Generation – Description & Characteristics–Integrated IoT Sensors – Description & Characteristics– Polytronics Systems – Description & Characteristics–Sensors' Swarm – Description & Characteristics–Printed Electronics – Description & Characteristics–IoT Generation Roadmap
3	TECHNOLOGICAL ANALYSIS - Wireless Sensor Structure–Energy Storage Module–Power Management Module–RF Module–Sensing Module
4	IOT DEVELOPMENT EXAMPLES:ACOEM Eagle – EnOcean Push Button – NEST Sensor – Ninja Blocks - Focus on Wearable Electronics
5	- PREPARING IOT PROJECTS (9 hours) Creating the sensor project - Preparing Raspberry Pi - Clayster libraries - Hardware- Interacting with the hardware - Interfacing the hardware- Internal representation of sensor values - Persisting data -
6	External representation of sensor values - Exporting sensor data - Creating the actuator projectHardware - Interfacing the hardware - Creating a controller - Representing sensor values - Parsing sensor data - Calculating control states
7	- Creating a camera - Hardware -Accessing the serial port on Raspberry Pi - Interfacing the hardware - Creating persistent default settings - Adding configurable properties - Persisting the settings - Working with the current settings - Initializing the camera

Elective Group: (09) Internet Of Things

Course Number	Course Name	L-T-P- Credits	Year of Introduction
505-09-D	Smart city use case, MQTT, Integrating on Cloud	2L+1T+0P=3C	2018

Course Objective:

The purpose of this course is to impart knowledge on Internet of Things (IoT), which relates to the study of sensors, actuators, and controllers, among other Things, IoT applications and examples overview (building automation, transportation, healthcare, industry, etc.) with a focus on wearable electronics

Expected Outcome :

At the end of the course a student should be able to upload IoT application on cloud.

REFERENCES:

1. Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024',Yole Développement Copyrights ,2014
2. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015
3. Editors OvidiuVermesan Peter Friess,'Internet of Things – From Research and Innovation to Market
4. Deployment', River Publishers, 2014 5. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014.
http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.htm

Text Books:

- Vijay Madisetti and ArshdeepBahga, “Internet of Things (A Hands-onApproach)”, 1 st Edition, VPT, 2014.

Suggested MOOC :

Please refer these websites for MOOC’s:
NPTEL / Swayam
www.edx.com
www.coursera.com

Course Plan

Unit	Contents
1	LoRA, LoRAWAN - Smart City Use Cases Working with Smart City Solutions Problem understanding Introduction to LoRA
2	LoRA Hardware and bandwidth Communication between Lora Devices,
3	LoRA Gateway, LoRAWAN WIFI vs BLE vs ZigBee vs LoRA

4	IoT and Cloud IoT and Cloud introduction
5	Data ingestion using MQTT
6	Understanding Device Management Device Security
7	Device Connectivity MQTT MQTT Introduction Brokers Publish/Service Topics QOS [0, 1, 2 levels] MQTT Message Format Messaging, Ack format Payload Security [TLS, User Authentication] MQTT Authorization

Elective Group:(10) Big Data

Course Number	Course Name	L-T-P- Credits	Year of Introduction
404-10-A	Business Intelligence Applications	2L-1T-0P= 3C	2018

Course Objective :

To introduce learner with Business Intelligence Concept, decision making by Business Intelligence Tools on Applications such as Finance, Marketing, Education etc.

Pre-requisites: Preliminary knowledge of computer, Big Data Analysis and Business Intelligence.

Expected Outcome :

- Good knowledge of Business Intelligence Tools.
- Knowledge of Decision making using analysis on the Big Data using Excel Tools.
- Case Studies: Knowledge about different applications used in industries.

Reference Books :

1. Big Data- Understanding How Big Data Power Big Business –By Bill Schmarzo
2. Business Intelligence Strategy -By John Boyer, Bill Frank, Brain Green, Tracy Harris

Course Plan

Unit	Contents
1	**Introduction To Business Intelligence Applications:** Introduction to Big Data, Business Intelligence Data Mining, and Data Warehousing, What are Business Intelligence Applications (BIA). Features of BIA.
2	**Sales, Finance And Marketing:** Introduction to Sales, Finance and Marketing Concept, features of Sales, features of Finance, features of Marketing, Use of Business Intelligence in Sales, Finance and Marketing in any Organization, Case Study.
3	**Education And Learning:** Introduction to Education System, Learning Concept, Difficulties in Education Systems, Use of Business Intelligence for Education and Learning, Case Study.
4	**Vertical Ai Applications:** Overview of AI, What is Vertical AI, Features of Vertical AI, Use of Business Intelligence in Vertical AI, Case Study.
5	**Security:** Define Security, Security in Big Data, Problems with Security, Business Intelligence for Security, Case Study.
6	**Lifescience:** Introduction to Life Science, Life Science Intelligence, Features of Life Science Intelligence, Use of Life Science Intelligence in Decision Making, Case Study.
7	**Ad Optimisation:** Define Optimization, Introduction to Ad Optimization, Uses of Ad Optimization for Industry, Use if Business Intelligence in Ad Optimization, Case Study.

Elective Group: (10) Big Data

Course Number	Course Name	L-T-P- Credits	Year of Introduction
405-10-B	Business Intelligence Tools	2L-1T-0P= 3C	2018-2019

Course Objective :

To introduce learner with Big Data Concept. Using different Advance Excel Functions (like Optimization) and implementing it on Big Data for decision making. By solving Case Studies the students will get real example of using BI Tools in industry. To introduce learner with Business Intelligence Concept, decision making by Business Intelligence Tools on Applications such as Finance, Marketing, Education etc.

Pre-requisites: Preliminary knowledge of computer, Big Data Analysis and Business Intelligence.

Expected Outcome :

- Good knowledge of Business Intelligence Tools.
- Knowledge of Decision making using analysis on the Big Data using Excel Tools.
- Case Studies: Knowledge about different applications used in industries.

Reference Books :

- Tutorials Point for advance Excel Tools.
- Excel 2010 Bible by John Walkenbach, John Wiley & Sons, 2010 Edition.
- *https://office.live.com/start/Excel.aspx*
- *https://www.talend.com/*

Course Plan

Unit	Contents
1	**Introduction To Big Data:** **Overview of** - Data Mining, Data Warehousing, Big Data, How Business Intelligence is useful for Big Data, Big Data Problems.
2	**Introduction To Business Intelligence:** Introduction to BI, **Data Cleaning-** Editing a Workbook, Data Cleaning Using Te Functions, Using Validation To Keep Data Clean, **Working with Multidimension Data-** Pivot Tables, Pivot Charts.
3	**Applications Of Business Intelligence:** CRM Domain, Banking Domain, Health Care Domain, Mobile Industry Domain, Creation of a New Product, Providing Personalized Services
4	**Optimization Modeling With Solver:** Introduction to MS-Excel and MS-Excel Formulas, Understanding Optimization Modeling, Setting Up a Solver Worksheet, Solving an Optimization Modeling Problem, Reviewing the Solver Reports
5	**Working With Solver:** Working With the Solver Options, Setting a Limit on Solver, Understanding the Solver Error Messages, Case Studies (Solver Problems).
6	**Advance Excel Tools:** **Using Shared Work Books-** Sharing a workbook, Opening and editing a shared workbook, Tracking changes, Resolving conflict in a shared workbook, Multiple workbooks- Linking workbooks, Editing the Link, Consolidating the workbook.
7	**Working With Macros:**

	Introduction to Macros? Where are Macros, Features of Macros, **Working with Macros-** Display the developer Tab, Changing Macro security Settings, Recording and running a Macro.

Elective Group: (10) Big Data

Course Number	Course Name	L-T-P- Credits	Year of Introduction
504-10-C	Introduction to Big Data	2L-1T-0P= 3C	2018

Course Objective :

To introduce learner with Big Data Concept, decision making by doing analysis on the data and managing the data using Big Data Tools like Apache Hadoop, Pig and Hive. What are the problems of Big Data and how it can be solved by different tools.

Pre-requisites: Preliminary knowledge of computer, Data Mining, Data Warehousing Concepts.

Expected Outcome :

- Good knowledge of Big Data Concepts
- Knowledge of Decision making using analysis on the Big Data
- Introduction to Big data Tools like Hadoop and Weka.

Reference Books :

1. Big Data- Understanding How Big Data Power Big Business –By Bill Schmarzo
2. Edureka lectures **Link:-** https://www.youtube.com/watch?v=A02SRdyoshM

Course Plan

Unit	Contents
1	**Introduction:** Big Data History, The Big Data Business Opportunity- Business Transformation Imperative, Big Data Business Model, Business Impact of Big Data
2	**Big Data In Organization:** Data Analytics Lifecycle, **Data Scientist Roles and Responsibilities** – Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize, New Organizational Roles, Liberating Organizational Creativity.
3	**Decision Theory And Strategy:** Business Intelligence Challenge, Big Data User Interface Ramifications, Human Challenge of Decision Making, **Strategy for Decision Making**- Big Data Strategy Document, Case Study.
4	**Value Creation Process:** Understanding Big Data Value Creation, Value Creation Drivers, **Michael Porter's Value Creation Models**- Michael Porter's Five Forces Analysis, Michael Porter's Value Chain Analysis, Case Study.
5	**Big Data User Experience:** The Unintelligent User Experience, Understanding the Key Decisions to Build a Relevant User Experience, Using Big Data Analytics to Improve Customer Engagement, Uncovering and Leveraging Customer Insights, Big Data can Power a New Customer Experience.
6	**Big Data Use Cases:** **The Big Data Envisioning Process** –1. Research Business Intiatives, 2. Acquire and Analyze your Data, 3. Brainstorm New Ideas , 4. Prioritize Big Data Use Cases, 5. Document Next Steps, The Prioritization Process.
7	**Big Data Architecture:**

	New Big Data Architecture, **Introducing Big Data Technologies** – Apache Hadoop, MapReduce, R, WEKA etc.

Elective Group: (10) Big Data

Course Number	Course Name	L-T-P- Credits	Year of Introduction
505-10-D	HADOOP	2L-1T-0P= 3C	2018

Course Objective :
To introduce learner with HADOOP Tool for Business Intelligence, decision making by doing analysis on the data using HADOOP Tool and also managing the Big Data using HADOOP.

Pre-requisites: Preliminary knowledge of computer, Big Data Analysis and Business Intelligence. Also students must know Core Java, C Programming and Data Structure Languages.

Expected Outcome :

- Good knowledge of HADOOP Tool.
- Knowledge of Decision making using HADOOP analysis on the Big Data
- Hands-on Big Data tools- Hadoop, Pig, Hive, HBase

Reference Books :

1. Big Data- Understanding How Big Data Power Big Business –By Bill Schmarzo
2. www.tutorialspoint.com

Course Plan

Unit	Contents
1	**BIG DATA Overview** : What is Big Data?, What Comes Under Big Data?, Benefits of Big Data, Big Data Technologies Operational vs. Analytical Systems, Big Data Challenges.
2	**Introduction To HADOOP**: Hadoop Architecture, MapReduce, Hadoop Distributed File System, How Does Hadoop Work?, Advantages of Hadoop.
3	**HDFS Overview:** Features of HDFS, HDFS Architecture, Starting HDFS, Listing Files in HDFS, Inserting Data into HDFS, Retrieving Data from HDFS, Shutting Down the HDFS.
4	**MAPREDUCE:** What is MapReduce?, The Algorithm for MapReduce, Inputs and Outputs (Java a Perspective), Analyze different use-cases where MapReduce is used, Differentiate between traditional way and MapReduce way.
5	**Introduction To Hadoop Features:** New Big Data Architecture, Introducing HADOOP Features – Apache Hive, Apache HBase, Pig.
6	**Multi Node Cluster:** Multi Node Cluster, Install Java, Creating User Account, Mapping the Nodes, Installing Hadoop, Configuring Hadoop, Start Hadoop Services, Adding New Data Node in the Hadoop Cluster, Removing New Data Node from the Hadoop Cluster.
7	**Environment Setup:** Pre-installation Setup, Installing Java Downloading Hadoop Hadoop Operation Modes Installing Hadoop in Standalone Mode Installing Hadoop in Pseudo Distributed Mode Verifying Hadoop Installation, Implement basic Hadoop commands on terminal.

Elective Group: (11) Cyber Security

Course Number	Course Name	L-T-P- Credits	Year of Introduction
404-11-A	Introduction to Linux	2L+1T+0P=4C	2018

Course Objective:
Introduce the learner to Linux environment

Expected Outcome :
Practical understanding of Linux environment

References (Books, Websites etc) :
Red Hat Linux Bible: Fedora and Enterprise Edition - by Christopher Negus

Suggested MOOC :
SWAYAM

Syllabus

Unit	Contents
1	Installation of Kali-Linux, Understanding Kali Linux
2	**Using Shell Interface** Introduction to Linux, Internal and external commands, General purpose utilities, Navigating the file system, Handling ordinary files
3	**Using GUI Environments** GNOME desktop environment, KDE desktop environment
4	**Using open source office suite:** Word processor application , Spreadsheet application, Presentation application, Desktop database application
5	**Using the Internet** World wide web, FTP, Telnet
6	**Using Multimedia** Graphics, Audio, Video
7	**Shell commands** General purpose utilities, File management , Process management, Communication management

Elective Group: (11) Cyber Security

Course Number	Course Name	L-T-P- Credits	Year of Introduction
405-11-B	Information Security Concepts	2L+1T+0P=3C	2018

Course Objective:
Introduce the learner to concepts involved in Information Security domain

Expected Outcome :
Theoretical understanding of Information Security Concepts

References (Books, Websites etc) :
CEH Study Guide - Sybex

Suggested MOOC :
SWAYAM

Syllabus

Unit	Contents
1	**Information Security Concepts:** Confidentiality, Integrity and Availability of Information, Identification, Authentication and Authorization, Security Principles and Models
2	**Physical Security:** Facility Requirement, Perimeter Security, Fire Protection, Fire Suppression, Power Protection, General Environmental Protection, Equipment Failure Protection
3	**Network Security:** Secure Network design, Firewalls, WLAN Security, VPNs, Types and Sources of Network Threats
4	**Operating System Security:** Windows, Linux/UNIX
5	**Database Security:** MS SQL
6	**Web Application Security:** Web Application Vulnerabilities, Secure Coding Techniques, Continuous Security Testing and Assessments
7	**Compliance Standards :** IT Act, ISO 27001, ITIL Framework

Elective Group: (11) Cyber Security

Course Number	Course Name	L-T-P- Credits	Year of Introduction
504-11-C	Information Security Threats	2L+1T+0P=4C	2018

Course Objective:
Introduce the learner to threats involving Information Systems

Expected Outcome :
Practical understanding of threats involving Information Systems

References (Books, Websites etc) :
CEH Study Guide - Sybex

Suggested MOOC :
SWAYAM

Syllabus

Unit	Contents
1	**Introduction to Information Security Threats** TCP/IP Fundamentals , Operating System Fundamentals , Web Application and Database Fundamentals , Introduction to Ethical Hacking, Advanced Persistent Threats
2	**Information Gathering:** Footprinting, Advanced Google Hacking, Nmapping the network, Fingerprinting
3	**Exploitation:** Hacking Networks, Hacking Servers, Hacking Databases, Password Cracking
4	**Advanced Exploitation:** Hacking WLANs, Evading IDS, Firewalls, Web Application Hacking, Advanced Web Hacking, Hacking Web Browsers
5	**Social Engineering:** Introduction to Social Engineering, Common Types of Attacks, Online Social Engineering
6	**Cryptography:** Introduction to Cryptography, Encryption and Decryption, Cryptographic Algorithms, Digital Signature, Cryptography Tools, Cryptography Attacks
7	**Malware Attacks:** Viruses, Worms, Trojans

Elective Group: (11) Cyber Security

Course Number	Course Name	L-T-P- Credits	Year of Introduction
505-11-D	Information Security Administration	2L+1T+0P=3C	2018

Course Objective:
Introduce the learner to concepts involving security administration

Expected Outcome :
Practical understanding of setting, managing and securing Information Systems

References (Books, Websites etc) :
Red Hat Linux Bible: Fedora and Enterprise Edition - by Christopher Negus

Suggested MOOC :
SWAYAM

Syllabus

Unit	Contents
1	**Setup a Client:** Introduction to client-side devices, Setup, Manage and Secure a Desktop PC Setup, Manage and Secure a Mobile Device
2	**Setup a LAN:** Introduction to LAN devices, Simulate a LAN, Setup, Manage and Secure a Local Area Network
3	**Connect a LAN to the Internet:** Introduction to WAN devices, Setup, Manage and Secure a Connection to the Internet
4	**Share an Internet Connection across a LAN:** Introduction to Internet Connection sharing, Introduction to NAT and PAT Setup, Manage and Secure a Proxy Server
5	**Share resources over a LAN:** Setup, Manage and Secure a Print Server, Setup, Manage and Secure a File server
6	**Host a Website:** Introduction to website hosting, Setup, Manage and Secure a Web Server
7	**Setup support servers:** Setup, Manage and Secure a Mail Server, Setup, Manage and Secure a FTP Server, Setup, Manage and Secure a Boot Server, Setup, Manage and Secure a DNS Server