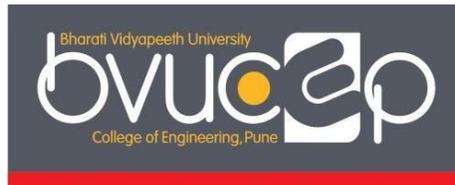# Bharati Vidyapeeth
(Deemed to be University)
Pune, India

College of Engineering, Pune

B.Tech. (Information Technology)

Program Curriculum (2020-21 Course)

BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY),
COLLEGE OF ENGINEERING, PUNE

Department of Information Technology

VISION OF THE UNIVERSITY:

Social Transformation Through Dynamic Education

MISSION OF THE UNIVERSITY:

- To make available quality education in different areas of knowledge to the students as per their choice and inclination.
- To offer education to the students in a conducive ambiance created by enriched infrastructure and academic facilities in its campuses.
- To bring education within the reach of rural, tribal, and girl students by providing them substantive fee concessions and subsidized hostel and mess facilities.
- To make available quality education to the students of rural, tribal, and other deprived sections of the population.

VISION OF THE INSTITUTE

To be a world-class Institute for Social Transformation through Dynamic Education.

MISSION OF THE INSTITUTE

- To provide quality technical education with advanced equipment, qualified faculty members, infrastructure to meet the needs of the profession and society.
- To provide an environment conducive to innovation, creativity, research, and entrepreneurial leadership.
- To practice and promote professional ethics, transparency, and accountability for social community, economic and environmental conditions.

VISION OF THE DEPARTMENT

To be a leading Programme, transforming students into skilled IT professionals.

MISSION OF THE DEPARTMENT

- Amplify the student's technical skills by conducting continuing education programs, organizing and participating in various technical events.
- Provide comprehensive support in synchronization with industry to achieve professional and technological excellence.
- Provide an environment for effective social and ethical skills.

Program Educational Objectives:

PEO1: Cultivate IT graduates for industry, pertaining to Information Technology solutions.

PEO2: Practice technical competency and teamwork abilities.

PEO3: Exhibit social responsibilities by following ethical practices in graduates' professional pursuits.

Program Specific Outcomes

At the end of the program, Graduates will be able to

- **PSO 1:** Use knowledge of core and allied courses for developing a computer-based system to deliver a quality product for real-world problems of society.

- **PSO 2:** Apply modern IT tools and techniques for perusing student's professional career by practicing effective communication with team members.

- **PSO 3:** Develop time-bound, cost-effective and sustainable solutions by following professional ethics.

Program Outcomes

1. Apply knowledge of Mathematics and Computer Science to analyze computer-based information systems.
2. Apply logical and programming skills to identify, formulate and analyze for solving computational problems.
3. Examine complex problems by a diagnosis of available information to provide an appropriate conclusion.
4. Design applications with suitable consideration of societal needs.
5. Use functional skills of modern IT tools and techniques for modeling and implementation.
6. Play the role of a team player to accomplish a common goal.
7. Convey technological concepts through significant documentation and presentation skills.
8. Demonstrate professional conduct by following norms of the Engineering practice.
9. Apply Software Engineering methodologies for sustainable development.
10. Follow ethical and legal practices related to the functioning of the IT industry.
11. Apply management skills and techniques for creating time-bound and cost-effective projects.
12. Exhibit lifelong learning by upgrading to state-of-the-art IT practices and technology.

COURSE COMPONENTS OF UNDERGRADUATE ENGINEERING PROGRAMME

Sr. No.	Category	Number of Courses
1	Basic Science Course (BSC)	05
2	Engineering Science Course (ESC)	03
3	Core Course (CC)	36
4	Elective Course (EC)	02
5	Project (PROJ)	02
6	Internship (INT)	01
7	Vocational Course (VC)	04
8	Massive Open Online Course (MOOC)	02
9	Research Paper Publication (Research)	01
10	Social Activities (SA)	02
11	Mandatory Course (MC)	01
TOTAL		**59**

CORRELATION BETWEEN GRADUATE ATTRIBUTES AND PROGRAMME OUTCOMES

Graduate Attributes/ Program Outcomes	a	b	c	d	e	f	g	h	i	j	k	l
Engineering Knowledge	✓											
Problem Analysis		✓										
Design/Development of Solutions			✓									
Conduct Investigations of Complex Problems				✓								
Modern Tool Usage					✓							
The Engineer and Society						✓						
Environment and Sustainability							✓					
Ethics								✓				
Individual and Teamwork									✓			
Communication										✓		
Project Management and Finance											✓	
Life-long Learning												✓

CREDIT DISTRIBUTION TO COURSE COMPONENTS OF UNDERGRADUATE ENGINEERING PROGRAMME

Sr. No.	Category	Breakup of Credits
1	Basic Science Course (BSC)	20
2	Engineering Science Course (ESC)	15
3	Core Course (CC)	139
4	Elective Course (EC)	10
5	Project (PROJ)	09
6	Internship (INT)	03
7	Vocational Courses (VC)	04
8	Massive Open Online Course (MOOC)	04 (Add On)
9	Research Paper Publication (Research)	02 (Add On)
10	Social Activities (SA)	04 (Add On)
11	Mandatory Course (MC)	Non-Credit
TOTAL		**200**

Program: **B.TECH. (Information Technology)** **Semester - I** **CBCS 2021 Course**

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Mathematics for Computing-I	3	-	1	60	40	-	-	-	100	3	-	1	4
2		Physics for Computing System	3	2	-	60	40	25	-	-	125	3	1	-	4
3		Computer Aided Drafting	4	2	-	60	40	50	-	-	150	4	1	-	5
4		Digital Electronics	4	2	-	60	40	25	-	-	125	4	1	-	5
5		Structured Programming	4	2	-	60	40	50	-	50	200	4	1		5
6		Computer System Workshop Technology	-	2	1	-	-	25	-	25	50	-	1	1	2
		Total	**18**	**10**	**2**	**300**	**200**	**175**	**-**	**75**	**750**	**18**	**5**	**2**	**25**

Program: B.TECH. (Information Technology)   Semester - II   CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Mathematics for Computing-II	3	-	1	60	40	-	-	-	100	3	-	1	4
2		Organic and Electrochemistry	3	2	-	60	40	25	-	-	125	3	1	-	4
3		Electrical Technology	4	2	-	60	40	25	-	-	125	4	1	-	5
4		Object Oriented Programming	4	2	-	60	40	25	-	50	175	4	1	-	5
5		Programming Paradigms	4	2	-	60	40	25	50	-	175	4	1	-	5
6		Web Programming	-	2	1	-	-	25	-	25	50	-	1	1	2
	Total		18	10	2	300	200	125	50	75	750	18	5	2	25

Program: **B.TECH. (Information Technology)**   **Semester - III**   **CBCS 2021 Course**

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Discrete Structures and Graph Theory	4	-	-	60	40	-	-	-	100	4	-	-	4
2		Data Structures	4	2	-	60	40	25	-	25	150	4	1	-	5
3		Database Management System	4	2	-	60	40	25	-	25	150	4	1	-	5
4		Software Engineering*	3	2	-	60	40	25	-	-	125	3	1	-	4
5		Computer Communication and Networks	3	2	-	60	40	25	-	-	125	3	1	-	4
6		Information Technology Laboratory - I	-	2	1	-	-	25	-	25	50	-	1	1	2
7		Vocational Course-I	-	2	-	-	-	25	25	-	50	-	1	-	1
		Total	**18**	**12**	**1**	**300**	**200**	**150**	**25**	**75**	**750**	**18**	**6**	**1**	**25**
	#Social Activity - I		-	-	-	-	-	-	-	-	-	-	-	-	2

* Industry Taught Course -I
 # Add on Course

List of Vocational Courses will be published by the department before the commencement of respective semester.

Program: B.TECH. (Information Technology)   Semester - IV   CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		IT Infrastructure Management*	4	-	-	60	40		-	-	100	4	-	-	4
2		Formal Languages and Computation Theory	4	-	-	60	40	-	-	-	100	4	-	-	4
3		Microprocessors and Microcontrollers	4	2	-	60	40	25	-	-	125	4	1	-	5
4		Applied Algorithms	4	2	-	60	40	25	25	-	150	4	1	-	5
5		Operating System	3	2	-	60	40	25	-	25	150	3	1	-	4
6		Information Technology Laboratory - II	-	2	1	-	-	25	-	50	75	-	1	1	2
7		Vocational Course - II	-	2	-	-	-	25	25	-	50	-	1	-	1
		Total	**19**	**10**	**1**	**300**	**200**	**125**	**50**	**75**	**750**	**19**	**5**	**1**	**25**
	#MOOC - I		-	-	-	-	-	-	-	-	-	-	-	-	2

* Industry Taught Course – II

 # Add-on Course - List of MOOC and Vocational Courses will be published by the department before the commencement of respective semester.

Program: B.TECH. (Information Technology) Semester - V CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Human Computer Interaction	4	-	-	60	40	-	-	-	100	4	-	-	4
2		Artificial Intelligence and Machine Learning	4	2	-	60	40	25	25	-	150	4	1	-	5
3		Computer Architecture and Organization	3	-	1	60	40	-	-	-	100	3	-	1	4
4		Advanced Database System*	3	2	-	60	40	25	-	25	150	3	1	-	4
5		Mobile Application Development	4	2	-	60	40	25	-	25	150	4	1	-	5
6		Information Technology Laboratory- III	-	2	1	-	-	25	-	25	50	-	1	1	2
7		Vocational Course - III	-	2	-	-	-	25	25	-	50	-	1	-	1
	Total		18	10	2	300	200	125	50	75	750	18	5	2	25
	#Social Activity - II		-	-	-	-	-	-	-	-	-	-	-	-	2
	Environmental Studies**		2	-	-	50	-	-	-	-	-	-	-	-	-

 * **Industry Taught Course - III**
Add on Course
 ** **Mandatory Audit Course - 50 Marks Theory Examination**

Program: B.TECH. (Information Technology)   Semester - VI   CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Cloud Computing*	4	2	-	60	40	25	25	-	150	4	1	-	5
2		Software Testing and Quality Assurance	4	2	-	60	40	25	-	50	175	4	1	-	5
3		Data Warehousing and Data Mining	3	-	1	60	40	-	-	-	100	3	-	1	4
4		Quantitative Techniques, Communication and Values	4	-	-	60	40	-	-	-	100	4	-	-	4
5		Agile Methodologies	4	-	-	60	40	-	-	-	100	4	-	-	4
6		Information Technology Laboratory- IV	-	2	1	-	-	25	-	50	75	-	1	1	2
7		Vocational Course- IV	-	2	-	-	-	25	25	-	50	-	1	-	1
		Total	**19**	**8**	**2**	**300**	**200**	**100**	**50**	**100**	**750**	**19**	**4**	**2**	**25**
	#MOOC - II		-	-	-	-	-	-	-	-	-	-	-	-	2

*Industry Taught Course - IV

 # Add-on Course - List of MOCC and Vocational Courses will be published by the department before the commencement of respective semester.

Program: B.TECH. (Information Technology)   Semester - VII   CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Project Planning & Management	3	-	-	60	40	-	-	-	100	3	-	-	3
2		Web Services*	4	2	-	60	40	25	-	25	150	4	1	-	5
3		Business Intelligence	4	2	-	60	40	25		25	150	4	1	-	5
4		Elective - I	4	2	-	60	40	25	25	-	150	4	1	-	5
5		Information Technology Laboratory -V	-	2	-	-	-	25		25	50	-	1	-	1
6		Project Stage - I	-	2	-	-	-	50	50		100	-	3	-	3
8		Internship	-	-	-	-	-	-	50	-	50	-	3	-	3
		Total	**15**	**10**	**-**	**240**	**160**	**150**	**125**	**75**	**750**	**15**	**10**	**-**	**25**

*Industry Taught Course - V

Elective - I

1. Software Architecture
2. Information Retrieval
3. User Experience
4. Storage Area Network

Program: B.TECH. (Information Technology)   Semester - VIII   CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Information Security	4	2	-	60	40	25	-	25	150	4	1	-	5
2		Elective - II	4	2	-	60	40	25	25	-	150	4	1	-	5
3		Internet of Things*	4	2	-	60	40	25	-	25	150	4	1	-	5
4		Data Engineering	3	-	-	60	40	-	-	-	100	3	-	-	3
5		Information Technology Laboratory-VI	-	2	-	-	-	25	-	25	50	-	1	-	1
6		Project Stage - II	-	4	-	-	-	50	100		150	-	6		6
		Total	**15**	**12**	**-**	**240**	**160**	**150**	**125**	**75**	**750**	**15**	**10**	**-**	**25**
		#Research Paper Publication	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

*Industry Taught Course - VI
 # Add-on Course

Elective - II

1. Semantic Web Mining
2. Social Analytics in Digital Marketing
3. Management Information System
4. Cyber security

B.Tech. (Information Technology)
Semester-I

Mathematics for Computing-I

TEACHING SCHEME   **EXAMINATION SCHEME**   **CREDIT SCHEME**

Lecture:	3 Hours/Week	End Semester Examination:	60 Marks	Theory	3
Tutorials:	1 Hours/Week	Internal Assessment:	40 Marks	Tutorial	1
Total	4 Hours/Week		100 Marks		4

Course Objective:
To study
1. Linear equations and its basis and dimension.
2. Linear mapping and its matrix representation.
3. Orthogonalization and diagonalization of matrices.

Prerequisite: The students should have knowledge of algebra of matrices and determinants.

Course Outcomes: On completion of the course, students will have the ability to:
1. Apply rank of matrix in solving system of equations.
2. Identify basis and dimension of matrix.
3. Solve problems on kernel and image of linear transformation.
4. Apply linear operator to represent matrix.
5. Evaluate orthogonalization of inner product space.
6. Use methods to find eigen values and eigen vectors.

Unit I   **06 Hours**
System of Linear Equation: Vectors and linear combinations, Rank of a matrix, Gaussian elimination, LU Decomposition, Solving Systems of Linear Equations using the tools of Matrices.

Unit II   **06 Hours**
Vector Spaces: Definition, linear combination, spanning sets subspaces, linear dependence and independence, basis and dimension, rank of matrix.

Unit III   **06 Hours**
Linear Mapping: Linear mapping, Kernel and image of linear mapping, rank and nullity of a linear mapping, singular and non-singular linear mapping

Unit IV   **06 Hours**
Linear mapping and matrices: Matrix representation of linear operator, change of base, similarity matrices

Unit V   **06 Hours**
Inner Product space and orthogonalization: Inner product space, Cauchy-schwarz equality, orthogonality, orthogonal sets and bases, projections, Gramschidt orthogonalization, orthogonal and positive definite matrices, matrix representation of inner produc**t**

Unit VI   **06 Hours**
Diagonalization Eigen values and eigen vectors:
Characteristic polynomial, Cayley-Hamilton theorem, eigen values and eigen vectors, properties.

List of Assignment for Internal Assessment will be framed by respective Course Coordinator.

Textbooks/Reference Books

1. P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volumes I and II), 7th Ed., Pune Vidyarthi Griha Prakashan, Pune, 2013.
2. B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publication, Delhi
3. B.V. Ramana, Higher Engineering Mathematics, 6th Ed., Tata McGraw-Hill, New Delhi, 2008.
4. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Ed., John Wiley & Sons, Inc., 2015.
5. Peter V. O'Neil, Advanced Engineering Mathematics, 7th Ed., Cengage Learning, 2012.
6. Michael Greenberg, Advanced Engineering Mathematics, 2nd Ed., Pearson Education, 1998.

Project Based Learning Assignments*
Note: - *Students in a group of 3 to 4 shall complete any one project from the following list)
Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code for it, wherever applicable.
1. Gauss Elimination method.
2. LU-decomposition method
3. Rank of matrix
4. Linear combination
5. Basis and dimension
6. Spanning sets
7. Kernel and image of linear transformation
8. Rank-nullity theorem
9. Non-singular linear mapping
10. Linear operator
11. Similarity matrices
12. Change of base
13. Cauchy Schwarz equality
14. Orthogonality
15. Gram schmidt Orthoginalization
16. Matrix representation of matrix
17. Cayley-Hamilton theorem
18. Eigen values and Eigen vectors

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Physics for Computing System

TEACHING SCHEME		EXAMINATION SCHEME		CREDIT SCHEME	
Lecture:	03 Hours/Week	End Semester Examination: 60 Marks		Theory	3
Practical:	02 Hours/Week	Internal Assessment:	40 Marks		
		Term Work:	25 Marks	Practical	1
Total	5 Hours/Week		125 Marks		4

Course Objective: To impart knowledge of basic concepts in physics relevant to engineering applications in a broader sense with a view to lay foundation for the Computer Engineering and Science.

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

Course Outcomes: At the completion of the course, the students should be able to**:**
1. Interpret the properties of charged particles to develop modern instruments such as electron microscopy.
2. Appraise the wave nature of light and apply it to measure stress, pressure and dimension etc.
3. Summarize the structure and properties of lasers to their performance and intended applications.
4. Classify the optical fiber, understanding the structure, types and its applications in the field of communication.
5. Solve quantum physics problems to micro level phenomena and solid-state physics.
6. Explain mechanical properties of solid matter, and connect to applications in the field of engineering.

Unit I   **06 Hours**
Modern Physics: Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatics focusing, Electron microscope, Wavelength and resolution, Specimen limitation, Depth of field and focus, Transmission electron microscope (TEM), Scanning electron microscope (SEM), Separation of isotopes by Bainbridge mass spectrograph, Cathode ray tube (CRT).

Unit II   **06 Hours**
Wave Optics
Interference: Interference of waves, interference due to thin film (Uniform and nonuniform (only formula-no derivation is expected), Newton's ring, Applications of interference (optical flatness, highly reflecting films, non-reflecting coatings).
Diffraction: Introduction, Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Plane diffraction grating, Conditions for principal maxima and minima
Polarization: Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism.

Unit III   **06 Hours**
Lasers: Principle of laser, Einstein's coefficients, Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Single Hetro-junction laser, Gas laser: CO_2 laser, Properties of lasers, Laser speckles, Applications of lasers (Engineering/ industry, medicine, Computers).

Unit IV   **06 Hours**
Fiber Optic: Principle of fiber optics, Construction, Numerical Aperture for step index fiber; critical angle, angle of acceptance, V number, number of modes of propagation, types of optical fibers, Fiber optic communication system, advantages, and disadvantages of fiber optics.

Unit V   **06 Hours**
Quantum Mechanics: Dual nature of matter, DeBroglie's hypothesis, Heisenberg's uncertainty principle with illustrations, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box, step potential and potential barrier (analytical discussion), tunnelling effect.

Unit VI   **06 Hours**
Solid state physics: Free electron theory, Density of states, Bloch theorem (Statement only), Origin of band gap, Energy bands in solids, Effective mass of electron, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

Textbooks
1. A Textbook of Engineering Physics, M N Avadhanulu, P G Kshirsagar and TVS Arun Murthy, S. Chand Publishing (2018).
2. Engineering Physics, R K Gaur and S L Gupta, Dhanpat Rai Publishing Co Pvt Ltd (2015)
3. Concepts of Modern Physics, Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, McGraw Hill Education (2017).

Reference Books
1. Fundamentals of Physics, Jearl Walker, David Halliday and Robert Resnick, JohnWiley and Sons (2013).
2. Optics, Francis Jenkins and Harvey White, Tata Mcgraw Hill (2017).
3. Principles of Physics, John W. Jewett, Cengage publishing (2013).
4. Introduction to Solid State Physics, C. Kittel, Wiley and Sons (2004).
5. Principles of Solid-State Physics, H. V. Keer, New Age International (1993).
6. Laser and Non-Linear Optics, B. B. Laud, New Age International Private Limited (2011).
7. Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni, Capital Publishing Company (2014).
8. Science of Engineering Materials- C.M. Srivastava and C. Srinivasan, New Age International Pvt. Ltd. (1997).
9. Introduction to Electrodynamics –David R. Griffiths, Pearson (2013).
10. Renewable Energy: Power for a Sustainable Future, Boyle, Oxford University Press (2012).

List of Laboratory Exercise (Any Eight of the Following)
1. Study of lissajous figure by Cathode Ray Oscilloscope (CRO).
2. Determination of e/m by Thomson method.
3. Determination of radius of planoconvex lens/wavelength of light/Flatness testing by Newton's rings.
4. Determination of wavelength of light using diffraction grating.
5. Determination of resolving power of telescope.

6. Determination of thickness of a thin wire by air wedge.
7. Determination of refractive index for O-ray and E-ray.
8. Determination of divergence of a laser beam.
9. Particle size by semiconductor laser.
10. Determination of wavelength of laser by diffraction grating.
11. To study Hall effect and determine the Hall voltage.
12. Calculation of conductivity by four probe methods.
13. Study of solar cell characteristics and calculation of fill factor.
14. Determination of band gap of semiconductor.
15. Determination of Planck's Constant by photoelectric effect.

Project Based Learning Assignments*

Note: - *Students in a group of 3 to 4 shall complete any one project from the following list.
1. Measurement and effect of environmental noise in the college
2. Design and simulation of automatic solar powered time regulated water pumping
3. Solar technology: an alternative source of energy for national development
4. Design and construction of digital distance measuring instrument
5. Design and construction of automatic bell ringer.
6. Design and construction of remote-control fan
7. Design and construction of sound or clap activated alarm
8. Electronic eye (Laser Security) as auto switch/security system
9. Electric power generation by road power
10. Determination of absorption coefficient of sound absorbing materials
11. Determination of velocity of O-ray and E-ray in different double refracting materials
12. Need of medium for propagation of sound wave
13. Tesla Coil
14. Thin film interference in soap film-formation of colors
15. LiFi- wireless data transfer system using light

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Computer Aided Drafting

TEACHING SCHEME		EXAMINATION SCHEME		CREDIT SCHEME	
Lecture:	4 Hours/Week	End Semester Examination: 60 Marks		Theory	4
Practical:	2 Hours/Week	Internal Assessment: 40 Marks		Practical	1
		Term Work :	50 Marks		
Total:	6 Hours/Week		150 marks		5

Course Objectives:
To provide knowledge about
1. Fundamentals of engineering drawing and curves.
2. Isometric views and projection.
3. Projections of points, lines, planes & solids.
4. Use of CAD tools.

Prerequisite: The students should have knowledge of
Basics of mathematics at secondary school level

Course Outcomes: On completion of the course, students will have the ability to:
1. Understand dimensioning methods and drawing of engineering curves.
2. Draw orthographic projections using 1st angle method of projection*.
3. Draw Isometric views from given orthographic projections*.
4. Draw projection of Lines, its traces, and projections of planes*.
5. Draw projection of different solids*.
6. Draw development of lateral surfaces of solids*.
   *Using CAD tools

Unit I   08 Hours
Lines and Dimensioning in Engineering Drawing and Engineering Curves:
Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.
Ellipse by Arcs of Circle method, Concentric circle method. Involutes of a circle, Cycloid, Archimedean Spiral, Helix on cone & cylinder, Introduction to Auto CAD commands.

Unit II   08 Hours
Orthographic Projections: Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views, and types of cutting planes and their representation, hatching of sections. (Also using AutoCAD commands).

Unit III   08 Hours
Isometric Projections: Isometric view, Isometric scale to draw Isometric projection, non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view. (Also using AutoCAD commands).

Unit IV   **08 Hours**

Projections of Points, Lines and Planes: Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines,

Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP. (Also using AutoCAD commands).

Unit V   **08 Hours**

Projection of Solids: Projection of prism, pyramid, cone and cylinder by rotation method. (Also using AutoCAD commands).

Unit VI   **08 Hours**

Development of Lateral Surfaces of Solids: Introduction to development of lateral surfaces and its Industrial application, draw the development of lateral surfaces of cone, pyramid, and prism. (Also using AutoCAD commands).

Textbooks
1. "Elementary Engineering Drawing", N. D. Bhatt, Charotar Publishing house, Anand India.
2. "AutoCAD 2020 Beginning and Intermediate", Munir Hamad, Mercury Learning & Information Publication, 2019.
3. "Engineering Drawing and Graphics", Venugopal K., New Age International publishers.

Reference Books
1. "Textbook on Engineering Drawing", K. L. Narayana & P. Kannaiah, Scitech Publications, Chennai.
2. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi.
3. "Engineering Drawing", M. B. Shah and B.C. Rana, 1st Ed, Pearson Education, 2005
4. "Engineering Drawing", P. J. Shah, C. Jamnadas and Co., 1st Edition,1988
5. "Engineering Drawing (Geometrical Drawing)", P. S. Gill, 10th Edition, S. K. Katariaand Sons, 2005.

List of Laboratory Exercise
All sheets should be completed using AutoCAD.

List of Drawing Sheets
1. Types of lines, Dimensioning practice, free-hand lettering, 1nd and 3rdangle methods symbol.
2. Engineering curves.
3. Orthographic Projections.
4. Isometric views.
5. Projections of Points and Lines and planes.
6. Projections of Solids.
7. Development of lateral surfaces

List of Assignments: Assignment questions are supposed to be solved in A3 size sketchbook
1. At least 4 questions on engineering curves.
2. At least 2 questions on orthographic projections without sections.
3. At least 2 questions on sectional orthographic projections.
4. At least 2 questions on isometric views.
5. At least 4 questions on projections of lines.

6. At least 4 questions on projections of planes.
7. At least 4 questions on projections of solids.
8. At least 4 questions on development of lateral surfaces.

Project Based Learning Assignments*
Note:- *Students in a group of 3 to 4 shall complete any one project from the following list)
1. To obtain industrial drawings to identify the types of lines, dimensioning methods and method of projection.
2. To develop the model/charts based on engineering curves.
2. To prepare model/chart for identification of engineering curves in nature for industrial, societal etc application.
4. To demonstrate different methods of orthographic projection.
5. To demonstrate projection of Points.
6. To demonstrate projection of Lines.
7. To demonstrate projection of Planes.
8. To demonstrate projection of Solids.
9. To demonstrate developments of surfaces for solids.
10. To demonstrate industrial application of development of surfaces such as steam carrying pipes, Ducts of air conditioning systems, etc.
11. To demonstrate Isometric projection method through model of a cube.
12. To obtain industrial drawings to identify the types of lines, dimensioning methods, and method of projection.
13. To develop the model/charts based on engineering curves.
14. To prepare model/chart for identification of engineering curves in nature for industrial, societal, etc application.
15. To demonstrate different methods of orthographic projection.

Syllabus for Unit Tests:

Unit Test-1	Unit-I, Unit-II, Unit-III
Unit Test-2	Unit-IV, Unit-V, Unit-VI

Digital Electronics		
TEACHING SCHEME	**EXAMINATION SCHEME**	**CREDIT SCHEME**
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory 4
Practical: 2 Hours/Week	Internal Assessment: 40 Marks	Practical 1
	Term Work: 25 Marks	
Total 6 Hours/Week	125 Marks	5

Course Objective:
1. To present the Digital fundamentals, Boolean algebra and its applications in digital systems.
2. To familiarize with the design of various combinational digital circuits using logic gates
3. To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits.
4. To understand the various semiconductor memories and related technology.

Prerequisite: Physics, Mathematics, Basics of electrical engineering

Course Outcomes: On completion of the course, students will have the ability to:
1. Comprehend different number systems and Boolean algebraic principles.
2. Apply logic design minimization techniques to simplify Boolean expressions
3. Analyze and design combinational logic circuits.
4. Demonstrate the operations of systems with sequential circuit elements.
5. Comprehend characteristics and structure of Programmable Logic Devices and Memory.
6. Draw ASM charts for sequential circuit design.

Unit I   08 Hours
Digital systems:
Number Systems: Introduction to Number Systems-Decimal, Binary, Octal, Hexadecimal, Conversion of number system, Representation of Negative Numbers, 1's complement and 2's complement.
Binary Arithmetic: Binary addition, Binary subtraction, Subtraction using 1's complement and 2's complement, Binary multiplication, and division.
Digital Codes: BCD code, Excess-3 code, Gray code and ASCII code.
Logic Gates: Logical Operators, Logic Gates-Basic Gates, Universal Gates, realization of other gates using universal gates.

Unit II   08 Hours
Logic Design Minimization: Boolean algebra, De Morgan's Theorems, Standard representation of logic functions, Sum of Product (SOP) form, Product of Sum (POS) form, Simplification of logical functions, Minimization of SOP and POS forms using Karnaugh-Maps up to 4 variables Don't care condition, Quine-McCluskey Method.

Unit III   08 Hours
Combinational Circuits: Binary and BCD arithmetic, Half Adder, Full Adder, Half Subtractor, Full Subtractor, Binary Adder (IC 7483), BCD adder, Code converters, Multiplexers, De multiplexer, Decoder (IC 74138) and their use in combinational logic design, Priority Encoder, Digital Comparators, Parity generators and Checker (IC 74180), ALU.

Unit IV   **08 Hours**

Sequential Circuits: Flip- flop: SR, JK, D, T flip flops, Truth Tables and Excitation tables, Conversion from one type to another type of Flip Flop.
Registers: Buffer register, Shift register.
Counters: Asynchronous counters, Synchronous counters, Modulus counters

Unit V   **08 Hours**

FSM and ASM charts: Introduction to FSM, Moore and Mealy State machine, state machine as a sequential controller. Design of state machines: state table, state assignment, transition/excitation table, excitation maps and equations, logic realization, ASM chart notations, ASM block, State diagram, ASM chart for sequential circuits, Multiplexer Controller.

Unit VI   **08 Hours**

Memory and PLD: Semiconductor memories: memory organization, memory expansion, Classification and characteristics of memories, RAM, ROM, EPROM, EEPROM, NVRAM, SRAM, DRAM. Programmable logic devices: Study of PROM, PAL, PLAs. Architecture of PLA, designing combinational circuits using PLDs.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks
1. M. Morris Mano and M. D. Ciletti, Digital Design, Pearson Education.
2. R. P. Jain, Modern Digital Electronics, Tata McGraw Hill Publication.
3. F.J. Hill and G.L. Peterson, Switching Theory and Logic Design, John Wiley
4. J.F. Wakerly "Digital Design: Principles and Practices", 3rd edition, 4th reprint, Pearson Education, 2
5. David J. Comer, Digital Logic & State Machine Design, Oxford University Press.
6. Digital Integrated Electronics- H.Taub & D.Shilling, Mc Graw Hill.

List of Laboratory Exercises:
1. Verify truth tables of logic gates. (AND, OR, XOR, NOT, NAND, NOR). Simplify the given Boolean expression using K-map and implement using gates
2. State De-Morgan's theorem and write Boolean laws. Implement NAND and NOR as Universal gates.
3. Design (truth table, K-map) and implement half and full adder/subtractor.
4. Design (truth table, K-map) and implement 4-bit BCD to Excess-3 Code converters.
5. Study of magnitude Comparator using IC 7485.
6. Implement of logic functions using multiplexer IC 74151 (Verification, cascading & logic function implementation).
7. Implement logic functions using 3:8 decoder IC 74138.
8. Verify truth tables of different types of flip flops.
9. Design (State diagram, state table & K map) and implement 3 bits Up and Down Asynchronous and Synchronous Counter using JK flip-flop.
10. Design and implement modulo 'n' counter with IC 7490.

Project Based Learning Assignments*
Note: - *Students in a group of 3 to 4 shall complete any one project from the following list)
1.Survey report of basic gates ICs 7432, 4011, 4050, 4070,4071,40106
2. Implement combinational logic Circuit of given Boolean Equation.
3. Implement Half Adder and Half Subtractor.

4. Implement Full Adder using two Half Adders
5. Build 4-bit parallel Adder / Subtractor using IC.
6. Build Code Converters: Binary to Gray
7. Build Code Converters: Excess 3 to Binary)
8. Implement Two Bit Magnitude Comparator using IC 7485
9. Implement given combinational logic using MUX
10. Implement 7 segment decoder driver using IC 7447.
11. Build a Decade counter and Up-Down Counter.
12. Build a Shift Registers: SISO and SIPO
13. Implement the Johnson Counter and Ring Counter.
14. Survey Report on Static I/O and transfer Characteristic of TTL and CMOS.

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit –V, Unit - VI

Structured Programming

TEACHING SCHEME　　　**EXAMINATION SCHEME**　　　**CREDIT SCHEME**

Lecture:	4 Hours/Week	End Semester Examination:	60 Marks	Theory	4
Practical:	2 Hours/Week	Internal Assessment:	40 Marks		
		Term Work	50 Marks	Practical:	1
		Practical:	50 Marks		
Total	**6 Hours/Week**		**200 Marks**		**5**

Course Objective:

1. To build the programming skills using 'C' to solve real world problems.
2. To provide an overview of fundamental principles, concepts, and constructs of computer programming.

Prerequisite:

Basic knowledge of Computer Handling.

Course Outcomes: On completion of the course, students will have the ability to:

1. Apply steps towards problem solving.
2. Apply fundamental concepts of programming language.
3. Implement conditional, branching and iteration
4. Decompose a problem into functions.
5. Apply programming to solve simple numerical method problems.
6. Exercise structures to formulate programs.

Unit I　　　　　　　　　　　　　　　　　　　　　　　　　08 Hours

Introduction to Computing: Components of computer system, concept of hardware and software, introduction to system software- operating system, editor, compiler, assembler, linker, loader, introduction to computer programming, types of programming languages, software development life cycle, problem solving techniques- fundamental stages of problem solving, define the problem, -designing- development of an algorithm, algorithm design tools- flowcharts, pseudo codes.

Unit II　　　　　　　　　　　　　　　　　　　　　　　　　08 Hours

Programming language 'C': Features of C, header files, pre-processor directives, compiling and executing a C program, syntax and semantic errors, libraries, structure of a C program, declarations, constants, variables, data types, operators and expressions, precedence and associativity of operators, type conversions, input, and output functions- printf and scanf.

Unit III　　　　　　　　　　　　　　　　　　　　　　　　08 Hours

Control Structures: if-else statement, nested if-else, use of logical operators, Loop control structure: for, while, do-while loops, use of break and continue, Case control structure: switch case
Pointers: Concept, pointer declaration, assignment, initialization, and access.

Unit IV　　　　　　　　　　　　　　　　　　　　　　　　08 Hours

Function: Types of functions, function definition and declaration, function prototype, calling and returning function, passing values between functions, standard library functions and user defined functions, passing array as function parameter, call-by-value, call-by-reference, recursive function.

Unit V   **08 Hours**

Arrays: Concept, declaration, initialization, processing with array, one and multidimensional array, pointer to an array, use of array for searching techniques: linear and binary search. sorting techniques: bubble sort, insertion sort, selection sort, applications of array in image processing.

Strings: concept, declaration, initialization, and standard string library functions.

Unit VI   **08 Hours**

Structures: Concept, declaration, accessing structure elements, array of structures, pointer to structures, self-referential structures, use of structures, union.

Introduction command line concepts, programs using command line argument.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks

1. Brian W. Kernighan, Dennis M. Ritchie, "The C Programming Language", Prentice Hall, ISBN 0131103628.
2. Donald E. Knuth, "The Art of Computer Programming", Addison-Wesley, ISBN-10: 0201485419, ISBN13: 978-0201485417.
3. T. E. Bailey, "Program design with pseudo code", Brooks/Cole Publisher, ISBN-10 : 0534055745, ISBN-13: 978-0534055745.
4. Kanetkar Yashavant P, "Let us C", BPB publications.
5. Subrata Saha and Subhodip M., "Basic Computation and Programming with C", Cambridge University of Press, India, ISBN:9781316601853.

Reference Books

1 Lamey Robert, "Logical problem solving", Prentice Hall, ISBN: 9780130618825.
2 Henry Mullish, Herbert L. Cooper, "The Spirit of C", Thomson Learning, ISBN 0314285008.

List of Laboratory Exercise
1. Write a program to accept the length of three sides of a triangle and to test and print the type of triangle as equilateral, isosceles or right angled or none.
2. Write a program to check whether input number is Prime or not with and without use of recursive function.
3. Write a program to separate digits of input 4-digit integer, separate and display its digits.
4. Write a program to implement linear and binary search techniques.
5. Write a program to implement sorting techniques: Bubble, Selection, and Insertion sorting.
6. Write a program to accept a string and to display the following:
   (a) Total number of characters in the string.
   (b) Total number of vowels in the string.
   (c) Total number of occurrences of character in the string.
   (d) Check whether string is palindrome or not.
7. Write a program to carry out following operations on strings using library functions.
   (a) To concatenate a string S2 to string S1.
   (b) To find the length of a given string.
   (c) To compare two strings S1 and S2.
   (d) To copy a string S2 to another string S1.
8. A class teacher wants to keep record of 10 students in the class along with the names and marks obtained in 5 subjects. Write a C program with function that displays.
   (a) Name of the student with highest marks in a particular subject.

      (b) Overall percentage result of the class.

      (c) Total number of passing students in the class.

      (d) Total number of students failing in one subject.

9. Write a program with function to swap values of two elements (call by reference).

Project Based Learning Assignments*

Note:- *Students in a group of 3 to 4 shall complete any one project from the following list)

1. Design and develop a project for Diary management System
2. Design and develop a project for Calendar using C
3. Design and develop a project for Contact Management System
4. Design and develop a project for Library Management System
5. Design and develop a project for Snake Game
6. Design and develop a project for Bus Reservation system
7. Design and develop a project for Hospital Management system
8. Design and develop a project for Employee management system
9. Design and develop a project for Diary management System
10. Design and develop a project for Calendar using C
11. Design and develop a project for Contact Management System
12. Design and develop a project for Library Management System

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit – III
Unit Test -2	Unit – IV, Unit –V, Unit - VI

Computer System Workshop Technology

TEACHING SCHEME	EXAMINATION SCHEME	CREDIT SCHEME

Practical:	2 Hours/Week	Practical : 25 Marks	Practical:	1
Tutorial:	1 Hours/Week	Term work: 25 Marks	Tutorial:	1
Total	3 Hours/Week	50 Marks		2

Course Objective:
Provide student a knowledge of computer hardware and networking, enabling them to identify computer hardware, software and network related problems, and develop an ability to use the basics of computing, necessary for computing courses.

Prerequisite: Basic knowledge of Computer and Electronics.

Course Outcomes: On completion of the course, students will have the ability to:
1. Identify the architecture of a computer and its different components, including their technology evolution.
2. Apply their knowledge about computer peripherals to identify problems.
3. Install and uninstall given software step-by-step.
4. Configure local area network to access the Internet.
5. Prepare document using Latex.
6. Use GitHub tool for coding and collaboration.

Unit I   08 Hours
Computer hardware peripherals: Introduction to hardware components, random access memory (RAM), Types Of RAM & their speed, tips for buying ram, how to add memory to a computer, problems when installing memory, Central Processing Unit (CPU), Types Of CPU: considerations when buying a new CPU (Types & Differences), different speeds available for CPU and what do they mean, 32 Bit vs 64 Bit – Which One To Choose &Why? How to choose a CPU type for different needs? Graphic Card & Types, How to install a Graphics Card, Installing a CD or DVD burner, Jumper Switch settings, Hard Disk upgrade, Different ports and why we use them - USB, PS2, DivX, Graphic card & types, Virtual Memory and how to configure it for optimum system performance.

Unit II   08 Hours
Assembly of Computer and Software Installations: Assembling the motherboard, Replacing fan, how to avoid common mistakes during assembly, Installation of system software: Operating system (Windows and Linux),Installations step for operating system, Dual booting, Configure the BIOS, Installation of Antivirus, Installation of the open source software such as Scilab, Latex Installation of MS Office.

Unit III   08 Hours
Basic Diagnostic of Hardware and Software: Diagnosis of Power Up problem, Boot Drive, Errant Keyboard, mouse problems, slow computer performance, Computer freezes and displays BSOD (Blue screen of death), no display on monitor, no sound, computer rebooting or turning itself off, how to troubleshoot a computer that does not boot, Registry Cleaner.

Unit IV   **08 Hours**

Computer network environments: Network connecting devices. Configure the TCP/IP setting, connect to Local Area Network and access the Internet, Configuring Wireless network. Server and Its Configuration, Email Clients, Browsers, Office tools, customize web browsers with the LAN proxy settings, bookmarks, search toolbars and pop-up blockers, Browsing netiquettes and cyber laws. Cloud Access Tools.

Unit V   **08 Hours**

Configuration of External devices: Physical set-up of Printers- Performing test print out, Printing of document etc, Scanner set-up, Webcam, Bluetooth device, Memory card reader etc.

Unit VI   **08 Hours**

Productivity tools: Open-Source Tools Such as Latex, GitHub.
Latex: Format words, lines, and paragraphs, design pages, create lists, tables, references, and figures in LaTeX. Introduction to LaTeX Packages and classes. Using Git, Version Control Systems, interacting with GitHub, Reverting Changes, Creating Pull Requests.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks:
1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2. PC Hardware and A+Handbook – Kate J. Chase PHI (Microsoft).
3. LaTeX Companion – Leslie Lamport, PHI/Pearson.
4. https://nptel.ac.in/courses/106/105/106105081/.
5. http://nptel.ac.in/courses/106105084/.
6. https://guides.github.com/.
7. Introduction to Linux: Installation and Programming, N B Venkateswarlu, BS Publication.

Reference Books
1. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.
2. Computer Fundamentals, MS Office, and Internet & Web Technology by Dinesh Maidasani.

List of Laboratory Exercise
1. Demonstrate the Computer Hardware Components and explain its working.
2. Demonstrate the Networking Components and explain its working.
3. Installation of operating system MS windows, Unix on the personal computer
4. Installation of Application software Latex, MS office on the personal computer
5. Troubleshooting hardware related problem.
6. Customize web browsers with the LAN proxy settings, bookmarks, search toolbars and pop-up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.
7. Execution of Important "layout" and formatting commands in Latex,
8. Installation of Antivirus and customize the browsers to block pop ups, block active x downloads to avoid viruses and/or worms

9. Assignment on Pull request, code review and collaboration using GitHub.

Project Based Learning Assignments
Note: - *Students in a group of 3 to 4 shall complete any one project from the following list
1. Collect specifications of similar types of hardware and software and prepare report comparing them
2. Assembling and disassembling the PC back to working condition.
3. Installation of operating systems LINUX on Server and different packages on a PC.
4. Practice hardware troubleshooting exercises related to various components of computer like monitor, drives, memory devices, printers etc. and software troubleshooting related to BIOS etc
5. To start your own computer repair workshop. What would your initial planning involve? What would you look for in terms of building, furnishings, tools and any other equipment that you can think of?
6. Cyber Hygiene: Installing antivirus for Windows.
7. Prepare the report of need of programming language in 21st century.
8. Collect various types of computer hardware and prepare summary report
9. Prepare Seminar report using LaTeX.
10. Prepare Project report using LaTeX.

B.Tech(Information Technology)

Semester-II

Mathematics for Computing-II

TEACHING SCHEME		EXAMINATION SCHEME		CREDIT SCHEME	
Lecture:	3 Hours/Week	End Semester Examination:	60 Marks	Theory	3
Tutorials	1 Hour/Week	Internal Assessment:	40 Marks	Tutorial	1
Total	4 Hours/Week		100 Marks		4

Course Objectives:

1. Fourier series and integral transforms.
2. Multiple integrals and its applications.
3. Vector calculus and its applications.

Prerequisite: The students should have knowledge of vector algebra, derivative and integration.

Course Outcomes: On completion of the course, students will have the ability to:
1. Use periodic functions as Fourier series.
2. Apply methods of finding Fourier and Z-transforms.
3. Apply methods of Laplace transform of piecewise continuous functions.
4. Identify concepts of double and triple integrals.
5. Apply vector derivative for physical quantities.
6. Evaluate line, surface, and volume integrals.

Unit I   **06 Hours**
Fourier Series: Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis.

Unit II   **06 Hours**
Fourier Transform (FT): Complex Exponential Form of Fourier series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory.
Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.

Unit III   **06 Hours**
Laplace Transform and its application: Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz., Periodic, Unit Step, Unit Impulse, ramp, jump, Problems on finding LT & inverse LT. Applications of LT and Inverse LT for solving ordinary differential equations.

Unit IV   **06 Hours**
Multiple Integrals and their Application: Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values, moment of inertia, centre of gravity.

Unit V   **06 Hours**
Vector Differential Calculus: Physical interpretation of Vector differentiation, Vector differential operator, Gradient, Divergence and Curl, Directional derivative, Solenoidal, Irrotational and Conservative fields, Scalar potential, Vector identities.

Unit VI   **06 Hours**
Vector Integral Calculus and Applications: Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence theorem, Stoke's theorem. Applications to problem in engineering.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks/Reference books:

1. P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volumes I and II), 7th Ed., Pune Vidyarthi GrihaPrakashan, Pune, 2013.
2. B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publication, Delhi
3. B.V. Ramana, Higher Engineering Mathematics, 6th Ed., Tata McGraw-Hill, New Delhi, 2008.
4. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Ed., John Wiley & Sons, Inc., 2015.
5. Peter V. O'Neil, Advanced Engineering Mathematics, 7th Ed., Cengage Learning, 2012.

Project Based Learning Assignments
Note:- *Students in a group of 3 to 4 shall complete any one project from the following list
Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code for it, wherever applicable.

1. Fourier series
2. Harmonic analysis
3. Fourier transform
4. Z-Transform
5. Laplace transform technique to solve ODE
6. Multiple Integral to evaluate area and volume
7. Directional derivative
8. Divergence and curl
9. Greens theorem
10. Gauss Divergence Theorem
11. Stokes theorem
12. Unit step function
13. Solenoidal and irrotational fields
14. Simple difference equation

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Organic and Electrochemistry

TEACHING SCHEME		EXAMINATION SCHEME		CREDIT SCHEME	
Lectures:	3 Hours/Week	End Semester Examination:	60 Marks	Theory	3
Practical:	2 Hours/Week	Internal Assessment:	40 Marks	Practical	1
		Term Work:	25 Marks		
Total	5 Hours/Week		125 Marks		4

Course Objective:
The student should acquire the knowledge of
1. To develop the interest among the students regarding chemistry and their applications in engineering.
2. To develop confidence among students about chemistry, how the knowledge of chemistry is applied in technological field.
3. The student should understand the concepts of chemistry to lay the groundwork for subsequent studies in the computing field.

Prerequisite: Capacitor, insulator, classification and properties of polymers, electromagnetic radiation, electrochemical series

Course Outcomes: On completion of the course, students will be able to:
1. Differentiate between ionic and covalent bonding and classify the bonding in a compound as ionic or covalent.
2. Develop a working knowledge of the twelve fundamental principles of green chemistry and what it is all about.
3. Apply standard reduction potential data to determine the relative strength of oxidizing/reducing agents.
4. Demonstrate the knowledge of polymer materials for futuristic engineering applications.
5. Describe the properties of materials and Application of semiconductor electronics
6. Describe the manufacturing and refining process of fuels and lubricants.

Unit I 06 Hours
Chemical Bonding in Molecules: MO theory, Structure, bonding and energy levels of bonding and shapes of many atom molecules, Coordination Chemistry, Electronic spectra and magnetic properties of complexes with relevance to bio-inorganic chemistry, organ metallic chemistry.

Unit II 06 Hours
Green Chemistry: Introduction, Twelve Principles of Green chemistry, numerical on atom economy, synthesis, adipic acid and indigo. Organic dye-Traditional methods of organic dye. Green solvents (ionic liquid supercritical CO_2), and products from natural materials.

Unit III 06 Hours
Electrochemistry: Electrochemical cells and Galvanic cells, EMF of a cell, Single electrode potential, Nernst equation, Electrochemical series, Types of electrodes, Reference electrodes, pH, pOH, acids and basis, Fuel cells, Construction and Working of - Acid and Alkaline Storage Battery, Dry Cell, Ni-Cd Batteries, Li-Ion Batteries, Li-Po Batteries.

Unit IV   **06 Hours**
Polymers for the Electronics Industry: Polymers, Conduction mechanism, Preparation of conductive polymers, Polyacetylene, Poly (p-phenlylene), Polyhetrocyclic systems, Polyaniline Poly (Phenylene sulphide), Poly (1,6-heptadiyne), Applications, Photonic applications.

Unit V   **06 Hours**
Semi-Conductors, Insulators and Superconductors: Semi conductivity in non-elemental materials, Preparations of semiconductors, Chalcogen photoconductors, photocopying process Introduction to Superconductors, types of Superconductors, Properties of superconductors, Applications of Superconductors, Electrical insulators, or Dielectrics.

Unit VI   **06 Hours**
Fuels and Lubricants: Classification of fuels, Calorific values, Comparison between solid, liquid and gaseous fuels, Theoretical calculation of calorific value of a fuel, Selection of coal, analysis of coal, Natural Gas, Producer gas, water gas, Lubricants, Mechanism of lubrication, classification of lubricants, lubricating oils, Solid lubricants, Greases or Semi-Solid lubricants, Synthetic lubricants, Lubricating emulsions, Properties of lubricating oils.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks
1. Polymer Science and technology (2nd Edition), P. Ghosh, Tata McGRAW Hill, 2008.
2. Polymers: Chemistry & Physics of Modern Materials (2nd edition) J.M.G.Cowie, Blackie Academic & Professional, 1994.
3. A Textbook of Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Co, 2004.
4. Engineering Chemistry (16th Edition) Jain, Jain, Dhanpat Rai Publishing Company, 2013.
5. Inorganic Chemistry (4th edition), D. F. Shrives and P. W. Atkins, Oxford University, Oxford, 2006.
6. Applications of Absorption Spectroscopy of Organic Compounds (4th edition), John R. Dyer, Prentice Hall of India Pvt. Ltd., 1978.
7. Reactions, Rearrangements and Reagents (4th edition), S. N. Sanyal, Bharti Bhawan (P & D), 2003.

List of Laboratory Exercise
1. Determination of Hardness of water sample by EDTA method.
2. Determination of Chloride content in water sample by precipitation titration method.
3. To determine strength of acid by pH – metric Titration
4. To measure the Conductance of a solution by conductometric titration
5. Measurement of Surface tension of a given liquid by Stalagmometer.
6. Determination of viscosity of a given liquid by Ostwald's Viscometer.
7. Determination of Saponification value of an oil sample.
8. To determine alkalinity water sample.
9. Determination of Hardness of water sample by EDTA method.
10. Determination of Chloride content in water sample by precipitation titration method.
11. To determine strength of acid by pH – metric Titration
12. To Prepare Phenol formaldehyde/Urea formaldehyde resin.
13. To study set up of Daniel cell.

Project Based Learning Assignments
Note: - *Students in a group of 3 to 4 shall complete any one project from the following list

1. Green Chemistry approach to Nano-Structured Electronics
2. Assessment of Environmentally Benign Photopolymers as an Alternative to the Use of Formaldehyde Based Textile Finishing Agents
3. Solvent-Free Synthesis of Phthalocyanines
4. Synthesis of Conjugated Polymers and Molecules Using Sugar Reagents and Solventless Reactions
5. Environmentally Benign Control of Polymer Solubility: Photoresist Materials Using DNA Mimics
6. Enzymatic Synthesis of Non-Formaldehyde Phenolic Polymers: Control of Hydrogen Peroxide Concentration.
7. The materials chemistry and electrochemistry of lithium and sodium-ion batteries
8. Electroplating- the principles, how different metals can be used and the practical applications
9. Electroplating, Metal Polishing, Anodizing, Phosphating Metal Finishing and Powder Coating Projects.
10. To determine calorific value of a fuel by any suitable method
11. To study various properties of lubricants
12. To study various types of lubricants and its properties.
13. To determine quality of coal sample & its analysis.
14. To study mechanism of lubrication.
15. To study coal analysis & its significance.

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit –V, Unit - VI

Electrical Technology		
TEACHING SCHEME	**EXAMINATION SCHEME**	**CREDIT SCHEME**
Lecture: 4 Hours/Week	**End Semester Examination:** 60 Marks	**Theory** 4
Practical: 2 Hours/Week	**Internal Assessment:** 40 Marks	
	Term Work: 25 Marks	**Practical** 1
Total 6 Hours/Week	125 Marks	5

Course Objective:

To study of power system basics, magnetic circuits electrical machines, transformers, wiring, measurements, illumination and batteries.

Course Outcomes: On completion of the course, students will have the ability to:

1. Explain the various parameters related to magnetic circuit.
2. Describe basic concepts of AC fundamentals and circuits.
3. Illustrate constructional features and describe different parameters of transformer.
4. Describe basic concepts of power system and three phase circuits.
5. Demonstrate AC and DC electrical machines.
6. Classify types of batteries.

Unit I   **08 Hours**

Magnetic Circuits: Magnetic effect of electric current, Cross & Dot Convention, Right hand thumb rule, Concept of flux, flux linkages, magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability Kirchhoff's laws for magnetic circuits. Magnetic circuit concepts, analogy between electric & magnetic circuits, magnetic circuits with DC and AC excitations, magnetic leakage, B-H curve, hysteresis and eddy current losses, magnetic circuit calculations, mutual coupling

Unit II   **08 Hours**

AC Fundamentals and circuits: AC Fundamentals: Sinusoidal, square and triangular waveforms – average and effective values, form and peak factors, concept of phasor, phasor representation of sinusoidal varying voltage and current. Analysis of series, parallel and series parallel RLC Circuits: apparent, active & reactive powers, power factor, causes and problems of low power factor, power factor improvement; resonance in series and parallel circuits, bandwidth and quality factor (simple numerical problems.

Unit III   **08 Hours**

Single Phase Transformer: Faradays law of electromagnetic induction, statically and dynamically induced e.m.f, self-inductance, mutual inductance, coefficient of coupling. Single Phase Transformer: Principle of operation, construction, e .m. f. equation, voltage ratio, current ratio, KVA rating ,determination of efficiency and regulation by direct load test, equivalent circuit, power losses,(simple numerical problems), introduction to auto transformer. Three phase transformer and its different winding connections.

Unit IV   **08 Hours**

Introduction to Power System and Three Phase Circuits: General layout of electrical power system and functions of its elements, standard transmission and distribution voltages, concept of grid (elementary treatment only) Power generation to distribution through overhead lines and underground cables with single line diagram. Three phase system-its necessity and advantages, meaning of phase

sequence, star and delta connections, balanced supply and balanced load, line and phase voltage/current relations, three phase power and its measurement (simple numerical problems).

Unit V   **08 Hours**
Electrical Machines: DC & AC: Principles of electromechanical energy conversion, DC machines: types, e. m. f. equation of generator and torque equation of motor, characteristics, and applications of dc motors (simple numerical problems). Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications. Three Phase Induction Motor: types, Principle of operation, slip-torque characteristics, applications (numerical problems related to slip only).

Unit VI   **08 Hours**
Batteries: Basic idea of primary and secondary cells, Construction, working principle and applications of Lead-Acid, Nickel Cadmium and Silver-Oxide batteries, Charging methods used for lead-acid battery (accumulator), Care and maintenance of lead-acid battery, Series and parallel connections of batteries, General idea of solar cells, solar panels and their applications, Introduction to maintenance free batteries, Safe disposal of Batteries; Fuel cell: Principle & Types of fuel cell.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks:
1. B.L.Theraja, A Textbook of Electrical Technology, Vol.1, S.Chand& Company Ltd. New Delhi
2. V.K.Mehta, Basic Electrical Engineering, S Chand & Company Ltd. New Delhi.
3. J.Nagarath and Kothari, Theroy and applications of Basic Electrical Engineering, Prentice Hall of India Pvt. Ltd.

Reference Books:

1. Electrical Technology - Edward Huges (Pearson).
2. Basic Electrical Engineering - D. P. Kothari, J Nagarath (TMC).
3. Electrical power system technology - S. W. Fordo, D. R. Patric (Prentice Hall).
4. Electrical, Electronics Measurements and Instruments - (Satya Prakashan).

Project Based Learning Assignments
Note: - *Students in a group of 3 to 4 shall complete any one project from the following list

1. Building a small resistive load lamp bank.
2. Building a small resistive load lamp bank for various types of connections like series, parallel, star, delta
3. Building a small inductive load lamp bank for various types of connections like series, parallel, star, delta
4. Building a small capacitive load lamp bank for various types of connections like series, parallel, star, delta
5. Building a small resistive load lamp bank
6. Building a staircase wiring model on a board
7. Building a Go down wiring model on a board
8. Rewinding of a choke
9. Rewinding of a small transformer
10. Building a small rectifier circuit on bread board
11. Building a mobile charger circuit on a bread board

12. Building an electric buzzer circuit
13. Building a solar charger for mobile phone
14. Building a small wind turbine
15. Small Agricultural pump model with DC motor
16. Small Agricultural pump model with AC motor

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Object Oriented Programming

TEACHING SCHEME		EXAMINATION SCHEME		CREDIT CHEME	
Lecture:	4 Hours/Week	End Semester Examination:60 Marks		Theory	4
Practical:	2 Hours/Week	Internal Assessment:	40 Marks	Practical	1
		Term Work :	25 Marks		
		Practical:	50		
Total	6 Hours/Week		175 Marks		5

Course Objective:
The course focuses on the understanding and practical mastery of object-oriented concepts such as classes, objects, data abstraction, methods, method overloading, inheritance, and polymorphism.

Prerequisite:
Basics of C Programming.

Course Outcomes: On completion of the course, students will have the ability to:
1. Differentiate between top-down and bottom-up programming approach.
2. Associate the object-oriented programming approach in connection with C++.
3. Apply the concepts of array and operator overloading.
4. Implement basic concepts of inheritance.
5. Illustrate the process of data file manipulations using C++
6. Use the concepts of Templates and Exceptions.

Unit I   **08 Hours**
Introduction to OOP: Programming characteristics of object-oriented languages. Comparison between C and C++. C++ Programming basics: Output using cout. Directives. Input with cin. Type bool. The setw manipulator. Type conversions.

Unit II   **08 Hours**
Functions: Returning values from functions. Reference arguments. Overloaded function. Inline function. Default arguments. Returning by reference.
Object and Classes: Making sense of core object concepts (Encapsulation, Abstraction, Polymorphism, Classes, Messages Association, Interfaces) Implementation of class in C++, C++ Objects as physical object, C++ object as data types of constructor. Object as function arguments. The default copy constructor, returning object from function. Structures and classes. Classes objects and memory static class data. Const and classes.

Unit III   **08 Hours**
Arrays and string: arrays fundamentals. Arrays as class Member Data: Arrays of object, string, The standard C++ String class
Operator overloading: Overloading unary operations. Overloading binary operators, data conversion, pitfalls of operators overloading and conversion keywords. Explicit and Mutable.

Unit IV   **08 Hours**
I**nheritance**: Concept of inheritance. Derived class and based class. Derived class constructors, member function, inheritance in the English distance class, class hierarchies, inheritance and graphics shapes, public and private inheritance, aggregation: Classes within classes, inheritance, and program development.

Pointer: Addresses and pointers. The address of operator and pointer and arrays. Pointer and Faction pointer and C-types string. Memory management: New and Delete, pointers to objects, debugging pointers.

Unit V   08 Hours
Virtual Function: Virtual Function, friend function, Static function, Assignment and copy initialization, this pointer, dynamic type information.
Streams and Files: Streams classes, Stream Errors, Disk File I/O with streams, file pointers, error handling in file I/O with member function, overloading the extraction and insertion operators, memory as a stream object, command line arguments, and printer output.

Unit VI   08 Hours
Templates and Exceptions: Function templates, Class templates Exceptions
The Standard Template Library: Introduction algorithms, sequence containers, iterators, specialized iterators, associative containers, strong user-defined object, function objects.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks:
1 Object Oriented Programming with C++ Author: E. Balagurusamy.
2 C++: The complete Reference Author: Herbert Schildt.

Reference Books:

1 Object Oriented Programming C++, Fourth Edition, By Pearson.
2 Object Oriented Programming in C++ Author: Robert Lafore.

List of Laboratory Exercise:

1. Describe the OOP Concepts.
2. Demonstrate class concept using suitable programmes.
3. Demonstrate array concepts using suitable programmes.
4. Demonstrate Operator Overloading concepts using suitable programmes.
5. Demonstrate Inheritance and its types using suitable programmes.
6. Demonstrate the use of Pointer using suitable programmes.
7. Demonstrate the types of functions using suitable programmes.
8. Demonstrate File Handling using suitable programmes.
9. Demonstrate Templates using suitable programmes.
10. Implement User define Exception.

Project Based Learning Assignments
Note:- *Students in a group of 3 to 4 shall complete any one project from the following list
1. Login and Registration System using C++
2. Car Rental System using C++
3. Bookshop inventory system using C++
4. Student Report Management System using C++
5. Sudoku Game using C++
6. Credit Card Validator using C++
7. Using Graphics to Draw and Move Shapes using C++
8. Banking Record System using C++
9. Hotel Management System using C++

10. Student Management System using C++
11. Bus reservation System using C++

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Programming Paradigms

TEACHING SCHEME		EXAMINATION SCHEME		CREDIT SCHEME	
Lecture:	4 Hours/Week	End Semester Examination: 60 Marks		Theory	4
Practical:	2 Hours/Week	Internal Assessment:	40 Marks		
		Term Work	25 Marks	Practical	1
		Oral:	50 Marks		
Total	6 Hours/Week		175 Marks		5

Course Objectives:
1. To introduce the basic building blocks that underlie programming languages.
2. To introduce the basics of programming language design and implementation.

Prerequisite:
Introduction to computing and programming environment.

Course Outcomes:
On completion of the course, students will have the ability to:
1. Compare and contrast a range of programming paradigms.
2. Apply functional programming language features.
3. Implement the concepts of object orientation.
4. Interpret the features of logic programming paradigm.
5. Summarize the use and types of system programs.
6. Discuss the appropriateness of the using a given programming paradigm within a given environment.

Unit I   08 Hours
Introduction to Programming: Role of programming languages, need to study programming languages, Characteristics of Programming Languages
The Nature of Programming Languages: Imperative languages and non-imperative languages, Functional Language, Scripting languages, Data-oriented languages, Object-oriented languages, Event-driven Programming, Language Standardisation
Programming Environments: Compilers and Interpreters, Interactive development tools, Run-time support environments, Debugging Tools, Testing Tools, Configuration Management.

Unit II   08 Hours
Functional Programming: Definition of a function and Subprogram control: domain and range, total and partial functions, strict functions, subprogram sequence control, attributes of data control, shared data in subprograms, different parameter passing methods, lifetime of variables, Recursion, Referential transparency, Storage management. Desirable and undesirable characteristics of procedural programming.

Unit III   08 Hours
Object Orientation: Basic concepts: Objects, classes, methods, overloading methods, messages inheritance: overriding methods, single inheritance, multiple.
Inheritance, Interfaces (e.g., in Java), encapsulation, polymorphism, Implementing object-oriented programming, desirable characteristics of object-oriented programming, Comparative study of C++ and JAVA.

Unit IV   **08 Hours**

Logic programming Paradigm: Introduction, Logic programming language model, Brief Introduction to Predicate Calculus, Predicate Calculus and Proving Theorems, An Overview of Logic Programming, The Origins of Prolog, The Basic Elements of Prolog, Deficiencies of Prolog, Applications of Logic Programming Limitations of Logic Programming.

Unit V   **08 Hours**

System Programming: Types and functions of system Programs: Language processors and language processing activities, Assemblers, Macro processor, Linker, Loader, Interpreter, Compiler (steps in compilation).

Unit VI   **08 Hours**

Additional Programming Paradigms: Data flow programming design principles, Database programming design principles, Network programming design principles, Socket programming in JAVA, Internet programming design principles, windows programming.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks:
1. Roosta Seyed, "Foundations of Programming Languages Design & Implementation", 3rd Edition, Cenage learning, ISBN-13:978-81-315-1062-9.
2. Pratt T.W., Zelkowitz **"**Programming Languages: Design and Implementation" PHI, 2002, 3rd Edition, ISBN-81-203-1038-1
3. Sebesta R. W., "Concepts of programming languages", Pearson Education 2001, 4th edition, ISBN-81-317-0837-3.
4. D.M. Dhamdhere, "Systems Programming and Operating Systems", Tata McGraw-Hill, ISBN- 13:978-0-07-463579-7
5. Max Bramer, "Logic Programming with Prolog", 2nd Edition, Springer, ISBN-13 978-1447154860

Reference Books:
1. Sethi Ravi, **"**Programming Languages: Concepts and Constructs**"** Pearson Education, ISBN:9788177584226
2. Herbert Schildt, "C++: The Complete Reference, 4th Edition", McGraw Hill Education; 4th edition, ISBN-13 : 2242050700-849

List of Laboratory Exercises:
1. Implement parameter passing using functional programming approach.
2. Implement recursion using functional programming approach.
3. Implement and comparing lifetime of variable using functional and object-oriented programming approach.
4. Implement and comparing reference passing using functional and object-oriented programming approach.
5. Implement encapsulation in object-oriented programming approach.
6. Case study of Prolog.
7. Implement and compare functions in functional and object-oriented programming approach.
8. Implement concept of binding in functional and object-oriented programming approach

9. Implement inheritance using object-oriented programming approach.
10. Study of a website/software to identify event driven programming elements used.

Project Based Learning Assignments
Note:- *Students in a group of 3 to 4 shall complete any one project from the following list
1. Make a project in C to maintain student record using files. The project should be able to read, write, modify, add and search records.
2. Make a project in C++ to maintain employee data using files and dynamic object. The project should be able to read, write, modify, add and search records.
3. Implementation of a simple calculator with memory functions in C++ using polymorphism. The screen should continuously display numbers, signs, and symbols similar to calculator. Use shortcut keys for operations and memory functions.
4. Implementation of a simple predicate logic system for diagnosis and applicable medicines using prolog
5. Develop a simulator for assembler. It should accept a assembly program and separate the components of the program as per the data structures of assembler.
6. Develop a macro-processor like program which should identify the macro definitions, macro calls in an assembly program. It should also replace macro calls with macro definitions.
7. Implement a phone book using C/C++.
8. Develop a simple 3-page website to show event elements. It should have at least one registration page to communicate data to and from a server.
9. Implement result calculation system for student marks using each structured programming and object-oriented programming. Make use of files. Compare the difference in both implementation and identify the pros and cons of both implementations with the features of the programming types used.
10. Implement event driven programming on at least one webpage.

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit – III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

Web Programming

TEACHING SCHEME	EXAMINATION SCHEME	CREDIT SCHEME

Practical: 2 Hours/Week   **Practical:** 25 Marks   **Practical:** 1

                                                          Tutorial: 1

Tutorial: 1 Hours/Week   **Term Work:** 25 Marks

Total: 3 Hours/Week   50 Marks   2

Course Objectives:

To develop the skill & knowledge of Web page design.

Prerequisite:

Basic knowledge in HTML tags & skill of creating web pages should be known

Course Outcomes: On completion of the course, students will have the ability to:
1. Use HTML in website designing according to theme.
2. Design web pages with attributes
3. Design various layout of websites.
4. Implement responsive web design.
5. Implement front end framework with Bootstrap Elements.
6. Build website with Content Management System.

Unit I   **06 Hours**

HTML Tags: Choose a Website Topic, Overview of HTML Tags, The HTML 5 Template, The Head, Formatting Content, Compound Tags, Character Entities, Commenting and Formatting Code, Other HTML Tags.

HTML Attributes and Images:

Acquiring Images, Graphics File Formats, Editing Images, The img Tag, Absolute Links, Embedding Media, Relative Links, Validating Code

Unit II   **06 Hours**

CSS – Styling Tags and Page Layout: CSS Basics, Colors and Inline Styles, Internal Style Sheets and Basic Formatting, External Stylesheets, Common Properties. Classes IDs Divs Spans, The Box, Boxes in Boxes, Styling Page Divisions, Additional Resources

Designing with Sections: - Sections and Background Colors, Background Images, Adding a Navigation Bar

Unit III   **06 Hours**

Publishing Websites: -FTP and Web Servers

JavaScript: - Adding a jQuery Animated Scrolling Effect.

Responsive Design: - Media Queries, Multiple Media Queries, Targeting Devices, Images and Video, Columns and Tweaks, The Viewport

Unit IV   **06 Hours**

Front End Frameworks: Explore Bootstrap Elements, Downloading Bootstrap, downloading a Bootstrap Example, Reviewing the Example Code, Replacing Page Content, Customizing the Design.

Unit V   **06 Hours**

Web API: Working of APIs, Relationship between JavaScript, APIs, and other JavaScript tools.

Common browser APIs :- APIs for manipulating documents, APIs that fetch data from the server, APIs for drawing and manipulating graphics, Audio and Video APIs, Device APIs, Client-side storage APIs.
Common third-party APIs :- YouTube API, Facebook suite of APIs, Twitter API.

Unit VI   **06 Hours**
Content Management Systems: Setting up WordPress, Creating Posts, and Creating Pages, Working with Media, Themes and Widgets.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks:
1) Getting Started with Web Components: Build modular and reusable components using HTML, CSS and JavaScript by Prateek Jadhwani.
2) Jump Start Bootstrap: Get Up to Speed With Bootstrap in a Weekend By Syed Fazle Rahman.
3) Fronted Web Development/Web Designing, HTML, CSS & JavaScript Basic Tutorial by Sachin Srivastav
4) Web Design and Development: Website Technologies Fundamentals By Steven Bright.

Reference Books
1) HTML and C Learn HTML, CSS, and JavaScript and Build a Website, App, and Game by Young Rewired State and Duncan Beedie.
2) Mastering HTML, CSS & Javascript Web Publishing by Laura Lemay, Rafe Colburn HTML & CSS, and JavaScript & JQuery (2 book set) by Jon Duckett.

List of Laboratory Exercise:
1) Design home page for any website according to domain.
2) Implement various functionality using different tags of HTML while designing web pages.
3) Implement web pages formatting and content formatting using CSS.
4) Implement responsive approach in website designing
5) Explorer front end framework using Bootstrap Elements
6) Demonstrate website design using content management system.

Project Based Learning Assignments
Note:- *Students in a group of 3 to 4 shall complete any one project from the following list
1. Design website for department and college
2. Design website for e-commerce platform.
3. Design website for reservation system (eg. bus, train, air)
4. Design website for online food delivery system.
5. Design website for CRM (database management).
6. Design website for hospital management system.
7. Design website for advertisement of products.
8. Design website for customer support system.
9. Design website for Business Portfolio.
10. Design website for Quiz Game.
11. Design website for E-library system.
12. Design website for survey system.
13. Design website for Banking system.
14. Design website for social media.
15. Design matrimonial website.

B.Tech(Information Technology)
Semester-III

Discrete Structures and Graph Theory

TEACHING SCHEME		EXAMINATION SCHEME		CREDITSCHEME	
Lecture:	4 Hours/Week	End Semester Examination: 60 Marks		Theory	4
		Internal Assessment:	40 Marks		
Total	04 Hours/Week		100 Marks		4

Course Objectives:
1. To apply and relate knowledge of mathematics in computer science.
2. To learn proof theory with propositional calculus and induction.
3. To map, represent and solve network problem with trees and graphs.

Prerequisite:
Basic mathematics and programming fundamentals.

Course Outcomes: On completion of the course, students will have the ability to
1. Formulate real world problems into statement forms using sets and relations which
2. can be solved or proved mathematically using set theory and logic.
2. Design mathematical model from theoretical statements.
   Apply counting techniques to real world problems.
4. Apply knowledge of graphs to solve network problems.
5. Design searching algorithm efficiently by applying tree and tree traversal logic.
6. Apply algebraic structure and coding theory in computer science.

Unit I 08 Hours

Propositional Logic and Proof Theory: Sets, Set operations, Finite and Infinite sets, Venn diagram, Principle of inclusion and exclusion, Multisets. Propositions, Conditional Propositions, Logical Connectivity, Propositional calculus, Universal and Existential Quantifiers, Normal forms, methods of proofs, Principal of mathematical induction.

Unit II: 08 Hours

Relations and Functions: Properties of Binary Relations, Closure of relations, Warshall's algorithm, Equivalence, Relations and partitions, Partial ordering relations and lattices, Chains and Anti chains. Functions, Composition of functions, Invertible functions, Pigeonhole Principle.

Unit III 08 Hours

Counting and Recurrence Relations Basic counting principles, permutations, combinations, generalized permutations and combinations (with/without repetitions), Probability theory, Permutations with indistinguishable objects, Binomial coefficients, and identities. Linear Recurrence Relations with constant Coefficients, Homogeneous Solutions, Total solutions.

Unit IV 08 Hours

Graph theory: Basic terminology, multi graphs and weighted graphs, paths and circuits,shortest path in weighted graph, Dijkstra's algorithm, Hamiltonian and Euler paths and circuits, factors of a graph, planer graph and Travelling salesman problem.

Unit V   **08 Hours**
Trees: Trees, rooted trees, path length in rooted trees, prefix codes, binary search trees,tree traversal, spanning trees and cut set, minimal spanning trees, Kruskal's and Prim's algorithms for minimal Spanning tree. The Max flow- Min Cut Theorem (Transport network). Case Study- Game Tree, Mini-Max Tree.

Unit VI   **08 Hours**
Algebraic Structures: The structure of algebra, Algebraic Systems, Semi Groups, Monoids, Groups, Homomorphism and Normal Subgroups, Congruence relations, Rings, IntegralDomains and Fields, coding theory, Polynomial Rings and polynomial Codes.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks:
1. Kenneth H. Rosen, Discrete Mathematics and its Applications, 7th Edition, McGraw Hill.
2. C. L. Liu, D. P. Mohapatra, Elements of Discrete Mathematics: A Computer Oriented Approach, 4th Edition, McGraw Hill.

Reference Books
1. Seymour Lipzschutz, M. Lipson, Discrete Mathematics, 3rd Edition, McGraw Hill.
2. P. Tremblay, R. Manohar, Discrete Mathematical Structures With Applications to Computer Science, McGraw Hill.

List of Laboratory Exercise
1. Write a program to implement set operations. (Set size and elements to be taken from user at runtime).
2. Write a program to calculate value of polynomial for variable x. (Highest degree and coefficients to be taken from user at runtime).
3. Write a program to find value of composite function: fogoh. (f(x), (g(x) and h(x) tobe taken from user.)
4. Write a program to implement Warshall's algorithm.
5. Write a program to check whether Eulerian circuit is present in the given graph.
6. Write a program to find shortest path between the vertices in given graph.
7. Write a program to create binary search tree for the values taken from user.
8. Write a program to implement various tree traversals.
9. Write a program to implement Kruskal's algorithm.
10. Write a program to implement Prim's algorithm.

Project Based Learning Assignments
Note:- *Students in a group of 3 to 4 shall complete any one project from the following list
1. Study the writings of Lewis Carroll on symbolic logic. Describe in detail some of the models he used to represent logical arguments and the rules of inference he used in these arguments.
2. Describe a variety of different applications of the Fibonacci numbers to the biological and the physical sciences.
3. Explain how graph theory can help uncover networks of criminals or terrorists by studying relevant social and communication networks.

4. Explain what community structure is in a graph representing a network, such as a social network, a computer network, an information network, or a biological network. Define what a community in such a graph is, and explain what communities represent in graphs representing the types of networks listed.
5. Describe how Euler paths can be used to help determine DNA sequences.
6. Describe some of the strategies and algorithms used to solve the traveling salesperson problem.
7. Five men with different nationalities and with different jobs live in consecutive houses on a street. These houses are painted different colors. The men have different pets and have different favorite drinks. Determine who owns a zebra and whose favorite drink is mineral water (which is one of the favorite drinks) given these clues: The Englishman lives in the red house. The Spaniard owns a dog. The Japanese man is a painter. The Italian drinks tea. The Norwegian lives in the first house on the left. The green house is immediately to the right of the white one. The photographer breeds snails. The diplomat lives in the yellow house. Milk is drunk in the middle house. The owner of the green house drinks coffee. The Norwegian's house is next to the blue one. The violinist drinks orange juice. The fox is in a house next to that of the physician. The horse is in a house next to that of the diplomat.
8. Explain how graph multicolorings can be used in a variety of different models.
9. Define a heap and explain how trees can be turned into heaps. Why are heaps useful in sorting?
10. Describe the techniques used by chess-playing programs such as Deep Blue or stockfish.
11. Discuss the algorithms used in IP multicasting to avoid loops between routers.
12. Compare and contrast some of the most important sorting algorithms in terms of their complexity and when they are used.
13. Describe an algorithm for finding the minimum spanning tree of a graph such that the maximum degree of any vertex in the spanning tree does not exceed a fixed constant k
14. Describe the origins of mathematical induction. Who were the first people to use it and to which problems did they apply it?
15. Explain how the ideas and concepts of program correctness can be extended to prove that operating systems are secure.

Syllabus for Unit Tests:

Data Structures

TEACHING SCHEME		EXAMINATION SCHEME		CREDIT SCHEME	
Lecture:	4 Hours/Week	End Semester Examination:	60 Marks	Theory	4
Practical:	2 Hours/Week	Internal Assessment:	40 Marks	Practical	1
		Term Work	25 Marks		
		Practical:	25 Marks		
Total	6 Hours/week		150 Marks		5

Course Objective:

The objective of the course is to familiarize students with fundamentals of data structures and algorithms.

Prerequisite:

Fundamental knowledge programming and problem-solving steps

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand the fundamentals of data structure and algorithms
2. Execute linear sequential data structures
3. Implement linear linked organization data structures
4. Execute nonlinear data structure-trees
5. Implement nonlinear data structure-graph
6. Know hashing and file organization concepts

Unit I 08 Hours

Introduction to Algorithm and Data Structures: Introduction to data structures, types of data structure, abstract data types (ADT), introduction to algorithms, characteristics of algorithms, algorithm design tools: pseudo code and flowchart, relationship among data, data structure and algorithms, analysis of algorithms, asymptotic notation.

Unit II 08 Hours

Sequential Organization Data Structures: Stacks: primitive operations, stack as an ADT, realization of stacks using array,stack operations, multi-stack, applications of stack, expression evaluation and conversion, simulating recursion using stack

Queue: primitive operations, queues as ADT, realization of queue using array, circular queue, double ended queue, priority queue, applications of queue.

Unit III 08 Hours

Linked Organization Data Structures: Introduction, comparison of sequential and linked organizations, comparison of static and dynamic memory allocation, realization of linked lists, dynamic memory management, linked list as ADT, types of linked list, polynomial manipulations, linked stack, linked queue, generalized linked list (GLL) concept, applications oflink list.

Unit IV 08 Hours

Non-Linear Data Structure-Tree: Tree terminology, types of trees, binary tree as an ADT, realization of tree, tree traversals, binary search tree, operations on BST, threaded binary tree, AVL tree,heap tree, applications of trees.

Unit V 08 Hours

Non-Linear Data Structure-Graph: Graph terminologies, graph as an ADT, realization of graphs using adjacency matrix and adjacency list, graph traversals: breadth first search traversal, depth first search traversal, spanning tree, prim's and kruskal's algorithms, topological sorting, applications of graph

Hashing and File Organization:
Hashing: introduction, key terms, hash function, Collision Resolution strategies,hash table overflow, skip list, comparison of hashing and skip lists.
File: concept of file, file organization, sequential file organization, direct access file organization, indexed sequential file organization.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks:
1. Y. Langsam, M. Augenstin, A. Tannenbaum, "Data Structures using C and C++", Prentice Hall of India, , ISBN-81-203-1177-9.
2. E. Horowitz, S. Sahni, D. Mehta, "Fundamentals of Data Structures in C++", Galgotia Book Source, New Delhi, ISBN 16782928
3. S. Lipschutz, "Data Structures", McGraw Hill Pub.
4. Patil V., "Data Structures using C++", Oxford university press, ISBN 0-19-806623-6
5. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein,"Introduction to Algorithms"

Reference Books
1. G. A.V, PAI , "Data Structures and Algorithms ", McGraw Hill, ISBN -13: 978-0-07-066726-6
2. M. Welss, "Data Structures and Algorithm Analysis in C++", Pearson Education, ISBN-81-7808-670-0

List of Laboratory Exercise
1. Write a program to implement functions (insert, delete, display) on stack, queue and circular queue data structure.
2. Write a program to convert and solve expression from
3. (a)Infix to Prefix
   (b) Infix to Postfix
Evaluate Postfix expression
3. Write a program to implement Singly Linked List manipulation for storing student information (PRN, Name, Marks).
   a. Display data of top rank student.
How many students secure first class and above rank?
4. Write a program to implement Doubly Linked List manipulation for storing Employee information (Name, Salary, Age).
   a. Display data of employees having salary more than 50,000.
Display list of employees having age less than 30 and salary greater than 30,000.
5. Write a program to implement Binary Search Tree storing city names and Traversal in BST (Inorder, Preorder, Postorder).
6. Write a program to implement Threaded Binary Tree and its Traversals.
7. Write a program to implement graph traversals: BFS and DFS.
8. Write a program to implement Prims and Krushkals algorithms MST.

Project Based Learning Assignments
Note:- *Students in a group of 3 to 4 shall complete any one project from the following list
1. Design and develop a project for Election System
2. Design and develop a project for Flight ticket booking
3. Design and develop a project for Tourism Management system
4. Design and develop a project for Simple Result system
5. Create a mini project to construct game: Tic-Tac-Toe
6. Design and develop a project for Phone Directory using doubly link list
7. Create a mini project to construct game: Snakes and Ladder

8. School fee enquiry Management System
9. Telecom Billing Management System

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Database Management System

TEACHING SCHEME	EXAMINATION SCHEME		CREDIT SCHEME	
Lecture: 4 Hours/Week	**End Semester Examination: 60 Marks**		**Theory**	**4**
Practical: 2 Hours/Week	**Internal Assessment:**	40 Marks		
	Term Work	25 Marks	**Practical:**	**1**
	Practical:	25 Marks		
Total	**6 Hours/week**	150 Marks		**5**

Course Objective

The objective of the course is to present an introduction to database management systems,with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information. from a Database Management Systems.

Prerequisite:
Students should have knowledge of
1) Basic understanding of data and data structure.
2) Basic understanding of programming language.

Course Outcomes: On completion of the course, students will have the ability to:
1. Model an application's data requirements using conceptual modeling tools.
2. Implement concepts of relational algebra and SQL queries.
3. Demonstrate concepts of relational database design.
4. Interpret the query processing and optimization activities in database.
5. Interpret the transaction activities in database.
6. Recognize the emerging database applications and security concerns.

Unit I   **06 Hours**
Introduction: Introduction to Database system architecture, Data Abstraction, Data Independence.

Data models: Extended Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

Unit II   **06 Hours**
Relational algebra: Fundamental and extended relational algebra operations, Tuple and domain relational calculus
Introduction to SQL: Data definition language, Data Manipulation Language, Joined relations, Views.
Introduction to PL/SQL: Functions, Procedures, Triggers, Cursors.

Unit III   **06 Hours**
Integrity constraints: What are constraints, types of constrains
Relational database design: Domain and data dependency, Armstrong's axioms, Functional Dependencies, Normal forms (1NF, 2NF, 3NF, BCNF, 4NF), Dependency preservation, Lossless design.

Unit IV   **06 Hours**
Storage strategies: Indices, B trees, B+ trees, Hashing
Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms

Unit V   **06 Hours**

Transaction processing: Concurrency control, ACID property, Serializability
of scheduling, Locking and timestamp-based schedulers, Multi-version and
optimistic Concurrency Control schemes, Database recovery.

Unit VI   **06 Hours**
Data Intensive Computing: Introduction to big data, unstructured
data processing using Hadoop, NoSQL database using MangoDB
Database Security: Authentication, Authorization and access control, DAC,
MAC and RBAC models, Intrusion detection, SQL injection.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks
1 Silberschatz, Korth, "Data base System Concepts", 7th ed., McGraw hill.
2 Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems" (3/e), McGraw
  Hill.
3 Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems (5/e),
   Pearson Education.
4 C. J. Date, Kannan, "An Introduction to Database Systems", 8e, Addison-Wesley
5 Ivan Bayross, "SQL, PL/SQL the Programming Language of Oracle", BPB Publication

Reference Books
1 Peter Rob and Carlos Coronel, Database Systesm- Design, Implementation and
  Management (7/e), Cengage Learning, 2007
2 Hector Garcia-Molina, Jeff Ullman, and Jennifer Widom, "Database Systems: The Complete
  Book" (2nd edition), Pearson Prentice Hall

List of Laboratory Exercise
1. Conceptual Designing using ER Diagrams (Identifying entities, attributes, keys and
    relationships between entities, cardinalities, generalization, specialization etc).
2. Convert ER Model to Relational Model (Represent entities and relationships in
    Tabular form, represent attributes as columns, identifying keys).
3. Remove the redundancies and anomalies in the above relational
    Tables, Normalize up to Third Normal Form.
4. Study and implementation of SQL: DDL
    Creation of above Tables using SQL- Data types in SQL, Creating Tables (along with
    Primary and Foreign keys), Altering Tables and Dropping Tables.
5. Study and implementation of SQL: DML, Querying with set operations and wildcards
6. Study and implementation of aggregate functions, joins, nested subqueries in SQL from
    querying above tables.
7. Study and implementation of views in SQL.
8. Study and implementation of PL/SQL – Control statements.
9. Study and implementation of PL/SQL Functions and stored procedure.
10. Study and implementation of Triggers.
11. Study and implementation of Cursors.

Project Based Learning Assignments
Note:- *Students in a group of 3 to 4 shall complete any one project from the following list
1. Make a project to maintain employee data using files and dynamic object/structure. The project
    should be able to read, write, modify, add, and search records. Also demonstrate the effect of
    performing change in employer data definition after few records have been added.
2. Make an extended ER diagram for insurance management system. Transform this into relation
    design and implement these relations with appropriate domain and integrity constraints.
3. Employ various data control restrictions on databases, relations, and attributes of relations.

4. Create a phonebook which enables user to save contacts with additional information and provides various retrieval mechanisms. Provisions should be made to view data in multiple ways.
5. Design and develop a library management system. The relations in the system should be normalized up to BCNF
6. Design and develop a inventory management system and create multiple views on the relations so that users not authorized to edit the relations should be able to views the data.
7. Implement of audit trails and backup on relations.
8. Create a student result calculation system. However, when updating results after calculation should be only of students who paid complete fees, such that transaction of each row is executed separately. Hint- use explicit cursor
9. Develop a student data management system using hash files.
10. Installation of a NoSQL database and implementing a simple student database to compare with SQL database.

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Software Engineering		
TEACHING SCHEME	**EXAMINATION SCHEME**	**CREDIT SCHEME**
Lecture: 3 Hours/Week	**End Semester Examination: 60 Marks**	**Theory:** 3
Practical: 2 Hours/Week	**Internal Assessment:** 40 Marks	**Term Work:** 1
	Term Work : 25 Marks	
Total 5 Hours/Week	125 Marks	4

Course Objective:
This course presents modern software engineering techniques and examines the software life-cycle, including software specification, design, implementation, testing. The course is organized as a project where the students work in a team to address a real-world software engineering assignment. The project is supplemented by exercises and lectures that provide insight into the assignment students are working on and software engineering in general.

Prerequisite: Programming knowledge

Course Outcomes: On completion of the course, students will have the ability to:
1. Compare various software development methods.
2. Identify requirements for project.
3. Apply software analysis principles.
4. State steps involved in software designing.
5. Show working of software engineering tools.
6. Execute a thorough software test.
7. Function effectively as a member of a team engaged in software engineering activities.

Unit I   **08 Hours**
Introduction to Software Development: Software Development Challenges, Software Scope , Software Engineering Discipline, Software Methodologies and Related Process Models, The Human Side of Software Development , Traditional Life Cycle Models o Waterfall , Incremental Evolutionary, Spiral, CBSE, Alternative Process models: Unified Process, Rapid Application Development, Introduction to Agile Software Engineering Process Models: Extreme Programming o Agile Software Development, DevOps, Site Reliability Engineering. Quality and Process Standards: ISO 9000, SWEBOK, ISO 15504, SEI's Capability Maturity Model (CMM).

Unit II   **08 Hours**
Requirement engineering: Requirements Development Methodology, Specifying Requirements, Eliciting Accurate Requirements, Documenting Business Requirements, Defining User Requirements, Validating Requirements, Achieving Requirements Traceability, Managing Changing Requirements, Reviews, Walkthroughs, and Inspections, Requirements Modelling, Agile Requirements Engineering.
Business Model Engineering: Business Model Capture Tools, Process Modelling, Capturing the Organization and Location Aspects, Developing a Process Model.

Unit-III   **08 Hours**

Analysis and Modeling: Elements of Analysis model, Analysis Modeling approaches, Data modeling, Scenario based modeling, Flow oriented modeling

Unit IV   **08 Hours**

System Design: Problem partitioning, abstraction, top-down and bottom-up design, Structured approach. Design Concepts, The Design model architecture, cohesion and coupling, Data Design, Architectural Styles and Patterns, Architectural Design, Mapping Data flow into Software Architecture. Functional versus object-oriented approach.

Coding: Programming languages and development tools Selecting languages and Tools, Good programming practices Coding Standards.

Unit V   **08 Hours**

Software configuration management (SCM): Elements of SCM, Base lines, Software configuration items, SCM Repository, SCM process:

Software Engineering Tools: Requirements Management Tools (e.g., IBM Rational Doors), Design Tools (e.g., Sparx Enterprise Architect), Development Tools o IDEs (e.g., Xcode, Eclipse, IntelliJ IDEA, NetBeans, Microsoft Visual Studio, Atom), Source Control Management (e.g., GitHub), Release Orchestration (e.g., Open Make), Collaboration (e.g., Jira, Trello, Slack).

Unit VI   **08 Hours**

Testing Strategies: Levels of Testing, Functional Testing, Structural Testing, Test Plan, Test Case Specification, Test case design, A strategic approach to software Testing: Verification and Validation Testing, organizing for software Testing, Software Testing Strategy for conventional Architecture: Unit Testing Integration Testing, Validation Testing, System Testing, Debugging, White-box, Black-box testing, Basis path Testing, Control structure testing.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks
1. Roger Pressman, Software Engineering: A Practitioner's Approach, 6th edition, McGraw Hill, 2005. ISBN 0-07-285318-2
2. Somerville, Ian (2001) Addison-Wesley Software Engineering 7th Edition). Massachusetts: Addison Wesley, ISBN 0-321-21026-3
3. Fundamentals of Software Engineering by Rajib Mall

Reference Books
1. Kniberg, H. (2015) Scrum and XP from the Trenches - 2nd Edition,
2. Pro Git: http://git-scm.com/

List of Laboratory Exercise
1. Preparing Software Requirements Specifications
2. Performing domain analysis
3. Perform E-R Modeling
4. Perform Data-Flow-Modeling
5. Draw State Diagram
6. Designing Test Suites
7. Calculate cyclomatic Complexity for code snippet

Project Based Learning Assignments
Note:- *Students in a group of 3 to 4 shall complete any one project from the following list
1. Android task monitoring
2. Sentiment analysis for product rating
3. Fingerprint-based ATM system

4. Advanced employee management system
5. Image encryption using AES algorithm
6. Fingerprint voting system
7. Weather forecasting system
8. Android local train ticketing system
9. Railway tracking and arrival time prediction system
10. Android Patient Tracker
11. Opinion mining for social networking platforms
12. Automated payroll system with GPS tracking and image capture
13. Data leakage detection system
14. Credit card fraud detection
15. AI shopping system

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

Computer Communication and Networks

TEACHING SCHEME		EXAMINATION SCHEME		CREDIT SCHEME	
Lecture:	3 Hours/Week	End Semester Examination: 60 Marks		Theory	3
Practical:	2 Hours/Week	Internal Assessment:	40 Marks	Practical:	1
		Term Work :	25 Marks		
Total	5 Hours/week		125 Marks		4

Course Objectives:
1. Build an understanding of the fundamental concepts of computer networking.
2. This course will enable students to understand the layering architecture of OSI reference model and TCP/IP protocol suite, protocols associated with each layer.
3. Learn the different networking architectures and their representations and able tolearn the various routing techniques and the transport layer services.

Prerequisite:
Students should have knowledge of
1. How computer networks operate and the fundamentals of data communication.
2. Concepts and fundamental design principles of modern computer networking in a top-down approach, focusing on the Internet's architecture and protocols.

Course Outcomes: On completion of the course, students will have the ability to:
1. Find the components required to build different types of networks.
2. Recognize the different types of network Transmission Media and Technologies.
3. Explain the layered architecture of computer networks and distinguish between the OSI reference model and TCP/IP protocol suite.
4. Match the division of network functionalities with the layers.
5. Distinguish the basic network Layer services and Protocols associated with each network.
6. Identify the protocols and functions associated with the transport layer services.

Unit I   06 Hours
Introduction to data communication and networking: Data Communications: Components, Representations, Data Flow. Digital Transmission: Analog-to-Digital Conversion, Digital-to-Digital Conversion. Analog Transmission: Digital-to-analog Conversion, Analog-to- Analog Conversion.
Networks: Physical Structures, Introduction to Networks – Building Network and Network Types: LAN, WAN, MAN and PAN, Overview of Topology, Concepts of Communication Modes and Transmission Modes. Categories of Networks Internet works.

Unit II   06 Hours
Data Transmission Media and Technologies: Transmission Media: Types of transmission media, principal, Specification of Medium, Performance, and Transmission Impairments. Applications of different transmission media.
Introduction to switching: Switching, Circuit-switched Networks, Packet Switching, Datagram Switching and Datagram networks, Virtual circuit networks, Structure of circuit and packet switch.

Unit III   **06 Hours**
Network Models: Protocol Layering: Scenarios, Principles, Logical Connections. Reference Models, Functions of the layers of The OSI Model, TCP/IP Protocol Suite: Layered Architecture, Layers in TCP/IP suite and its functioning, Description of layers, services, sockets and ports Encapsulation and D-encapsulation, Addressing, Multiplexing and De-multiplexing, Types of Multiplexing and Multiplexing applications. The OSI Model: OSI Versus TCP/IP.

Unit IV   **06 Hours**
Networking Devices: Networking Devices: Hubs, Switch, Router, Repeaters, Bridges, Gateway, Modem and Access Point, Backbone networks.
Data-Link Layer:
Introduction: Nodes and Links, Services, Categories of link, Sub layers, Link Layer addressing: Types of addresses, ARP, RARP. Data Link Control (DLC) services: Framing, Flow and Error Control, Data Link Layer Protocols: Simple Protocol, Stop and Wait protocol, Piggybacking.

Unit V   **06 Hours**
Network Layer: Introduction, Network Layer services: Packetizing, Routing and Forwarding, Other services. IPV4 Addresses: Address Space, Classful Addressing, Classless Addressing, DHCP, Network Address Resolution, Forwarding of IP Packets: Based on destination Address and Label. Overview of IPv6 Addressing – Transition from IPv4 to IPv6 Comparison of IPv4 and IPv6.
Network layer Protocols:
Internet Protocol (IP): Datagram Format, Fragmentation, Options, Security of IPv4 Datagrams, ICMPv4: Messages, Debugging Tools.
Routing: Introduction to Types of Routing, Routing Algorithms: Distance Vector Routing, Link State Routing, Path vector routing, Unicast Routing Protocol: Internet Structure, Routing Information Protocol, Open Shortest Path First, Border Gateway Protocol Version 4.

Unit VI   **06 Hours**
Transport Layer: Introduction: Transport Layer Services, Connectionless and Connection oriented Protocols, Transport Layer Protocols: Simple protocol, Stop and wait protocol, Go- Back-N Protocol, Selective repeat protocol, User Datagram Protocol: User Datagram, UDP Services, UDP Applications, Transmission Control Protocol: TCP Services, TCP Features, Transmission Policy, Segment header, Connection, State Transition diagram, Windows in TCP, Flow control, Error control, TCP congestion control, Timer Management. Application Layer Paradigms – Client Server Programming – World Wide Web and HTTP, DNS, Electronic Mail (SMTP, POP3, IMAP, MIME).

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks:
1. Data Communications and Networking, Forouzan, 5th Edition, McGraw Hill, 2016
   ISBN: 1-25-906475-3.
2. James F. Kurose, Keith W. Ross, ―Computer Networking - A Top-Down Approach Featuring the Internet, Seventh Edition, Pearson Education, 2016.

Reference Books:

1. Computer Networks, James J Kurose, Keith W Ross, Pearson Education, 2013,
2. Introductions to Data Communication and Networking, Wayarles Tomasi, Pearson Education,
3. Nader. F. Mir, ― Computer and Communication Networks, Pearson Prentice Hall Publishers,
4. 2nd Edition, 2014.
5. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, ―Computer Networks: An Open Source
6. Approach‖, Mc Graw Hill Publisher, 2011.
7. Larry L. Peterson, Bruce S. Davie, ―Computer Networks: A Systems Approach‖, Fifth Edition, Morgan Kaufmann Publishers, 2011.

List of Laboratory Exercise

1. Study and execution of Network commands.
2. Socket programming Client Server using RPC.
3. Demonstration of different types of cables used in data communication.
4. Perform various line coding formats and compare transmission characteristic of each formats.
5. Perform digital carrier modulation techniques used in wireless communication.
6. Study and demonstration of CISCO packet tracer with data transmission.
7. Study and demonstration of CISCO packet tracer with data loss.
8. Perform serial data communication between two data terminal equipment using optical link.
9. Perform Installation of LAN and troubleshooting of frequently occurred problems.
10. Create and test wireless sensor networks using zigbee.
11. To study various aspects of data communication by field visit at data centre.

Project Based Learning Assignments

Note:- *Students in a group of 3 to 4 shall complete any one project from the following list

1. Network Desktop Manager. Example Modules: Desktop Sharing, Desktop locking and unlocking, IP Port Scanning.
2. Analysis of IPv4/IPv6 protocols over 3G mobile networks
3. Network Traffic Monitoring & windows Remote Manager. Example Modules: Remote Desktop, Remote Chat, Monitoring
4. Learner's Interaction with Information and Communication Technologies.
5. Use of Information-Centric Networks in Revision Control Systems
6. TCP Performance in an EGPRS system
7. Real-Time Networking based Computer Ideas
8. An Internet Voting System Supporting User Privacy
9. Use of Information-Centric Networks in Revision Control Systems.
10. Networking and Security Projects
11. IP based Patient Monitoring System
12. Network Admission Control (NAC) Securing End Point Devices

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

Information Technology Laboratory - I

TEACHING SCHEME   **EXAMINATION SCHEME**   **CREDIT SCHEME**

Practical: 2 Hours/Week   **Term Work**   25 Marks   **Practical:**   1

                          Practical: 25 Marks

Tutorials: 1 Hour/Week   **Tutorial:**   1

Total   **3 Hours/week**   **75 Marks**   2

Course Objective
1. Compute time and space complexity for a given program.
2. Demonstrate concepts OOPS using java
3. Solve specified requirement
4. Infer various approaches to decide the efficiency of the given approach.
5. Formulate a given problem by providing the proof of behavior of the given model.
6. Design an application using a platform-independent approach.

Prerequisite:
Basic understanding of Object-Oriented Programming language and logic to solve.
given problem.

Course Outcomes: On completion of the course, students will have the ability to:
1. Design a solution to a given problem applying logic and features of the java language.
2. Develop their logical skill through various assignments and practicals.
3. Divide complex problem into subpart and then handle every part to achieve the
   Goal.
4. Model a solution to any real-world problem.
5. Analyze the significance of platform independence.
6. Design application using object-oriented norms.

Unit I   06 Hours
Introduction to Java: Java Fundamentals, Features of Java OOPs concepts Java
virtual machine Reflection byte codes Byte code interpretation Data types,
variable, arrays, expressions, operators, and control structures - if, switch, and
loops like for, do-
while, while. Introduction to Objects and classes.

Unit II   06 Hours
Classes and objects: Java Classes, Abstract classes Static classes Inner classes
Packages, Wrapper classes. Interfaces This Super Access control, embedded style
information Inheritance, Encapsulation, Polymorphism, Data Binding, data
abstraction.

Unit III: 06 Hours
String and Arrays: One dimensional Array, Multidimensional array, Array of an
object, Introduction
to vector. String, StringBuilder, String Buffer, String methods, manipulations.

Unit IV   06 Hours
Exception Handling: Checked exceptions, unchecked exceptions, and Errors, try-
catch block, throws,User-defined exception – Throw, Common exception classes.

Unit V   06 Hours

Threading and multithreading: Lifecycle of Thread, Basic functions of thread, multithreading, synchronization.

Unit VI   **06 Hours**
Collections and Generics: Introduction to collection framework, List, Set, Maps, utility class, Reflection API, Generics.

Textbooks
1 OCA Java SE 8 Programmer I Study Guide (Exam 1Z0-808) (Oracle Press) 3rd Edition. by Edward Finegan, Robert Liguori.
2 OCA Java SE 8 Programmer, Exam Guide (Exams 1Z0-808) 1st Edition, Kathy Sierra, Bert Bates.
3 Programmer's Guide to Java SE 8 Oracle Certified Associate (OCA), Khalid A. Mughal and Rolf W Rasmussen.

Reference Books
1 Headfirst Java, 2nd Edition by Kathy Sierra, Bert Bates.
2 Java: The Complete Reference, Eleventh Edition 11th Edition, Herbert Schildt.
3 OCAJP Associate Java 8 Programmer Certification Fundamentals: 1Z0-808, Hanmant Deshmukh.

List of Laboratory Exercise
1. Maintain record of students and perform CRUD functionality.
2. Write a program to redirect a request using a dynamic approach.
3. Write a program to pass the data using session.
4. Write a servlet to remove spam.
5. Maintain the record of faculty member using jsp action tags and directives.
6. Design a tag to perform the necessary editing in a given report.
7. Design reusable components of the form using taglib.
8. Implement sending and receiving mail utility using Java Mail API.
9. Implement Java Message Service queue.
10. Understand working of framework – struts- case study.

Project Based Learning Assignments
Note:- *Students in a group of 3 to 4 shall complete any one project from the following list
1. Implement assignment and project submission system.
2. Implement a program to issue Leaving Certificate, Transcripts and Bonafede certificate to student.
3. Implement a program to assign problem statement for practical examination in secured environment.
4. Design a template for NBA report.
5. Design an application for Feedback Management System.
6. Design application to maintain track of research paper with indexing per year.
7. Design a post customized as per social media platform.
8. Design an interface to collect job opportunities and disseminate to eligible student
9. Design a project to track details of Industrial Training.
10. Design notice board application to communicate with students.

B.Tech(Information Technology)
Semester-IV

IT Infrastructure Management

TEACHING SCHEME   **EXAMINATION SCHEME**   **CREDIT SCHEME**

Lecture: **4 Hours/Week**   **End Semester Examination: 60 Marks**   **Theory**   **4**

                            Internal Assessment: **40 Marks**

Total-   **4 Hours/Week**   **100 Marks**   **4**

Course Objectives:
Students undergoing this course are expected.
1. To introduce basic postulates of IT Infrastructure Management and shows the correlation
2. between system and service management process
3. Able to Know the Storage and database Management in Information Technology.
4. Infer various approach to decide efficiency of given approach.
5. Able to know the Security Management in IT.
6. To provide detailed knowledge of IT recent trends in globally.

Prerequisite:
       Object Oriented Programming language and Logic to solve given problem.

Course Outcomes: On completion of the course, students will have the ability to:
1. Outline IT Infrastructure, management challenges and requirement.
2. Select Service Delivery and Service Support Processes required in IT infrastructure management.
3. Breakdown complex problem into subpart and then handle every part to achieve the goal.
4. Categorize various storage levels in IT.
5. Select security techniques in information technology.
6. Explain new communication mechanism based on emerging trends in information technology.

Unit I   **08 Hours**
Introduction & It Infrastructure: Information Technology, IT Infrastructure Management, Introduction—IT Infrastructure Management, Challenges in IT Infrastructure Management, Design Issues of IT Organizations and IT Infrastructure, Determining Customers' Requirements, IT Systems Management Process, IT Service Management Process, Information System Design Process

Unit II   **08 Hours**
Service Delivery Process & Service Support Process: Service Level Management, Financial Management, IT Service Continuity Management, Capacity Management, Availability Management, Configuration Management, Incident Management, Problem Management, Change Management.

Unit III   **08 Hours**
Storage Management: Introduction to Storage, Backup and Storage, Archive, Retrieve, Disaster Recovery, Space Management, Database and application Protection, Bare, Machine Recovery (BMR), Data Retention

Unit IV   **08 Hours**

Security Management: Computer Security, Internet Security, Physical Security, Identity Management, Access Control System, Intrusion Detection, Intellectual Property.

Unit V   **08 Hours**
IT Ethics: Introduction to Cyber Ethics, Intellectual Property, Privacy and Law, Computer Forensics, Ethics and Internet, Cyber Crimes.

Unit VI   **08 Hours**
Emerging Trends in It: Introduction, Electronic Data Interchange, Infrared Technology, Bluetooth, GSM, WiFi, Standards of Wifi, WiMax, 5G Wireless Technology.
List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks
1. Gupta, "IT Infrastructure & Its Management", First Edition, Tata McGraw-Hill Education
2. IT Infrastructure and Management by Manoj Kumar Choubey - Published by Pearson Education

Reference Books
1. Firewalls for dummies, Brain Komar, Ronald Beekelaar, Joern Wettern, for Firewall Security, 70-662 MCTS exchage 2010 microsoft press.

List of Laboratory Exercise
1. Enlist and Illustrate Design Issues of IT Organisations and IT Infrastructure.
2. Demonstrate IT Service Continuity Management and Change Management.
3. Design and Implement various Storage Management and Recovery techniques.
4. Summarize different Security Management policies with assistance of Intellectual Property.
5. Setup and maintenance of Storage – Archive, Retrieve, Backup policies.
6. Configuration and Customization of Access Control List and Active Directory.
7. Discriminate various privacy and Cyber Laws with suitable example.
8. Demonstrate different internet security policies with suitable example.
9. Discover different Problem Management within Service Delivery Process.
10. Case Study- Disaster Recovery within Storage Management.

Project Based Learning Assignments
Note:- *Students in a group of 3 to 4 shall complete any one project from the following list

  1. Develop Infrastructure Management System project for Server Management and Maintenance.
  2. Develop Infrastructure Management System project for Software Management and Document Management
  3. Secure File Storage on Local Machine Using Hybrid Physical Security Techniques.
  4. Design security management for New Data center setup
  5. Infrastructure Management System project for Monitoring of Bandwidth.
  6. Tracking System for Defects. (For Example: Bug tracking and error system based on the web)
  7. Implement Secure Backup Software System.
  8. Design system for Detecting Data Leaks within storage management.
  9. Implement enterprise management of electronic data interchange systems. (For example: Process mining, Good Security Practice)
  10. Develop system for Bluetooth Controlled Electronic Home Appliances.

Formal Languages and Computation Theory

TEACHING SCHEME   **EXAMINATION SCHEME**   **CREDIT SCHEME**
Lecture: **4 Hours/Week**   **End Semester Examination: 60 Marks** **Theory**   **4**
                                      Internal Assessment: **40 Marks**
Total   **4 Hours/Week**   **100 Marks**   **4**

Course Objective:
Students will learn about a variety of issues in the mathematical development of computer.
science theory, particularly finite representations for languages and machines. Students will gain more formal understanding of algorithms and procedures.

Prerequisite:
Students should have knowledge of set theory and state transition diagrams.

Course Outcomes: On completion of the course, students will have the ability to
1. Design automata machines for strings given.
2. Write a regular expression for the given string and find set of strings if regular expression is given.
3. Write grammar rules for the strings given.
4. Design push down automata for the string and grammar.
5. Design Turing machine and apply the same to solve algorithmic problems.
6. Apply knowledge computation in complexity theory.

Unit I :   **08 Hours**
Finite Automata: Introduction to Finite Automata, Structural Representations, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence and Minimization of Automata, Conversion of NFA with epsilon to DFA Equivalence of Moore and Mealy Machine. Applications and Limitation of FA.

Unit II   **08 Hours**
Regular expressions: Regular expression (RE), Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to DFA, DFA to Regular expression, Non-Regular Languages, Pumping Lemma for regular Languages, Closure properties of Regular Languages, Applications of regular expressions.

Unit III   **08 Hours**
Grammar: Definition, Production rules, Derivation trees, Ambiguous Grammar, Removal of ambiguity, Regular Grammar, Inter-conversion between RE and Grammar, Reduced form of grammar. Linear grammar: left & right linear grammar, Inter- conversion. Chomsky hierarchy of languages, Context Free Grammar- Definition, Context free language (CFL. Normal Forms- Chomsky Normal Form (CNF), Griebach Normal Form (GNF).

Unit IV　　　　　　　　　　　　　　　　　　　　　　　　　　**08 Hours**

Push Down Automata (PDA): Limitations of FA, PDA: Definition, Uses, Equivalence between FA and PDA, Designing of PDA, Deterministic Push Down Automata and Non-Deterministic Push Down Automata- Definition, Language accepted by PDA, Designing a PDA for CFG, Properties of CFL, Pumping Lemma for CFL. Limitations of PDA, Applications of PDA.

Unit V　　　　　　　　　　　　　　　　　　　　　　　　　　**08 Hours**

Turing Machine (TM): Definition, Model, Comparison of TM, FSM, PDA, Design of TM, Examples of TM- Combinational TM, Iterative TM, Recursive TM, Universal TM, TM as a language acceptor, Some Problems that cannot be solved by Turning Machines, Language accepted by TM, Recursive sets, partially recursive functions. Church's Turing hypothesis, Multitask TM, TM limitations.

Unit VI　　　　　　　　　　　　　　　　　　　　　　　　　　**08 Hours**

Computational Complexity: Decidable problems concerning regular languages, Decidable problems concerning context-free languages, Un-decidability, Halting Problem of TM, Reducibility: Un-decidable Problems from Language Theory, A Simple Un-decidable Problem PCP, Mapping Reducibility Time Complexity: Measuring Complexity, The Class P, Examples of problems in P, The Class NP, NP- completeness.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks
　　1. "Introduction to Automata Theory, Languages and Computation", Hopcroft J,
　　　　Motwani R, Ullman ,Addison-Wesley, ISBN 81-7808-347-7, Third Edition .
　　2. "Introduction to Theory of Computation", Michael Sipser, Course Technology, ISBN-
　　　　10: 053494728X, Forth Edition. ISE.

Reference Books
　　1. "Introduction to Languages and Theory of Computation", John Martin. Fifth Edition,
　　　　McGrawHill.
　　2. "Computational Complexity", Christos H. Papadimitriou, Pearson Education.

List of Laboratory Exercise

　　1. Solve problems on designing finite automata.
　　2. Design and inter-convert Moore and Mealy Machine for same problems.
　　3. Form grammar rules for language of set of regular expression or strings given.
　　4. Design Push Down Automata for grammar or given string.
　　5. Construct Turing Machine to solve given problem.
　　6. Study Assignment on Complexity Theory.

　　Project Based Learning Assignments
　　Note:- *Students in a group of 3 to 4 shall complete any one project from the following list

　　1. Describe the process of designing the computer. How is it related with the simple

automata?

2. Write project based on famous computer scientist Alan Turing. Select suitable material for reference and summarize.
3. Describe the set of problems which can be represented using machines. What are the criteria we can enlist for such representations?
4. Relate the computational theory to World War II. What is the role of cryptography in World War II?
5. Invention of computer as a machine is related to formal automata. How today's complex and high-end computer systems can be mapped to these simple automata. Describe in detail.
6. Select a real-world problem and represent it mathematically. Design an automaton to solve this problem. Write detailed explanation of the entire process.
7. Study any text editor. Enlist its features. Map these features with the concepts you learned in the subject.
8. Enlist set of problems which can be solved, and which cannot be solved by memoryless automata. How memory affects the power of automata? Explain in detail and justify your answer with example.
9. Why Ethereum blockchain must be deterministic? Study and explain application of computation theory to blockchain technology.
10. Can human brain be simulated by Tring machine? Write detailed essay and justify your conclusions with theorem you learned.
11. Study research paper published by Alan Turing and write a summary in your words.
12. What are the similarities and differences between human brain and machine? Support your answers with suitable mathematical model.
13. Study any chess game software. Write the process of developing such software. Describe how this is related to Turing machine.

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

Microprocessors and Microcontrollers

TEACHING SCHEME   **EXAMINATION SCHEME**   **CREDIT SCHEME**

Lecture: 4 Hours/Week   **End Semester Examination: 60 Marks**   **Theory**   **4**

Practical: 2 Hours/Week   **Internal Assessment:**   **40 Marks**   **Practical**   **1**

                      Term Work   **:25 Marks**

Total   **6 Hours/Week**   **125 Marks**   **5**

Course Objective

This course facilitates the learners with the basic knowledge of microprocessors and microcontrollers. Also, the course supports the learners with detailed study of ARM processor and AVR Microcontroller.

Prerequisite:

Digital Electronics, C/C++/Java Programming

Course Outcomes: On completion of the course, students will have the ability to:

1. Learn basics of 16/32-bit Microprocessors.
2. Cognize the ARM Cortex Processor with its architecture and programming.
3. Discover Intel Pentium and i7 processor with its architecture and pipelining.
4. Comprehend basics of 8/16-bit Microcontrollers.
5. Uncover the details of AVR Microcontroller with its architecture and programming.
6. Understand the basics of Arduino and Raspberry Pi Controllers.

Unit I: **06 Hours**

Introduction to Microprocessors: Basics of 16-bit and 32-bit processor (Intel 8086 and 80386 processors), Multicore Architecture, Hyperthreading Technology, Instruction Set Architectures (ISA), Multiprocessor Organizations, Inter-Processor Communication (IPC).

Unit II: **06 Hours**

Intel Pentium Processor: Features and Internal Architecture, Superscalar Operation, Integer &Floating- Point Pipeline Stages, Branch Prediction Logic, Cache Organization and MESIProtocol, Comparative study of 8086, 80386, Pentium I, Pentium II and Pentium III, Hyper Threading technology and its use in Pentium 4, Intel i7 processor: Features, Architecture, Memory System, Pipelining.

Unit III   **06 Hours**

ARM Cortex: ARM Micro-architecture (ARMv7/v8/v9/v11), ARM architectures: Generic Interrupt Controller (GIC), Server Base System Architectures, Trusted Base System Architecture (TBSA), System Memory Management Unit (SMMU), Pipelining, ARM OS, ARM Programming.

Unit IV: **06 Hours**

Introduction to Microcontrollers: Microprocessors vs Microcontrollers, Basics of 8-bit and 16-bit Microcontrollers (Intel 8051 and 8096 microcontrollers), Applications of microcontrollers.

Unit V   **06 Hours**
AVR Microcontroller: Types of AVR Microcontrollers, ATmega16/32 8-bit AVR microcontroller: Features, Pin Description, Internal Architecture, Data and Program Memory, AVR Programming using C/Java/Assembly language, Study of VR Studio/Amtel, Studio 7, Visual Micro Lab.

Unit VI   **06 Hours**
Introduction to Arduino and Raspberry Pi : Introduction, Difference, Arduino Uno and Raspberry Pi Pico (RP2040), microcontrollers, Programming concepts of Arduino Uno with C/C++/Python and IDE, Programming concepts of Raspberry Pi Pico with C/MicroPython.

Textbooks
1 Arm Microprocessor Systems Cortex-M Architecture Programming and Interfacing, Muhammad Tahir, T&F India.
2 The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors, Joseph Yiu.
3 ARM A32 Assembly Language, Bruce Smith.
3 8051 Microcontrollers, Satish Shah, Oxford University Press.
4 Microprocessors and Interfacing, N.Senthil Kumar, M.Saravanan, Oxford University Press
5 Programming and Interfacing Atmel AVR Microcontrollers, Grace, Cengage Learning.
6 Practical AVR Microcontrollers, Alan Trevennor, Technology In Action.
7 Getting Started with Arduino, Massimo Banzi and Michael Shiloh.
8 Getting Started with Raspberry Pi, Matt Richardson and Shawn Wallace.

Reference Books
1 The Definitive Guide to ARM Cortex-M3 Processors, Stellaris, Texas Instruments.
2 ARM System-on-Chip Architecture, Steve Furber.
3 ARM processor, Santul Bisht, Lambert Publications
4 Modern Assembly Language Programming with the ARM Processor, Larry D Pyeatt.
5 Programming and Customizing AVR Microcontroller, Dhananjay Gadre.
6 Arduino Cookbook 2nd Edition, Michael Margolis.
7 Raspberry Pi The Ultimate Guide, Geoff Adams.
8 Internet of Things with Raspberry Pi and Arduino, Anita Gehlot.

List of Laboratory Exercise
1) Programming Assignments based on ARM Processor (Minimum 3) using Assembly
    Language.
2) Programming Assignments on 8051 using C (Minimum 2).
3) Programming Assignments based on AVR Controller (Minimum 3) on AVR Assembly
    language or Embedded C.
4) Study of and Using VR Studio/Amtel Studio 6/ Visual Micro Lab.
    Simple programming assignments on Arduino and Raspberry Pi Controllers (1 each) :
    Arduino Uno   programs on Arduino Desktop IDE or Web IDE using,
    a) Assembly/C/Python/Atmel   Studio7
    b) Raspberry Pi, Pico programs on C/C++/MicroPython.

Project Based Learning Assignments
Note:- *Students in a group of 3 to 4 shall complete any one project from the following list

1. Design and Implementation of Drunken People Identification with Auto Ignition Disable Function using ARM (Processor/Controller)/AVR Controller/8051 Microcontroller
2. Design and Implementation of Automatic Turn off for Water Pump with Four Different Time Slots using ARM (Processor/Controller)/AVR Controller/8051 Microcontroller

3. Design and Implementation of Gas Leak Detector with Automatic Air Exhaust Using ARM Cortex
4. Design and Implementation of ARM Based Liquid Level Detection & Flow Control
5. Design and Implementation of Motion Based Door Opener (in malls, big shops) using ARM (Processor/Controller)/AVR Controller/8051 Microcontroller
6. Design and Implementation of Fire Detection and Alarm using ARM (Processor/Controller)/AVR Controller/8051 Microcontroller
7. Design and Implementation of Remote-Control Plant Watering System using ARM (Processor/Controller)/AVR Controller/8051 Microcontroller
8. Design and Implementation of Voice Controlled Air Purifier based on Arduino and Raspberry Pi
9. Design and Implementation of Face Recognition Door Lock System based on Arduino and Raspberry Pi
10. Design and Implementation of Vehicle Number Plate Recognition based on Arduino and Raspberry Pi

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

Applied Algorithms

TEACHING SCHEME   **EXAMINATION SCHEME**   **CREDIT SCHEME**

Lecture:	4 Hours/Week	End Semester Examination: 60 Marks	Theory	4
Practical:	2 Hours/Week	Internal Assessment: 40 Marks		
		Term Work: 25 Marks	Practical	1
		Oral: 25 Marks		
Total	6 Hours/Week	150 Marks		5

Course Objective:
Understand and compare important algorithmic design paradigms and analysis of algorithms. To choose and extend efficient algorithms required for designs.

Prerequisite:
Students should be well versed with algorithms and operations on basic data structures stacks, queues, linked lists, trees, graphs. Students should have knowledge of searching sorting algorithms.

Course Outcomes: On completion of the course, students will have the ability to:
1. Interpret the performance of algorithms using analysis techniques.
2. Examine the fundamental algorithmic strategies.
3. Compare the fundamental algorithmic strategies.
4. Implement graphs and trees algorithms.
5. Interpret the tractable or intractable problem.
6. Summarize the advance types of algorithms.

Unit I   **08 Hours**
Introduction to Algorithm analysis: Characteristics of Algorithm. Analysis of Algorithm: Asymptotic analysis of Complexity Bounds – Best, Average and Worst-Case behavior, Performance Measurements of Algorithm, Time and Space Trade-Offs. Analysis of Recursive Algorithms through Recurrence Relations: Substitution Method, Recursion Tree Method and Masters' Theorem.

Unit II   **08 Hours**
Algorithmic Strategies 1: Brute-Force technique, Heuristics, Greedy algorithms, Divide and Conquer, Illustrations of these techniques for Problem-Solving.

Unit III   **08 Hours**
Algorithmic Strategies 2: Dynamic Programming, Branch and Bound algorithms, Backtracking, methodologies; Illustrations of these techniques for Problem-Solving.

Unit IV   **08 Hours**
Graph and Tree Algorithms: Self-Balancing tress, B Trees, B+ Trees, Single source shortest path algorithms, all pair shortest path algorithms, Network Flow Algorithm

Unit V   **08 Hours**
Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete andNP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques.

Unit VI 08 Hours

Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE, Introduction to Quantum Algorithms and parallel algorithms.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks
1. "Fundamental of Computer Algorithms", E. Horowitz and S. Sahni, Orient Black.
2. "Introduction to Algorithms", T. H. Cormen, C. E. Leiserson and R. L. Rivest,PHI Learning Pvt. Ltd. (Originally MIT Press).
3. "The Design and Analysis of Computer Algorithms", A. Aho, J. Hopcroft and J. Ullman, Pearson Education India.
4. Computer Algorithms: Introduction to Design and Analysis, S. Baase, Pearson Education India.
5. "The Art of Computer Programming", D. E. Knuth, Addison Wesley.

Reference Books
1. M. Welss, "Data Structures and Algorithm Analysis in C++", Pearson Education, ISBN- 81-7808-670-0.
2. G. A.V, PAI , "Data Structures and Algorithms ", McGraw Hill, ISBN -13: 978-0-07-066726-6.

List of Laboratory Exercise
1. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
2. Write a Code to find the shortest path using Bellman-Ford algorithm.
3. Write and analyze code to sort an array of integers using merge sort.
4. Write and analyze to sort an array of integers using divide and conquer quick sort Method.
5. Write a program to implement Longest Common Subsequence problem using Dynamic Programming.
6. Write a program to Implement 0/1 Knapsack problem using Dynamic Programming.
7. Write a program to Implement N Queen's problem using Back Tracking.
8. Write a program to implement quick sort using randomize algorithm.
9. Write a program to implement network flow algorithm.

Project Based Learning Assignments
Note:- *Students in a group of 3 to 4 shall complete any one project from the following list

1. Design and develop a project for Search engine using data structures
2. Design and develop a project for Google form like application
3. Design and develop a project for shortest path calculation for travelling salesman problem
4. Design and develop a project for finding keywords from the paragraph
5. Design and develop a project for Customer Billing system
6. Design and develop a project for word dictionary using search tree concept
7. Design and develop a project for salary calculation of employees based on performance
8. Design and develop a project for password recovery system
9. Create a mini project to construct game: Create Sudoku

Syllabus for Unit Tests:

Operating System

TEACHING SCHEME	EXAMINATION SCHEME		CREDIT SCHEME	
Lecture: 3 Hours/Week	End Semester Examination:	60 Marks	Theory:	3
Practical: 2 Hours/Week	Internal Assessment:	40 Marks	Practical:	1
	Term Work:	25 Marks		
	Practical:	25 Marks		
Total 5 Hours/Week		150 Marks		4

Course Objective:

The learning objective of this course is to introduce the internal operation of modern operating systems. The course will cover processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems.

Prerequisite:

Programming skills, elementary data structures, algorithms, and computer architecture.

Course Outcomes: On completion of the course, students will have the ability to:
1. Explain the services provided by the system calls.
2. Implement the scheduling algorithms like FCFS, SJF and priority scheduling.
3. Implement the memory allocation techniques like first fit, best fit and worst fit.
4. Explain practical implementation of the inter-process communication of the processes.
5. Implement the file system.
6. Explain the concept of the deadlock occurrence, avoidance and implementation of deadlock free condition.

Unit I   06 Hours

Computer System Overview: Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization. Operating system overview- objectives and functions, Evolution of Operating System. - Computer System Organization Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot.

Unit II   06 Hours

Process Management: Process Concept, Process states, Process control, Threads, Uni-processor Scheduling: Types of scheduling: Preemptive, Non preemptive, Scheduling algorithms: FCFS, SJF, RR, Priority, Thread Scheduling, Real Time Scheduling. System calls like ps, fork, join, exec family, wait.

Unit III   06 Hours

Memory Management: Memory Management requirements, Memory partitioning: Fixed and Variable Partitioning, Memory Allocation: Allocation Strategies (First Fit, Best Fit, and Worst Fit), Fragmentation, Swapping, and Paging. Segmentation, Demand paging Virtual Memory: Concepts, management of VM, Page Replacement Policies (FIFO, LRU, Optimal, Other Strategies), Thrashing.

Unit IV   **06 Hours**

Inter Process Communication: Basic Concepts of Concurrency, Cooperating process, Advantage of Cooperating process, Bounded- Buffer - Shared-Memory Solution, Inter-process Communication (IPC), Basic Concepts of Inter-process Communication and Synchronization.

Unit V   **06 Hours**

File Systems and I/O Systems : Mass Storage system – Overview of Mass Storage Structure, Disk Structure, Disk Scheduling and Management, swap space management; File-System Interface – File concept, Access methods, Directory Structure, Directory organization, File system mounting, File Sharing and Protection; File System Implementation- File System Structure, Directory implementation, Allocation Methods, Free Space Management, Efficiency and Performance, Recovery; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem, Streams, Performance.

Unit VI   **06 Hours**

Concurrency control: Concurrency: Principles of Concurrency, Mutual Exclusion: S/W approaches, H/W Support, Semaphores, pipes, Message Passing, signals, Monitors, Classical Problems of Synchronization: Readers-Writers, Producer Consumer, and Dining Philosopher problem. Deadlock: Principles of deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, System calls like signal, kill.

Textbooks
1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, Operating System Concepts. Sixth edition. Addison-Wesley (2003).
2. Modern Operating Systems -By Andrew S. Tanenbaum (PHI).
3. Operating Systems 5th Edition, William Stallings, Pearson Education India.
4. Peterson and Silberschatz, Modern Operating Systems.
5. Harvey M. Deitel, An introduction to operating systems. Addison-Wesley.

List of Internal Assignment will be framed by respective Course Coordinator.

Reference Books
1. A.M. Lister, Fundamentals of Operating Systems. Macmillan (1979).
2 Andrew Tanenbaum & Albert Woodhull, Operating Systems: Design and Implementation. Prentice-Hall.

List of Laboratory Exercise
1. Basic Linux Commands and Overview.
2. Write Shell Script for finding the global complete path for any file.
3. Write Shell Script to broadcast a message to a specified user or a group of users logged on any terminal.
4. Write Shell Script to copy the file system from two directories to a new directory in such a way that only the   latest file is copied in case there are common files in both the directories.
5. Write Shell Script to compare identically named files in two different directories and if they are same, copy one of them in a third directory.
6. Write Shell Script to delete zero sized files from a given directory (and all its sub-directories).
7. Implementation of FCFS (First Come First Serve) CPU Scheduling.
8. Implementation of SJF (Shortest Job First) CPU Scheduling.
9. Implementation of FIFO Replacement Algorithm.
10. Implementation of Optimal Page Replacement Algorithm.

Project Based Learning Assignments

Note:- *Students in a group of 3 to 4 shall complete any one project from the following list

1. Design of Intranet mail system project.

2. Design pf First-fit, worst-fit and best-fit for given allocation memory requirements

3. Simulation of the behavior of the multiprogramming operating system and use CPU scheduler, and CPU Execution.

4. Design the FCFS, SSTF, and SCAN disk-scheduling algorithms to simulate a simple disk drive, which has a specified number of logical blocks numbered from 0 onwards.

5. A Java simulator program to analyze the dependency of Page Faults on the Page Frames for incoming page requests.

6. CPU Scheduling Algorithm to calculate Throughput, Utilization, Turn Around time, Waiting Time. Gantt chart displayed for all n processes.

7. To simulate Round Robin algorithm.

8. A multi-threaded TCP server application, which allows multiple users to be registered and login.

9. Write a simple manual describing how to use the shell. The manual should contain enough detail for a beginner to UNIX to use it.

10. To simulate the dispatcher for allocating the process to CPU.

Syllabus for Unit Tests:

Unit Test -1   Unit – I, Unit – II, Unit - III

Unit Test -2   Unit – IV, Unit – V, Unit – VI

Information Technology Laboratory II

TEACHING SCHEME
Practical: 2 Hours/Week
Tutorial: 1 Hour/Week

Total   3 Hour/Week

EXAMINATION SCHEME
Term Work: 25 Marks
Practical: 50 Marks

                    75 Marks

CREDIT SCHEME

Theory	Credits
Practical:	1
Tutorial	1
	2

Course Objectives:
1) Understand web environment for building the application.
2) Implement web application.
3) Implement Servlet.
4) Implement Java Messaging Services.
5) Implement Java Mail API.

Prerequisite:
1) Core Java 2) Scripting languages.

Course Outcomes: On completion of the course, students will have the ability to:
1. Understand the lifecycle of web application.
2. Implement session management using servlet.
3. Apply standard and custom tags of JSP.
4. Design competitive web application which will work real web environment.
5. Implement Java Messaging Services.
6. Apply Java Mail API.

Unit I   **06 Hours**
Introduction to Servlet: Web Application Basics, Architecture and challenges of Web, application. Introduction to servlet, Servlet life cycle, Developing and Deploying Servlets, Exploring Deployment Descriptor (web.xml).

Unit II   **06 Hours**
Session Management and Servlet Chaining: Handling Request and Response Initializing a Servlet, Accessing Database, Servlet Chaining, Session Tracking & Management, dealing with cookies, Transferring Request, Accessing Web Context, Passing INIT and CONTEXT Parameter, sharing information using scope object Controlling concurrent access User Authentication, Filtering Request and Response, Programming Filter, Filter Mapping, Servlet Listeners.

Unit III   **06 Hours**
Java Server Pages: Standard Tags: Basic JSP Architecture, Life Cycle of JSP (Translation, compilation), JSP Tags and Expressions, Role of JSP in MVC-2, JSP with Database, JSP Implicit Objects.

Unit IV   **06 Hours**
Java Server Pages: Custom Tags: Tag Libraries, JSP Expression Language (EL), Using Custom Tag, JSP Capabilities Exception Handling Session Management Directives JSP with Java. Introduction to struts.

Unit V   **06 Hours**
Java Messaging Services: JMS Architecture, Point-to-Point Messaging
Domain, Publisher/Subscriber, Messaging Domain, JMS API, JMS Queue.

Unit VI   **06 Hours**
Java Mail API: SMTP, POP, IMAP, MIME, NNTP, sending mail, receiving
mail, mail with attachment, forward email, delete email.

Textbooks
1. Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book: HTML, JavaScript, PHP, Java, Jsp, XML and Ajax, Black Book Paperback – 1 January 2009, Kogent Learning Solutions Inc.
2. Java EE 8 Cookbook: Build reliable applications with the most robust and mature technology for enterprise development, Packt Publication, Elder Moraes.
3. Headfirst Servlets and JSP: Passing the Sun Certified Web Component Developer Exam 2nd Edition, Bryan Basham, Kathy Sierra, Bert Bates.

Reference Books
1. Beginning Java EE 7, Appress Publication, Antonio Goncalves.
2. Java EE 7 Essentials: Enterprise Developer Handbook 1st Edition, Headfirst Publication, Arun Gupta.
3. J2EE: The complete Reference Paperback, Jim Keogh.

List of Laboratory Exercise:
1. Maintain record of students and perform CRUD functionality.
2. Write a program to redirect a request using a dynamic approach.
3. Write a program to pass the data using session.
4. Write a servlet to remove spam.
5. Maintain the record of faculty member using jsp action tags and directives.
6. Design a tag to perform the necessary editing in a given report.
7. Design reusable components of the form using taglib.
8. Implement sending and receiving mail utility using Java Mail API.
9. Implement Java Message Service queue.
10. Understand working of framework – struts- case study.

Project Based Learning Assignments

Note:- *Students in a group of 3 to 4 shall complete any one project from the following list

1. Implement assignment and project submission system.
2. Implement a program to issue Leaving Certificate, Transcripts and Bonafede certificate to student
3. Implement a program to assign problem statement for practical examination in secured environment.
4. Design a template for NBA report.
5. Design an application for Feedback Management System.
6. Design application to maintain track of research paper with indexing per year.
7. Create message and mail communication of given message.
8. Design a post customized as per social media platform.
9. Design an interface to collect job opportunities and disseminate to eligible student
10. Design a project to track details of Industrial Training.

B.Tech. (Information Technology)

Semester-V

HUMAN COMPUTER INTERACTION

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Lecture:	04	University Examination	60		
Practical:	-	Internal Assessment	40	Lecture	04
		Term Work	--	Practical	-
		Practical / Oral	--		
Total	04	Total	100	Total	04

Course Objective:

To gain theoretical knowledge and practical experience in the fundamental aspects of designing and implementing user interfaces.

Prerequisite:

Basic computer knowledge

Basic HTML knowledge

Basic Software Engineering knowledge

Course Outcomes: On completion of the course, students will have the ability to:

1. To learn foundations of Human Computer Interaction.
2. To understand Graphical User Interface.
3. To identify Design Process.
4. To learn Screen Designing.
5. To understand Models and Theories of HCI.
6. To learn Web Interface Designing.

Unit I INTRODUCTION	08 Hours
What is HCI, History of HCI, Computer Devices, Difference between Humans and Computers, User Interface, Benefits of User Interface, Good Design, Benefits of Good Design	

Unit II THE GRAPHICAL USER INTERFACE	08 Hours
Popularity of Graphics, The concept of Direct Manipulation, Graphical System,Characteristics,Web User-Interface Popularity, Characteristics, Principles of User Interface. Design Thinking. Stages of Design Thinking.	

Unit III DESIGN PROCESS	08 Hours
Human Interaction with Computers, Models of Interaction: Frameworks, Ergonomics, Styles, Elements, Interactivity. Human Characteristics, Human Considerations. Design rules: principles, standards, guidelines, rules. Golden rules.	

Unit IV SCREEN DESIGNING	08 Hours
Design goals-Screen planning and purpose, organizing screen elements, Ordering of screen data and content-screen navigation and flow, Information retrieval on web-statistical graphics	

Unit V MODELS AND THEORIES	08 Hours
HCI Models, Cognitive models, Communication and collaboration models, Hypertext, Multimedia and World Wide Web.	

Unit VI WEB INTERFACE DESIGN	08 Hours
Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays andVirtual Pages, Process Flow – Case Studies, Game Designing, Application designing.	

Textbooks

1. Ben Shneidermann, "Designing the user interface",Third edition, Pearson Education Asia
2. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, ―Human Computer Interaction‖, 3rd Edition, Pearson Education, 2004

Reference Books

1. Wilbert O Galitz ,"The essential guide to user interface design", ,Wiley Drdeam Tech
2. Alan Dix, janetFincay, GreGoryd, Abowd, Russell Bealg, "Human Computer Interaction", Pearson Education

List of Assignments

1. Describe User interface with it's benefits.
2. Enlist and explain characteristics of Graphical User Interface.
3. State design rules in Design process.
4. How to design screen with proper planning? Explain.
5. Explain HCI models.
6. Describe and design web interface.

Project Based Learning

1. Design E-Shopping system
2. Design E-government service system
3. Design E-Hotel reservation system.
4. Design E-Banking System
5. Design Mechanism for an Augmented Reality Interface
6. Design Mechanism for Virtual Reality Interface

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		**Marks**		**Credits**
Lecture	04	**University Examination**	60	**Lecture**	04
Practical:	02	**Continuous Assessment**	40		
		Termwork	25	**Practical**	01
		Oral	25		
Total	**06**	**Total**	**150**	**Total**	**05**

Course Overview

The course provides an overview of the fundamentals of Machine Learning. The basic components needed to design a model to solve the problem, are covered.

Prerequisite:

Fundamental understanding of statistics.

Introduction to Python.

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand the fundamentals of probability and statistics.
2. Implement the clustering using unsupervised learning.
3. Apply the classification techniques.
4. Apply the regression techniques.
5. Apply the regularization for balancing the bias and variance.
6. Apply the model for decision-making.

Unit I	08 Hours
Introduction to Artificial Intelligence & Machine Learning	
Introduction to AI, ML, AI- Scope, Application, Environment, Probability Density Function, Normal Distribution, Standard Deviation, Regression Coefficient. Hypothesis Testing, Loss Functions. Introduction to supervised and unsupervised learning.	
Unit II	**08 Hours**
Unsupervised Learning	
Clustering, Feature Extraction, Spurious Correlation, K-Means clustering, KNN, Dimensionality Reduction, Principal Component Analysis, Multidimensional Scaling.	
Unit III	**08 Hours**
Classification Algorithms	
Classification Algorithms- Naïve Bayes, Logistic Regression, Support Vector Machine, Decision Tree, **Result validation of Classification –** Precision, Recall, F-Measure, MAP, R-Curve.	
Unit IV	**08 Hours**
Regression algorithm	
Linear Regression, Lasso Regression, Ridge Regression, Random Forest **Regression Loss Function –** Mean Average Error, Mean Standard Error LogCosh, Huber, Quantile Loss	
Unit V	**08 Hours**
Regularization and Gradient Descent	
Cost functions, regularization, feature selection, hyper-parameters, and more complex statistical optimization algorithms like Gradient Descent and its.	
Unit VI	**08 Hours**

Bagging, Boosting, and stacking	
Bagging Advanced supervised learning algorithms -Combining classification and regression algorithm, Trade-off between bias and variance, bootstrapping, and aggregating (also known as "Bagging") to reduce variance. Random Forest algorithm, reduction in a correlation. Boosting and Stacking Advanced supervised learning algorithms –Boosting algorithm to reduce variance and bias. Design the case-specific model.	

Textbooks	
1 Introduction to Machine Learning with Python: A Guide for Data Scientists 1st Edition, Andreas Müller, Sarah Guido	
2 Data Science from Scratch: First Principles with Python 2nd Edition, Joel Grus	
3 Machine Learning in Action, Manning Publication, Peter Harrington	
4 Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, O'Reilly Media Publication, First Edition, AurelienGeron.	
5 Python Machine Learning, Packt Publication, Sebastian Raschka, Vahid Mirjalili.	

Reference Books

1 Pattern Recognition and Machine Learning, Author: Christopher M. Bishop, Springer Publication.

2 Machine Learning for Hackers: Case Studies and Algorithms to Get You Started
Authors: Drew Conway & John Myles, O'Reilly Media Publication.

List of Assignments

1. Identify the association between dependent and independent variables.
2. Apply the clustering techniques using unsupervised learning.
3. Apply dimensionality reduction using PCA
4. Apply Naïve Bayes classification algorithms.
5. Apply the KNN algorithm for the classification.
6. Implement Linear Regression Algorithm.
7. Implement the SVM Algorithm for Regression.
8. Apply regularization for avoiding overfitting.
9. Calculate the Gradient descent for the given algorithm.
10. Design a model for applying a combination of the algorithms.

Project Based Learning

1. Compare The effect of features over the output for the standard dataset (like Dataset at Kaggle).
2. Calculate the distribution, normalization, and outlies to maximize the effect of the training.
3. Compare the classification of the standard algorithm on the common dataset and check the consistency for the different datasets.
4. Apply Bagging for combining the effect of the various algorithm.
5. Implement the classification techniques for detecting spam content.
6. Apply the pre-processing techniques to explore insights of the Dataset.
7. Apply the regression approaches to predict the behaviour of a given stock.
8. Implement all optimization algorithms for any classification or regression algorithm.
9. Design a model to accurately classify the given video on YouTube based on the Metadata.
10. Design the model resilient to the effect of the number of Epochs.

A group of 3-4 students shall complete any one of the projects listed above.	
Syllabus for Unit Tests:	
Unit Test -1	Unit – I, Unit – II, Unit – III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

COMPUTER ORGANIZATION AND ARCHITECTURE

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Lecture:	03	University Examination	60	Lecture	03
Tutorial:	01	Internal Assessment	40	Tutorial	01
		Term Work	--	Practical /Oral	--
		Practical/Oral	--		
Total	04	Total	100	Total	04

Course Objective:
1. To learn the low-level design and working of computer/processor
2. To learn parallel computing architectures and platforms

Prerequisite:
Digital Electronics, Microprocessor Architecture, Structured Programming

Course Outcomes: On completion of the course, students will have the ability to:
1. Understand the recent trends in Computer Architecture
2. Understand various hardware design tools and platforms with case studies
3. Understand the design techniques of control unit of a processor
4. Understand the basic design of a processor and memory technologies
5. Understand different multiprocessor architectures
6. Understand different parallel processing architectures and concepts underlying.

Unit I – Recent Advances	**04 Hours**
Technology trends in Computer Architecture, Performance Metrics, Improving performance, Moore's law, Cluster Computing, Cloud Computing, Quantum Computers, Hardware support for Operating Systems, Hardware Transactional Memory with OS support (HTMOS), GPU vs TPU	
Unit II – Digital Logic Design, Simulation and Debugging with HDLs	**10 Hours**
Case Study of Hardware Description Languages: A) VHDL B) Verilog C) SystemVerilog D) SystemC Case Studies of HDL Simulation and Debugging tools like ModelSim, Xilinx etc.	
Unit III – Control Unit Design	**08 Hours**
Hardwired Control Unit, Micro-programmed Control Unit design, Recent Trends	
Unit IV – Processor and Memory Design	**08 Hours**
Basic design of a Processor, Control path, Data path Cache memory: Working principle, Mapping functions, Replacement algorithms, Cache coherence, Examples, Atomic Memory, UFFO storage, UltraRAM, 3D NAND, Intel Optane memory, Recent Trends	

Unit V – Multiprocessor Architectures	06 Hours
Shared memory – Distributed Memory multiprocessor architectures, Message-Passing Multiprocessors, Dataflow machine architecture Supercomputer architecture, Recent Trends	

Unit VI – Parallel Computing and Programming	12 Hours
Pipelining, Data and Control Hazards, Stalls, RISC/Pentium-4 Pipeline, Complex Pipelines, Out-of-order Execution, Dynamic Scheduling, Tomasulo Algorithm, Register renaming, Register Scoreboarding, Basic compiler techniques for exposing instruction-level parallelism, Vector processors, Array processors, VLIW architecture, Multithreaded architecture, GPU Computing architecture, Nvidia Maxwell, CUDA, Writing a simple parallel algorithm, Parallel Programming languages, OpenMP, MPI, Pthreads, Amdahl's Law, Gustafson-Barsis's Law, Karp-Flatt Metric, isoefficiency, Recent Trends	

Textbooks
1. Computer Organization and Architecture, William Stallings, Prentice Hall
2. Computer Organization and Embedded Systems, Hamacher&Zaky, McGraw Hill
3. Advanced Computer Architecture, Kai Hwang, Tata McGraw Hill
4. Fundamentals of Logic Design, Charles Roth & Larry Kinney, Cengage Learning
5. The Verilog: Hardware Description Language, Thomas &Moorby, Extra Materials
6. Advanced Computer Architecture and Parallel Processing, Rewini& Barr, Wiley Publications

Reference Books
3. Computer Organization and Design: The Software/Hardware Interface, David Patterson, Elsevier
4. Fundamentals and Standards in Hardware Description Languages, Jean Mermet, Springer Science
5. Parallel Computers: Architecture and Programming, V.Rajaraman&C.Murthy, Prentice Hall India
6. Introduction to Parallel Computing: From Algorithms to Programming, Roman Trobec, Springer

Project Based Learning
1. Case studies in recent trends in Computer Architecture
2. Case studies in Hardware Description Languages and Simulators
3. Recent Trends in Control Unit Design
4. Case studies in recent Memory Technologies
5. Case studies in recent trends in Multiprocessor Architectures
6. Case studies in recent trends in Parallel Computing

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit – III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

ADVANCED DATABASE SYSTEMS

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Lecture	03	University Examination	60	Lecture	03
		Internal Assessment	40		

Practical	02	Term Work	25	Practical	01
		Practical	25		
Total	05	Total	150	Total	04

Course Objective:

1. Exploring the working of large scale and emerging database management systems
2. Study and analysis of query processing and query optimization in distributed and parallel databases

Prerequisite:

Student should be well aware of database management systems, analysis of data structure and algorithms with sufficient programming experience

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand the working of distributed database management system
2. Understand the processing and optimization of distributed queries
3. Understand the architecture and query processing in parallel database management system
4. Understand the concepts of advanced transaction management
5. Understand the concepts of different information retrieval systems
6. Understand the structure and significance of Big Data and NoSQL Databases

Unit I - Distributed databases: Architecture and Design	**06 Hours**
Distributed data processing,What is a DDBS; Advantages and disadvantages of DDBS, Problem areas Distributed DBMS Architecture: Transparencies in a distributed DBMS,Distributed DBMS architecture, Global directory issues, Distributed Database Design: Alternative design methodologies and strategies, Distributed design issues, Types and role of Fragmentation, Types and role of replication, Data allocation	

Unit II - Distributed query processing and optimization	**06 Hours**
Distributed Query processing: Problem of query processing, Distributed query, Query decomposition, Distributed Query Processing Methodology, translation global queries to fragment queries Distributed Optimization: Objectives of query optimization, Factors governing query optimization, Ordering of fragment queries, optimization of join operation, Load balancing, Distributed query optimization algorithms	

Unit III - Parallel Database Management System	**06 Hours**
Introduction: Types of parallelism in database systems, Parallel Query Processing, multiprocessor architectures, parallel relational operators, parallelism in main-memory DBMS, parallel handling of integrity constraints, Integrated I/O parallelism Parallel Query Processing and Optimization: Inter-query parallelism, intra-query parallelism, intra-operation parallelism, inter-operation parallelism, objectives of parallel query optimization, parallel query optimization, load balancing, parallelism in join queries, testing the quality of query optimization	

Unit IV – Advanced concepts in Transaction Management	**06 Hours**
Transaction Management: ACID properties, pessimistic locking, optimistic locking, flat transactions, nested transactions, deadlock detection and management and their algorithms, Recovery Methods Concurrency control and Reliability in Distributed Dtabases: Concurrency	

control in centralized database systems vs Concurrency control in DDBSs, Distributed concurrency control algorithms, Deadlock management, Reliability issues in DDBSs; Types of failures, Reliability techniques, Commit protocols, Recovery protocol

Unit V –Advanced Querying and Information Retrieval	**06 Hours**
Decision Support Systems, Data Analysis and OLAP, Data Mining, Data Warehousing, Information Retrieval Systems Database Tuning and Performance: Benchmarking, TPC benchmarks, object oriented benchmarks, TP Monitors, TPC and Wisconsin benchmarks, performance measurement, and performance tuning	
Unit VI - Big Data and NoSQL Databases	**06 Hours**
What is NoSQL? Why NoSQL? History of NoSQL Databases, Features of NoSQL, Types of NoSQL Databases, Query Mechanism tools for NoSQL, CAP Theorem Big Data - Introduction, Types, Characteristics, Testing, Examples, Introduction to Hadoop, MongoDB- Introduction, Architecture, Features, Data Modelling in MongoDB	

Textbooks

1. Database System Concepts, Seventh Edition, AviSilberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill
2. Data Warehousing: Concepts, Techniques, Products and Applications, 3rd Edition, C.S.R. Prabhu, PHI Learning Pvt. Ltd.
3. Stefano *Ceri and* Giuseppe *Pelagatti,* "Distributed databases principles and systems", Tata McGraw Hill

Reference Books

1. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Sadalage, P. & Fowler, Wiley Publications
2. M. Tamer Özsu and Patrick Valduriez, "Principles of Distributed Database Systems", Springer Science & Business Media, 3rd edition

List of Assignments

1. Compare query processing in RDBMS with DDBMS
2. Analysis of parallel sort and parallel join operations
3. Analysis of Lucene web search engine
4. Comparison of different NoSQL databases types
5. Analyse comprehensive aspects of factors that drive the MongoDB vs SQL decision
6. Study of Hadoop as a big data tool

List of Laboratory Exercises

1. Installation of MongoDB
2. MongoDB Create Database with primary key
3. MongoDB Query Document using find(), Sort(), Limit() method
4. MongoDB Count(), Remove() , Update(), Document() Functions
5. MongoDB administration functions
6. Installation of Cassandra environment
7. Cassandra - Shell Commands
8. Cassandra Table Operations

9. Cassandra Keyspace Operations	
10. Cassandra CURD Operations	
Project Based Learning	
1. MongoDB Security, Monitoring & Backup	
2. MongoDB Indexing	
3. Creating User & add Role in MongoDB	
4. Streaming Twitter Data	
5. MongoDB Replication	
6. Analysis of FB data	
Syllabus for Unit Tests:	
Unit Test -1	Unit – I, Unit – II, Unit – III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

MOBILE APPLICATION DEVELOPMENT					
Teaching Scheme		**Examination Scheme**		**Credit Scheme**	
	Hours/Week		**Marks**		**Credits**
Lecture	04	**University Examination**	60	**Lecture**	**04**
Practical	02	**Internal Assessment**	40		
		Term Work	25	**Practical**	**01**
		Practical	25		
Total	**06**	**Total**	**150**	**Total**	**05**

Course Objective:

The aim of this course is to help the students to attain the following industry identified competency through various teaching learning experience-
1. To help students to gain a basic understanding of Android application development.
2. To create simple Android Applications.
3. To understand how to publish, deploy and monetize Mobile Applications.

Prerequisite:
1. Java or object-oriented programming experience.
2. Application Development with JavaScript.
3. Application Development with cross platform.
4. Knowledge about Impressive User Interface features.

Course Outcomes: On completion of the course, students will have the ability to:
1. Understand the features and architectures of mobile applications.
2. Apply essential Android Programming concepts.
3. Design user interface development using Android Screen Elements and Layouts
4. Develop Android applications related to mobile related server-less database like SQLite.
5. Create ISO Mobile application using Swfit and Xcode.
6. Deploy and maintain the Android Applications.

Unit I	08 Hours

Introduction to Mobile Application Development:
Introduction to Mobile Applications and Device Platforms, The Mobile Application Development Life Cycle, Mobile application developing frameworks and Tools, The Mobile Application Front-End, The Mobile Application Back-End. Key Mobile Application Services, Mobile OS Architectures-Kernel Structure-Comparing and Contrasting architectures of Android, iOS and Windows.

Unit II	08 Hours

Android Development Framework:
Android OS design and Features, Android development framework, Android SDK features, best practices in Android programming, Types Android tools, Installing and running applications on Android Studio.
Android application components: Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc., Android Application Lifecycle: Activities, Activity lifecycle, activity states, monitoring state changes, Services, Intents, Receiving and Broadcasting Intents, Permissions.

Unit III	08 Hours

Android User Interface Components and Layouts:
Android SDK, Android virtual Devices (AVDs), Emulators, Dalvik Virtual Machines, Difference between JVM and DVM, Android installation and

configuration steps.

Creating Adaptive and responsive user interfaces, Introduction to Android views and layouts, Editable and non-editable Text Views, Retrieving data from users, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers, View versus View Groups.

Layouts – Build in Layout Classes such as Linear, Relative, Grid and Table Layouts, Fragments Fragment Life Cycle, Testing the user interface.

Unit IV	**08 Hours**
Activity and Multimedia with Databases: Crating Private and Shard Preferences, Adding, Deleting and Updating Preferences, Working with Files and Directories, Creating SQlite Database, Storing, Updating and Deleting Database Records. Closing and Deleting SQLite Database. Study Andrios's Content Providers, Modify Content Providing Data Improving Applications using Content writing.	
Unit V	**08 Hours**
iOS Fundamental: Introduction to iOS, iOS Architecture, Frameworks, Application Life cycle, Features. Concepts of Swift, Features of Xcode, Navigator, Editor Utility, Tools. **iOS Application start up**: Application Templates, Concept of Storyboard, Hello World Application, Features and working approaches, Debugging Database, Preference, SQlite webservices and RESTful Web Services.	
Unit VI	**08 Hours**
Publishing Android Application: Performance Improvement of Android Application: Performance Parameters, Profiling Tools, Rendering and Layout, Garbage Collection and Memory Leaks, Best Practices, Testing Android applications. Preparing for Publishing: Signing, Versioning and Publishing the Android Application to the Android Market.	
Textbooks	
1. Android programming for Begineers, Horan,John, Packet Publication,2015, ISBN:978-1-78588-326-2	
2. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012	
3. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013	
4. J. F. DiMarzio, "Android: A Programmers Guide", McGraw Hill Education (India) Private Limited.1st Edition,2008.	
5. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)	
6. Unlocking Android Developer's Guide By Frank Ableson and Charlie Collins and RobiSen, Manning Publication Co.	
Reference Books	
1. Valentino Lee, Heather Schneider, Robbie Schell, Mobile Applications: Architecture, Design, and Development, Prentice Hall, April 2004, ISBN-13: 978-0131172630	
2. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013	
3. Beginning Android, Mark L Murphy, Wiley India Pvt Ltd, Dreamtech Press 2009.	

4. Android Application Development All-in-One For Dummies, Barry Burd, For Dummies, 2015.
5. Android Programming: The Big Nerd Ranch Guide), by Bill Phillips, Chris Stewart, Kristin Marsicano, Big Nerd Ranch Guides Publishing, 2017.
6. Head First Android Development 2e: A Brain-Friendly Guide, Dawn Griffiths , David Griffiths., O'Reilly Publishing ,2017.
7. Professional Android, by Reto Meier, Ian Lake, Wrox Publishing, 2018.
8. Beginner's Guide to IOS 11 App Development Using Swift 4: Xcode, Swift and App Design Fundamentals, by SerhanYamacli, Createspace Independent Publication , 2018.
9. Android Wireless Application Development By Lauren Darcey and Shane Conder, Pearson Education, 2nd Edition.

List of Assignments
1. Explain the basic terms related to Android system.
2. Identify the tools and software required for developing an Android application.
3. Describe the steps to configure the given Android Development environment.
4. Describe the user interface for given Android application.
5. Write the query to perform given operation.
6. Describe Application life cycle in detail with an example.

List of Laboratory Exercises
1. Create "First Android Application" that will display "**BVDUCOEP-PUNE**" in the middle of the screen in the green color with White background.
2. Develop an application that uses GUI components, Font and Colours.
3. Create login application where you will have to validate EmailID (UserName). Till the username and password is not validated, login button should remain disabled.
4. Developing of an application for data persistence.
5. Create an application that will change color of the screen, based on selected options from the menu.
6. Create an application that will display toast (Message) on specific interval of Time.
7. Create a background application that will open activity on specific Time.
8. Write an Android application for calculator.
9. Implement an application that creates an alert upon receiving a message.
10. Create simple app for Iso OS phone.

Project Based Learning
1. Create sample application with Check username and password only. On successful login, go to the next screen and on failing login, alert user using Toast. Also pass username to next screen.
2. Write an Android application to convert into different currencies for example, Rupees to dollar.
3. Create and Login application as above. On successful login, open browser with any URL.
4. Developing of simple game.
5. Write an application to mark the daily route of travel in map.
6. Write an android application to count library overdue.
7. Create the MP3 player like application with service.
8. Develop one Application, Which Contains Specific User Interface and design Interface.

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit – III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

INFORMATION TECHNOLOGY LABORATORY-III

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Practical	02	Term Work	25 Marks	Practical	01
Tutorial	01	Practical	25 Marks	Tutorial	01
Total	03	Total	50 Marks	Total	02

Course Objective:

To acquire programming skills in core Python to develop various applications.

Prerequisite:

 Understanding of basic programming knowledge and oops concepts.

Course Outcomes: On completion of the course, students will have the ability to:

1. To acquire programming skills in core Python.
2. To implement Object Oriented Skills in Python
3. To develop the skill of designing Graphical user Interfaces in Python
4. To develop the ability to write database applications in Python
5. Elaborate exception handling in various applications.
6. Demonstrate regular expressions in Data mining applications.

Unit I : Introduction to Python	06 Hours
Install Python and Environment Setup • First Python Program • Python Identifiers, Keywords and Indentation • Comments and document interlude in Python • Command line arguments • Getting User Input • Python Data Types • What are variables? • Python Core objects and Functions • Number and Maths	

Unit II : List, Ranges & Tuples in Python	06 Hours
Introduction • Lists in Python • More about Lists • Understanding Iterators • Generators, Comprehensions and Lambda Expressions: - Introduction, Generators and Yield, Next and Ranges • Understanding and using Ranges • More About Ranges • Ordered Sets with tuples	

Unit III :Python Dictionaries and Sets	06 Hours
Introduction to the section • Python Dictionaries • More on Dictionaries • Sets • Python Sets Examples	

Unit IV :Input and Output in Python	06 Hours
• Reading and writing text files • writing Text Files • Appending to Files and Challenge • Writing Binary Files Manually • Using Pickle to Write Binary Files	

Unit V : Exceptions	06 Hours
• Errors in Python • Compile-Time Errors • Runtime Errors • Logical Errors • What is Exception? • Handling an exception • try….except…else • try-finally clause • Argument of an Exception • Python Standard Exceptions • Raising an exceptions • User-Defined Exceptions	

Unit VI : Python Regular Expressions	06 Hours
What are regular expressions? • The match Function • The search Function • Matching vs searching • Search and Replace • Extended Regular Expressions • Wildcard	

Textbooks

Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning, ISBN: 978-1111822705.

Reference Books

1. Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016
2. Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010

List of Laboratory Exercises

1. Write a program to implement Arithmetic Operations
2. Write a program to implement Built-in Functions
3. Write a program to implement Loops
4. Write a program to implement Data Types
5. Write a program to implement Strings
6. Write a program to implement Classes and Objects
7. Write a program to implement Built-in Modules
8. Write a program to implement Constructors and Inheritance
9. Write a program to implement File Operators

Project Based Learning

1. Guess the Number Game
2. Rock, paper, scissors
3. Hangman
4. Countdown Timer
5. Password Generator
6. QR code encoder / decoder
7. Tic-Tac-Toe
8. Binary Search
9. Minesweeper
10. Sudoku Solver
11. Photo manipulation in Python
12. Markov Chain Text Composer
13. Pong
14. Snake
15. Online Multiplayer Game
16. Web Scraping Program
17. Weather Program
18. Code a Discord Bot with Python - Host for Free in the Cloud
19. Space invaders game

Syllabus for Unit Tests:

NA	

B.Tech. (Information Technology)

Semester-VI

CLOUD COMPUTING

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Lecture	04	University Examination	60	Lecture	04
		Internal Assessment	40		
Practical	02	Term Work	25	Practical	01
		Oral	25		
Total	06	Total	150	Total	05

Course Objective:

This course aims at giving students a knowledge of Cloud computing along with its applications in terms of the following

- Understanding the systems, protocols, and mechanisms to support cloud computing.
- Understanding the architecture of cloud computing
- Discuss Cloud Platforms in Industry
- Understanding cloud computing applications.
- Discuss Cloud Security and various challenges

Prerequisite:

- Computer Networks
- Operating System-I
- Information Security

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand the Concept of Cloud Computing
2. Understand the Virtualization Techniques and its need.
3. Analyse various types of clouds and its Architecture.
4. Illustrate the fundamental concepts of cloud computing and understand their use in different scientific applications.
5. Analyse and understanding of advanced concepts in Cloud Computing.
6. Understanding of cloud security techniques.

Unit I	08 Hours
Introduction: Definition, Historical Developments, Computing Platforms and Technologies. Building cloud computing environments, Principles of Parallel and Distributed Computing: Parallel versus Distributed Computing, Elements of Parallel Computing, Elements of Distributed Computing, and Technologies for Distributed Computing.	

Unit II	08 Hours
Virtualization: Characteristics, Virtualization Techniques, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples.	

Unit III	08 Hours
Cloud Computing Architecture: Cloud Reference Model, Types of Clouds, Economics of Clouds, Open Challenges, Cloud Platforms in Industry: Amazon Web Services, Google AppEngine, And Microsoft Azure.	

Unit IV	08 Hours
Cloud Applications: Scientific Applications in – Healthcare, Biology, Geo-Science; Business Applications in– CRM and ERP, Productivity, Social Networking, Media Applications, Multiplayer Online Gaming.	
Unit V	08 Hours
Advanced Topics in Cloud Computing: Energy Efficiency in Clouds, Market Based Management of Clouds, Federated Clouds / InterCloud, Third Party Cloud Services.	
Unit VI	08 Hours
Understanding Cloud Security: Securing the Cloud, The security boundary, Security service boundary, Security mapping, Securing Data, Brokered cloud storage access, Storage location and tenancy, Encryption, Auditing and compliance, Establishing Identity and Presence, Identity protocol standards	

Textbooks

1. Mastering Cloud Computing, Buyya R, Vecchiola C, Selvi S T, McGraw Hill Education (India), 2013.
2. Cloud Computing Bible, Barrie Sosinsky ,Wiley Publishing Inc. 2011
3. Cloud Computing from Beginning to End by Ray J Rafaels
4. Cloud Computing for Dummies by Judith S. Hurwitz, Robin Bloor, Marcia Kaufman, Fern Halper

Reference Books

1. Buyya R, Broberg J, Goscinski A, "Cloud Computing - Principles and Paradigms", Wiley, 2011
2. Cloud Computing: Concepts, Technology & Architecture by Zaigham Mahmood, Ricardo Puttini, Thomas Erl

List of Assignments

- It consist of 10-12 tutorials based on above topics& case study on cloud service providers like AMAZON EC2, salesforce.com etc.

Project Based Learning

Developing application on Google AppEngine

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit – III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

SOFTWARE TESTING AND QUALITY ASSURANCE					
Teaching Scheme		**Examination Scheme**		**Credit Scheme**	
	Hours/Week		**Marks**		**Credits**
Lecture	**04**	**University Examination**	60		
		Internal Assessment	40	**Lecture**	**04**
Practical	**02**	**Term Work**	25	**Practical**	**01**
		Practical	50		
Total	**06**	**Total**	175	**Total**	**05**

Course Objective:

Study fundamental concepts of software testing and its application in various scenarios with the help different testing strategies, methods and tools.

Prerequisite:

 Knowledge of Software Engineering, Software Project Management

Course Outcomes: On completion of the course, students will have the ability to:
1. Provide knowledge about fundamentals of software testing
2. Design specific and measurable test cases to ensure coverage
3. Apply black box testing techniques
4. Know various levels of testing
5. Apply automation tools for testing process
6. Understand notion of quality through software quality models

Unit I Software Testing – Concepts	08 Hours
Quality revolution, software quality, testing as a process, purpose of testing, principles of testing, error, fault, defect and failure, defect life cycle, notion of software reliability, verification and validation, white box and black box testing, static testing and dynamic testing. Test plan, test management, test execution and reporting, test team organization and management.	

Unit II White Box Testing Techniques	08 Hours
Need of white box testing, static white testing techniques: peer review, inspections, code walkthrough, formal technical reviews, test adequacy criteria Structural testing – code coverage testing, code complexity testing, mutation testing, debugging, design of test cases, instrumentation and tool support.	

Unit III Black Box Testing Techniques	08 Hours
Need of black box testing, static black box testing, requirement analysis, test case design criteria, requirement based testing, positive and negative testing, boundary value analysis, decision tables, equivalence partitioning, state based or graph based testing, cause effect graph based, error guessing, documentation testing, domain testing, design of test cases, instrumentation and tool support.	

Unit IV Testing Techniques	08 Hours
Levels of testing: unit testing, integration testing, system testing, acceptance testing, usability and accessibility testing, configuration testing, compatibility testing, GUI testing, regression testing, web-based system testing, non-functional testing techniques.	

Unit V Software Test Automation	08 Hours
Manual testing, test automation, terms used in automation, Process Model for Automation, automated testing tools and case studies, factors for choosing a particular tool, an overview for the major functional testing tools, overview of test management and bug tracking tools.	

Unit VI Software Quality Assurance	08 Hours
Software quality, quality attribute, quality assurance, quality control and assurance, methods of quality management, cost of quality, quality management and project management, software quality metrics-TQM, Six Sigma, ISO, SQA Model.	

Textbooks

1. Srinivasan Desikan and Gopalaswamy Ramesh, Software Testing – Principles and Practices, Pearson Education, 2011.

Reference Books

1. Ron Patton, Software Testing, Second Edition, Sams Publishing, Pearson Education, 2007. AU Library.com
2. Dorothy Graham, Rex Black, Erik Van Veenendaal, "Foundations of Software Testing, Fourth Edition, Cenage publication
3. Kshirasagara Naik, Priyadarshi Tripathy: Software Testing and Quality Assurance, Wiley India 2012
4. M.G. Limaye: Software Testing-Principles, Techniques and Tools – McGraw Hill, 2009

List of Laboratory Exercises

1. To Prepare Test Plan for the implemented system under test. The Test Plan shall be based on System Requirement Specification. The Test plan consists of following issues.
   a. Purpose of the test. /Location and schedule of the test.
   b. Test descriptions. /Pass and Fail Criteria.
2. Take any system (e.g. ATM system) and study its system specifications and write test cases
3. To perform Unit testing especially indicating the traced Independent data paths, Control paths and Error handling paths. Prepare control flow graphs for the unit under test. Compute the Cyclomatic complexity of the unit.
4. To perform Data Flow testing for the Program Segments by identifying the Definition-Use chain and type of data flow anomaly.
5. Design test cases for testing of any E-commerce web site.
6. To perform Black-Box Testing for all the units contained in the architectural segments using Equivalence Partitioning, Boundary Value Analysis and Orthogonal Array testing methods.
7. Creating a test report using BugZilla tool.
8. To perform Web Based Testing for Web Application incorporating Selenium testing tool.

Project Based Learning

Students shall construct a test plan for their mini projects and write test cases for testing of the same. Student shall test their project functionality using any appropriate automation testing tool.

Syllabus for Unit Tests:	
Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

DATA WAREHOUSING AND DATA MINING					
Teaching Scheme		**Examination Scheme**		**Credit Scheme**	
	Hours/Week		**Marks**		**Credits**
Lecture	03	**University Examination**	60	**Lecture**	03
Tutorial	01	**Internal Assessment**	40	**Tutorial**	01
		Total	100	**Total**	04

Course Objective:
• To understand data warehouse concepts, architecture, business analysis and tools
• To understand data pre-processing and data visualization techniques

Prerequisite:
Basic concepts of DBMS

Course Outcomes: On completion of the course, students will have the ability to:
1. Design a Data warehouse system and perform business analysis with OLAP tools.
2. Apply suitable pre-processing and visualization techniques for data analysis
3. Apply frequent pattern and association rule mining techniques for data analysis
4. Apply appropriate classification techniques for data analysis
5. Apply appropriate clustering techniques for data analysis
6. Understand WEKA tool.

Unit I Data Warehousing, Business Analysis And On-Line Analytical Processing (OLAP)	08 Hours
Basic Concepts - Data Warehousing Components – Building a Data Warehouse – Database Architectures for Parallel Processing – Parallel DBMS Vendors - Multidimensional Data Model – Data Warehouse Schemas for Decision Support, Concept Hierarchies -Characteristics of OLAP Systems – Typical OLAP Operations, OLAP and OLTP.	

Unit II Data Mining – Introduction	08 Hours
Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques – Issues – applications- Data Objects and attribute types, Statistical description of data, Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.	

Unit III Data Mining - Frequent Pattern Analysis	08 Hours
Mining Frequent Patterns, Associations and Correlations – Mining Methods- Pattern Evaluation Method – Pattern Mining in Multilevel, Multi Dimensional Space – Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns	

Unit IV CLASSIFICATION	08 Hours
Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines — Lazy Learners – Model Evaluation and Selection-Techniques to improve Classification Accuracy.	

Unit V CLUSTERING	08 Hours
Clustering Techniques – Cluster analysis-Partitioning Methods - Hierarchical Methods – Density Based Methods - Grid Based Methods – Evaluation of clustering – Clustering high dimensional data- Clustering with constraints,	

Outlier analysis-outlier detection methods.	
Unit VI WEKA TOOL	**08 Hours**
Datasets – Introduction, Iris plants database, Auto imports database - Introduction to WEKA, The Explorer – Getting started, Exploring the explorer, Learning algorithms, Clustering algorithms, Association–rule learners.	

Textbooks

Jiawei Han and Micheline Kamber, ―Data Mining Concepts and Techniques‖, Third Edition, Elsevier, 2012

Reference Books

1. Alex Berson and Stephen J.Smith, ―Data Warehousing, Data Mining & OLAP‖, Tata McGraw – Hill Edition, 35th Reprint 2016
2. K.P. Soman, Shyam Diwakar and V. Ajay, ―Insight into Data Mining Theory and Practice‖, Eastern Economy Edition, Prentice Hall of India, 2006.
3. Ian H.Witten and Eibe Frank, ―Data Mining: Practical Machine Learning Tools and Techniques‖, Elsevier, Second Edition.

Project Based Learning

1. Data Warehouse Design for E-commerce Environments.
2. Data Warehouse Project for Music Data Analysis.
3. Data Warehouse Project for B2B Trading Company.

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit – III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

QUANTITAITVE TECHNIQUES, COMMUNICATION AND VALUES

Teaching Scheme		Examination Scheme		Credits	
	Hours/Week		Marks		Credits
Lecture	04	University Examination	60	Theory	04
Practical	--	Internal Assessment	40	Practical	--
Total	04	Total	100	Total	04

Course Pre-requisites: The students should have knowledge of	
1	Basic mathematics, reasoning and comprehensive ability
2	Communication process, soft skills
3	Leadership qualities, ethics, etiquettes and values

Course Objective:

The **Quantitative Techniques, Communication and Values** aims to augment students to face the campus recruitment test and train them on applying short techniques/ tricks to solve questions of Maths, reasoning and English in very less amount of time. The communication and values section focuses on the aspects of communication and soft skills such as grooming personality for leading team, presentation, business communication which would enable graduates to project themselves as a professionals in the corporate sector and/or otherwise.

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

Course Content:

Unit-I	**QUANTITATIVE APTITUDE**: Number system, Percentage, profit and loss, Simple Interest and Compound Interest, Ratio, Proportion and Average, Mixture and Allegation, Time, Speed & Distance, Time & Work , Permutation & Combination, Probability, Pipes and Cisterns	**08 Hrs**
Unit-II	**NON-VERBAL REASONING:** Coding, Decoding, Number series, Blood relation Directions, cubes &dices , Data Interpretation, Data Sufficiency, Set Theory & Syllogisms, Matching, Selection & Arrangement, Clocks & Calendars, Visual Reasoning, Input, Output & Flow Chart.	**08 Hrs**
Unit-III	**VERBAL REASONING:** Sentence Patterns, Sentence correction and spotting errors, Vocabulary, antonyms and synonyms and analogy, Phrasal Verbs, idiomatic expressions, reading comprehension, closest, sentence rearrangement and theme detection	**08 Hrs**
Unit-IV	**SELF AWARENESS AND SOFT SKILLS DEVELOPMENT:** Concept of SWOT, Importance of SWOT, Individual & Organizational SWOT Analysis, Soft skills, meaning, need and importance, difference between soft skills and hard skills, life skills and personal skills, Leadership skills,-Importance ,Types, Attributes of good leader Motivational theories	**08 Hrs**

	and leadership ,Emotional intelligence in personal and professional lives its importance need and application, Team Building and conflict resolution Skills ,Problem solving skills, Time Management and Stress Management Skills Pareto Principle(80/20) Rule in time management, Time management matrix, creativity and result orientation, working under pressure, stress management	
Unit-V	**COMMUNICATION AND HONING EMPLOYMENT SKILLS:** Communication process, Non-verbal codes in communication, importance of LSRW in communication, Barriers to communication, Principles of effective Technical writing, Email writing and Netiquettes, **Letter writing** – formal letters, job application letter, cover letter, structure of technical report writing, Building Resume and CV, Tips to build an effective Resume Group discussion, Skills required for Group Discussion Interview skills, Ways of handling telephonic interviews, Importance of body language, grooming &etiquettes for getting right impression in PI&GD , Extempore, Introduction to PowerPoint presentation, Structure & flow of presentation,	**08 Hrs**
Unit-VI	**BUSINESS ETHICS, ETIQUETTES AND VALUES:** The Importance of Ethics and Values in Business World, Respect for Individuality and diversity at workplace values of a good manager Key features of corporate etiquette, Corporate grooming & dressing, etiquettes in social & office Setting-Understand the importanceof professional behaviour at the work place, Corporate social responsibility (CSR) its importance and need.	**08 Hrs**

Internal Assessment:		
Unit Test – I	UNIT – I, II, III	
Unit Test – II	UNIT – IV, V, VI	

Reference Books:	
1	Quantitative Aptitude by R. S. Agarwal published by S. Chand
2	The Book of Numbers by Shakuntala Devi
3	A Modern Approach To Logical Reasoning by R. S. Agarwal published by S. Chand
4	A New Approach to Reasoning Verbal & Non-Verbal by InduSijwali
5	Business Communication by Meenakshi Raman, Prakash Singh published by Oxford University press, second edition
6	Communication Skills by Sanjay Kumar, Pushp Lata, published by Oxford University press, second edition
7	Technical Communication by Meenakshi Raman, Sangeeta Sharma published by Oxford University press
8	Developing Communication Skills by Krishna Mohan, Meera Banerji published by Macmillan India Pvt Ltd
9	Soft Skills by Meenkashi Raman, published by Cengage publishers
10	Soft Skills by Dr. K Alex published by Oxford University press
11	Soft skills for Managers by Dr. T. KalyanaChakravarthi and Dr. T. LathaChakravarthi published by biztantra

Project Based Learning Topics:	
1	Form a model for spoken and written communication skills which avoid grammar mistakes and common errors.
2	Develop various activity models for enriching and developing vocabulary.
3	Preparing strategies by using SWOT and TWOS analysis.
4	Analysing differences between Soft Skills, Hard skills, and Personal skills.
5	Develop Bruce Tuchman's Team Building Models with classmates/Teammates.
6	To study different personalities of Leaders from various sectors and find out their attributes and success stories.

7	Preparing a model for Time Management Skills and Stress Management and conduct activities for effective implementation of it.
8	Form a model to develop LSRW and communication Skills.
9	Conduction of mock interview and practice GD activities to build competencies for actual selection process.
10	Prepare a model for evaluating Values and Ethics of Good Managers.
11	Prepare a model of dress codes and attire for different professional situations Corporate etiquettes and its implications.
12	Develop some good activities to understand the importance and need of Corporate social responsibility (CSR).

AGILE METHODOLOGIES

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Lecture	04	University Examination	60	Lecture	04
		Internal Assessment	40		
		Total	100	Total	04

Course Objective:

To prepare students for software development using agile methodology

Prerequisite: Software Engineering

Course Outcomes: On completion of the course, students will have the ability to:

1. Differentiate traditional project development methodology and Agile methodology.
2. Identify the roles and responsibilities of agile practitioners in agile projects
3. Apply requirement engineering practices behind several specific agile methodologies.
4. Define the core practices behind Scrum framework.
5. Understand the role of design principles in agile software design.
6. Define the core practices behind Extreme Programming framework.
7. Describe implications of functional testing, unit testing, and continuous integration.

Unit I	08 Hours
Introduction: Agile Software Development, Traditional Model vs. Agile Model, Agile Manifesto and Principles, Agile Project Management, Agile Team Interactions, Ethics in Agile Teams, Agile Documentations: Agile Drivers, Overview of Feature driven development, Lean Software Development	

Unit II	08 Hours
Agility and Requirements Engineering (RE): Impact of Agile Processes in RE–Current Agile Practices, Overview of RE Using Agile , Managing Unstable Requirements, Requirements Elicitation, Agile Requirements Abstraction Model, Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modelling and Generation, Concurrency in Agile Requirements Generation.	

Unit III	08 Hours
Agile Scrum Framework: Scrum Artifacts, Meetings, Activities and Roles, Scrum Team Simulation, Scrum Planning Principles, Product and Release Planning, Sprinting: Planning, Execution, Review and Retrospective; User story definition and Characteristics, Acceptance tests and Verifying stories, Burn down chart, Daily scrum, Scrum Case Study, Kabana case study	

Unit IV	08 Hours
Agile Software Design and Development: Agile design practices, Role of design Principles, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control; Agility and Quality Assurance: Agile Interaction Design, Agile approach to Quality Assurance, Test Driven Development, Pair programming: Issues and Challenges.	

Unit V	08 Hours
Extreme Programming (XP): XP Lifecycle, The XP Team, XP Concepts: Refactoring, Technical Debt, Timeboxing, Stories, Velocity; Adopting XP: Pre-requisites, Challenges; Applying XP: Thinking- Pair Programming, Collaborating, Release, Planning, Development; XP Case Study	
Unit VI	**08 Hours**
Agile and Testing: The Agile lifecycle and its impact on testing, Test driven development– Acceptance tests and verifying stories, writing a user acceptance test, Developing effective test suites, Continuous integration, Code refactoring. Risk based testing, Regression tests, Test automation.	

Textbooks
1. Robert C. Martin, "Agile Software Development, Principles, Patterns and Practices", First International Edition, Prentice Hall.
2. Ken Schawber, Mike Beedle, "Agile Software Development with Scrum", International Edition, Pearson.

Reference Books
1. David J. Anderson and Eli Schragenheim, "Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results" , Prentice Hall, 2003
2. Hazza and Dubinsky, "Agile Software Engineering, Series: Undergraduate Topics in Computer Science", Springer, 2009.
3. James Shore and Shane Warden, "The Art of Agile Development", O'Reilly Media, 2007
4. Cohn, Mike, "User Stories Applied: For Agile Software Development", Addison Wisley, 2004.

Project Based Learning:
Students are encouraged to decide one project in the group (of min 2 to max) and applications of agile methodologies shall be demonstrated by team :
1. For example "solve the traveling salesman problem (TSP) using a algorithm in the context of an XP project".
2. Develop sprint backlog for for project under consideration.
3. Develop a Kabana board for complete project per week.
4. Write a report and demonstrate the project using Extremes practices in software development
5. Write a report and demonstrate the project using Scrum practices in software development
6. Student database management projects in which the stories, sprints and action items can be created or updated weekly.
7. Library management project in which the stories, sprints and action items can be created or updated weekly.
8. Online appointment booking project in which the stories, sprints and action items can be created or updated weekly.

Syllabus for Unit Tests:	
Unit Test -1	Unit – I, Unit – II, Unit – III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

INFORMATION TECHNOLOGY LABORATORY - IV

Teaching Scheme		Examination Scheme			Credit Scheme	
	Hours/Week			Marks		Credits
Practical	02	Term Work		25	Practical	01
Tutorial	01	Practical		50	Tutorial	01
Total	03	Total		75	Total	02

Course Objective:

To acquire programming skills in core Python to develop applications in various domain.

Prerequisite:

Understanding of basic python programming and OOPs concepts

Course Outcomes: On completion of the course, students will have the ability to:

1. To acquire programming skills in Python Multithreaded Programming.
2. To acquire database management with python
3. To develop the skill of data science using python
4. To develop the ability of Data Visualization using Python
5. To develop the ability to implement Graphical User Interface
6. To develop the ability to implement Django Web Framework in Python

Unit I :Python Multithreaded Programming	06 Hours
What is multithreading? • Difference between a Process and Thread • Concurrent Programming and GIL • Uses of Thread • Starting a New Thread • The Threading Module • Thread Synchronization :- Locks , Semaphore • Deadlock of Threads • Avoiding Deadlocks • Daemon Threads	

Unit II : Using Databases in Python	06 Hours
Python MySQL Database Access • Install the MySQLdb and other Packages • Create Database Connection • CREATE, INSERT, READ Operation • DML and DDL Oepration with Databases	

Unit III : Data Science Using Python	06 Hours
•Numpy: Introduction to numpy , Creating arrays , Indexing Arrays , Array Transposition , Universal Array Function , Array Processing , Array Input and Output	

Unit IV Pandas	06 Hours
What are pandas? • Where it is used? • Series in pandas • Index objects • Reindex • Drop Entry • Selecting Entries • Data Alignment • Rank and Sort • Summary Statics • Index Hierarchy • Matplotlib: Data Visualization • Python for Data Visualization • Welcome to the Data Visualization Section • Introduction to Matplotlib	

Unit V :Graphical User Interface	06 Hours
• GUI in Python • Button Widget • Label Widget • Text Widget	

Unit VI : Django Web Framework in Python	06 Hours
• Introduction to MVC and MVT architecture in Web development • Django folder structure and flow of control	

Textbooks

1. Fluent Python: Clear, Concise, and Effective Programming , by Luciano Ramalho

2. Introduction to Machine Learning with Python: A Guide for Data Scientists, by Sarah Guido and Andreas C. Muller

Reference Books

1. Python Cookbook: Recipes for Mastering Python 3, by David Beazley and Brian K. Jones

List of Laboratory Exercises

1. Write a program to implement threads (Multithreaded Programming).
2. Write a program to implement Databases (MySQL, MongoDB)
3. Write a program to implement Handle and store Two-dimensional data
4. Write a program to manipulate structured data.
5. Write a program to implement GUI application
6. Implement web applications using Django Web Framework

Project Based Learning

1. Automating boring Stuff Using Python (ex. Automate LinkedIn connections using Python)
2. Python Text to Speech and Vice-Versa (ex. Convert Speech to text and text to Speech, Build a Virtual Assistant Using Python)
3. Crawl Wikipedia pages with python
4. E-commerce website project
5. Build a blockchain using python
6. Python Django Projects (ex. Weather app ,Voting system)
7. Twitter Sentiment Analysis using Python
8. Website Blocker using Python
9. Python Language Translator
10. Desktop Notifier Python App
11. Creating Notepad using Python

Syllabus for Unit Tests:

NA	

B.Tech. (Information Technology)
Semester-VII

<table>
<tr><td colspan="3" align="center">B.Tech (IT) Semester-VII
Subject: Project Planning and Management</td></tr>
</table>

TeachingScheme	ExaminationScheme		CreditAllotted
Theory :03Hrs/ Week	**EndSemesterExamination :60Marks**		**Theory :03**
	InternalAssessment :40Marks		**Practical:0**
	Total Marks: 100		**Total Credits: 03**

CourseObjectives:

1) To make them understand the concepts of Project Management for planning to execution of projects

2) To make them understand the feasibility analysis in Project Management and network analysis tools for cost and time estimation.

Course Prerequisites:

Students should have knowledge of

Object Oriented Software Engineering

Course Outcome:

Students will be able to:

1)Understand the basic concepts of project management.

2) Apply selection criteria and select an appropriate project from different options.

3) Write work break down structure for a project and develop a schedule based on it.

4) Identify opportunities and threats to the project and decide an approach to deal with them strategically.

5) Use Earned value technique and determine & predict status of the project.

6) Capture lessons learned during project phases and document them for future reference

UNIT-I	**Project Management Foundation:**	**(6 Hours)**
	Definition of a project, Project Vs Operations, Necessity of project management, Triple constraints, Project life cycles (typical & atypical) Project phases and stage gate process. Role of project manager, Negotiations and resolving conflicts, Project management in various organization structures, Project Lifecycle and IT development, Agile Project Management	
UNIT-II	**Project Human Resource Management and Stakeholder Management**	**(6 Hours)**
	Introduction, Organization and Project Planning, Formal Organization , Project Team, Multidisciplinary Teams, Project Environment, Project Leadership, Leadership Styles, Ethics in project, Role of project manager, IT Governance	

UNIT-III	Project Planning and Scheduling:	(6 Hours)
	Work Breakdown structure (WBS) and linear responsibility chart, Interface Co-ordination and concurrent engineering, Project cost estimation and budgeting, Top down and bottoms up budgeting, Networking and Scheduling techniques. PERT, CPM, GANTT chart, Introduction to Project Management Information System (PMIS)	
UNIT-IV	Planning Projects:	(6 Hours)
	Crashing project time, Resource loading and levelling, Goldratt's critical chain, Project Stakeholders and Communication plan Risk Management in projects: Risk management planning, Risk identification and risk register, Qualitative and quantitative risk assessment, Probability and impact matrix. Risk response strategies for positive and negative risks	
UNIT-V	Executing and Controlling	(6 Hours)
	Team Management, Communicating and Engaging with all stakeholders of the project, Controlling project earned value techniques for measuring your completed work, Using milestone for measurement, change request and scope creep	
UNIT-VI	Closing the Project:	(6 Hours)
	Customer acceptance; Reasons of project termination, Various types of project terminations (Extinction, Addition, Integration, Starvation), Process of project termination, completing a final report; doing a lessons learned analysis; acknowledging successes and failures; Project management templates and other resources; Managing without authority; Areas of further study	

AssignmentList:	
1)	Explore the various Agile Models
2)	Create a SRS of a system under development
3)	Prepare a project plan of a system using applicable tool
4)	Discuss the applications and limitations of Gantt chart.
5)	**Conduct Risk analysis for system under development**

TextBooks:	
1)	Prasanna Chandra; Projects- Planning, Analysis, Selection, Financing, Implementation and Review',VI Edition, Tata Mc Graw Hill, 8th Edition 2015.

ReferenceBooks:	
1)	Jack T. Marchewka,Information Technology Project Management,4th edition Wiley India,2009
2)	John M. Nicholas,Project Management for Business and Technology,3rd edition Pearson Education

Web Services

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Lecture:	04 Hours/Week	University Examination:	60 Marks		
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	Theory	04
		Term Work	25 Marks	Practical	01
		Practical	25 Marks		
		Total	150 Marks	Total	05

Course Objective:

To Understand Web Services with different technologies and applications.

Prerequisite:

Distributed Computing, XML, HTTP, TCP/IP concepts.

Course Outcomes: On completion of the course, students will have the ability to:

1. Create and consume Web services
2. Implement with appropriate framework components in creation of web services solution
3. Reuse of XML schemes
4. Understand the principles of SOA
5. Understand Web Services Building Blocks
6. Security and configuration issues for enterprise systems

Unit I :- Introduction	08 Hours
Evolution and Emergence of Web Services – Evolution of distributed computing. Core distributed computing technologies – client/server, CORBA, JAVA RMI, Micro Soft DCOM, MOM, Challenges in Distributed Computing, Introduction to Web Services – The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services.	

Unit II :- Architecture	08 Hours
Web Service Architecture – Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication, basic steps of implementing web services.	

Unit III :- Document Structure	08 Hours
Brief Over View of XML – XML Document structure, XML namespaces, Defining structure in XML documents, Reuse of XML schemes, Document navigation and transformation. SOAP : Simple Object Access Protocol, Inter-application communication and wire protocols, SOAP as a messaging protocol, Structure of a SOAP message, SOAP envelope, Encoding, Service Oriented Architectures, SOA revisited, Service roles in a SOA, Reliable messaging. Brief Overview of JSON – JSON Schema, JSON Web Service functionality, differences between SOAP and JSON.	

Unit IV :- WSDL introduction	08 Hours
Describing Web Services – WSDL introduction, non functional service description, WSDL1.1 Vs WSDL 2.0, WSDL document, WSDL elements, WSDL binding, WSDL tools, WSDL port type, limitations of WSDL.	
Unit V :- UDDI Architecture	08 Hours
Registering and Discovering Services : The role of service registries, Service discovery, Universal Description, Discovery, and Integration, UDDI Architecture, UDDI Data Model, Interfaces, UDDI Implementation	
Unit VI :- Security Considerations	08 Hours
SOA and web services security considerations, Network-level security mechanisms, Application-level security topologies, XML security standards, Semantics and Web Services, The semantic interoperability problem, The role of metadata, Service metadata, Overview of .NET and J2EE, SOA and Web Service Management, Managing Distributed System, Enterprise management Framework, Standard distributed management frameworks, Web service management, Richer schema languages, WS-Metadata Exchange.	

Textbooks

1. Web Services & SOA Principles and Technology, Second Edition, Michael P. Papazoglou.
2. Developing Java Web Services, R. Nagappan, R. Skoczylas, R.P. Sriganesh, Wiley India.
3. Developing Enterprise Web Services, S. Chatterjee, J. Webber, Pearson Education.

Reference Books

1. XML, Web Services, and the Data Revolution, F.P.Coyle, Pearson Education.
2. Building web Services with Java, 2nd Edition, S. Graham and others, Pearson Education.
3. Java Web Services, D.A. Chappell & T. Jewell, O"Reilly, SPD.
4. McGovern, et al., "Java web Services Architecture", Morgan Kaufmann

List of Assignments

1. Explain How Web Services Work
2. Explain Application Programming Interface Types & Example
3. Explain Web Services Architecture
4. Explain SOAP web service
5. Explain RESTful web services.
6. Explain Web Services Description Language with Example

List of Laboratory Exercises

1. Write a program to implement to create a simple web service that converts the temperature from Fahrenheit to Celsius and vice a versa.
2. Write a program to implement the operation can receive request and will return a response in two ways. a) One - Way operation b) Request – Response

3. Write a program to implement business UDDI Registry entry.
4. Develop client which consumes web services developed in different platform.
5. Write a JAX-WS web service to perform the following operations. Define a Servlet / JSP that consumes the web service.
6. Define a web service method that returns the contents of a database in a JSON string. The contents should be displayed in a tabular format.
7. Define a RESTful web service that accepts the details to be stored in a database and performs CRUD operation.
8. Implement a typical service and a typical client using WCF.
9. Use WCF to create a basic ASP.NET Asynchronous JavaScript and XML (AJAX) service.
10. Demonstrates using the binding attribute of an endpoint element in WCF.

Project Based Learning

1. Rapid Document Conversion example pdf to word, excel to word
2. Email system
3. Website Development
4. Serverless web App
5. Real time data processing applications. (blood bank , attendance system etc)
6. chat bots

Syllabus for Unit Tests:

Unit Test -1	Unit - I, Unit - II, Unit - III
Unit Test -2	Unit - IV, Unit - V, Unit - VI

<div align="center">Business Intelligence</div>

TEACHING SCHEME		EXAMINATION SCHEME	CREDIT SCHEME	
Lecture:	4 Hours/Week	**End Semester Examination:** 60 Marks	**Theory**	4
Practical:	2 Hours/Week	**Continuous Assessment:** 40 Marks		
		Termwork: 25 Marks	**Practical:**	1
		Practical: 25 Marks		
		Total : 150 Marks	**Total Credits: 5**	

Course Overview

This course provides an overview of the field of Business Intelligence and its applications in modern organizations. Students will learn the basics of data warehousing, data mining, and predictive analytics, and explore various tools and technologies used for BI.

Prerequisite:

1. Basic understanding of database management systems
2. Knowledge of statistics and data analysis
3. Basic programming skills in any language.
4. Understanding of data structures, algorithms and computer science fundamentals

Course Outcomes:

1. Understanding of BI concepts: student will gain an understanding of the concepts of business intelligence and how it helps organizations make data-driven decisions.
2. Data Analytics: Students will learn how to collect, process, and analyse large amounts of data from various sources, such as databases, spreadsheets, and other data sources.
3. Data Warehousing: Students will learn about the concepts of data warehousing and how to design and implement a data warehouse to support business intelligence.
4. Data Mining: Students will learn how to apply data mining techniques to identify patterns, relationships, and insights in data.
5. Business Intelligence Tools: Students will learn how to use various BI tools to extract insights from data.
6. Problem Solving: Students will learn how to apply BI techniques and tools to solve real-world business problems.

Unit I: Introduction and Data Pre-processing:	06 Hours
Introduction: Challenges of decision making**,** what is business intelligence (BI)? Need for BI. Drawing insights from data: DIKW pyramid, levels of decision making. **Data Pre-processing**: Data quality, Pre-processing operations: combining values into one, sub setting, sorting, transforming scale, determining percentiles, removing noise, removing inconsistencies, transformations, standardizing, normalizing min-max normalization, z-score standardization.	

Unit II: Data Warehousing and Enterprise reporting:	06 Hours
Data Warehousing: What is a data warehouse, need for a data warehouse, architecture, data marts, OLTP vs OLAP, Multidimensional Modelling: Star and snowflake schema, Data cubes, OLAP operations, Data Cube Computation and Data Generalization, Data Lake **Enterprise Reporting:** Metrics, Measurement, Measures, KPIs, Dashboards, Reports, Scorecards	

Unit III Inferential Statistics:	**06 Hours**
Inferential Statistics: Role of probability in analytics, probability distributions and their characteristics. Need for sampling, generating samples, sampling, and non-sampling error. Sampling Distribution of Mean, Standard Error. Estimation: Point and Interval Estimates, Confidence Intervals, level of confidence, sample size, ETL (extract, transform and load), regression analysis, market basket analysis, analysis of variance (ANOVA), and chi-square tests.	
Unit IV Data Modelling, visualization.	**06 Hours**
Data Modelling and visualization: Logic driven modelling, data driven modelling, basic what-if spreadsheet models, Role of visualization in analytics, techniques of visualization. data modelling and visualization in financial analysis. **Data Visualization using Tools:** Introduction to tools for visualization, data import, and management, data type and operations, Different types of data visualizations, dashboards, data storytelling, understanding the concepts of dynamic/interactive data visualization and report generation.	
Unit V: Time Series Analysis and Forecasting:	**06 Hours**
Introduction to Time Series Analysis and Forecasting: Time series patterns, forecast accuracy, moving averages and exponential smoothing, casual models, using regression analysis for forecasting, ARIMA models. **Prescriptive/Optimization Analytics:** Overview of simulation and risk analysis, Linear Optimization Models (linear programming), Integer Linear Optimization models (integer programming), Non-linear optimization models (portfolio theory), Decision Analysis.	
Unit VI: Business Intelligence Applications:	**06 Hours**
Big data, Three Vs of big data, Big data applications, Data analytics, business analytics, ERP and Business Intelligence, BI Applications in CRM, BI Applications in Marketing, BI Applications in Logistics and Production, Role of BI in Finance, BI Applications in: Stock market analysis, Forensics, Banking.	
Textbooks	
1. "Data Science for Business" by Foster Provost and Tom Fawcett, published by O'Reilly Media.	
2. "Business Intelligence: A Managerial Approach" by Fred S. Siebert, published by Pearson.	
3. "Business Intelligence: The Savvy Manager's Guide" by Dylan Jones, published by Apress.	
4. "Fundamentals of Business Analytics", by R. N. Prasad, Seema Acharya, Wiley-India	
5. "Business Analytics for managers", Wolfgang Jank	
Reference Books	
6. "Data Warehousing for Dummies" by Thomas C. Hammergren, published by John Wiley & Sons.	
7. "Data-Driven: Creating a Data Culture" by Hilary Mason and DJ Patil, published by John Wiley & Sons.	
List of Assignments	
1. Create a presentation demonstrating the features and functionality of any BI tool.	

2.	Design a galaxy schema for a set of business processes of a chosen organization and document the schema design along with a detailed explanation of the business processes and their interrelationships.
3.	Conduct Hypothesis Testing and Chi-square test on a given dataset to test the significance of the data and draw conclusions based on the results obtained
4.	Perform what-if analysis on a given dataset to identify potential outcomes and optimize decision-making. Document the analysis process and share the results.
5.	Utilize Hive for data analysis in a Big Data environment, including data manipulation, transformation, and querying. Document the analysis process.
6.	Conduct analysis using various OLAP cube operations, including drill-down, roll-up, slice-and-dice, and pivoting.
7.	Create a dashboard for an organization that showcases the relevant data and KPIs. Include visualizations, graphs, and tables that highlight the key performance indicators.
8.	Perform regression analysis on a dataset to predict the value of the dependent variable.
9.	Conduct prescriptive/optimization analysis on a suitable dataset to identify optimal solutions that optimize the desired outcomes.
10.	Case Study: Select any application of Business Intelligence and prepare analysis report.

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Elective-I Software Architecture		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDIT SCHEME**
Lectures: 4 Hours / Week	End Semester Examination : 60 Marks	Theory : 04
	Continuous Assessment : 40 Marks	
	Total: 100 Marks	Total: 04
Course Pre-requisites:		
Software Engineering, Object-oriented Programming		
Course Objectives:		
	Course objective is to understand the need, design approaches for software architecture and develop appropriate architectures for various case studies	
Course Outcomes:		
The students will be able to		
1.	Describe the Fundamentals of software architecture, qualities, and terminologies.	
2.	Express the analysis and design of a system using UML.	
3.	Apply object-oriented design techniques for behavior modeling.	
4.	Create UML package, component, and deployment diagrams to express the architectural structure of a system	
5.	Select appropriate architectural styles.	
6.	Apply principles of software architectures for enterprise application development.	
Topics covered		
UNIT - I	**Software Architecture:** Definition, Architecture and Agile, Requirements and software architecture: Quality attributes NFRs and FR, Software Architecture and Components, Multiple views of software architecture.	**(06 Hours)**
UNIT - II	**Software architecture using UML diagrams**: Overview of the UML Notation, Static Modelling	**(06 Hours)**
UNIT -III	**Behaviour modelling:** UML Sequence diagram and Activity diagram State diagram,	**(06 Hours)**
UNIT -IV	**UML component, Package, and deployment diagram:** Implementation architecture: component diagram, Hardware architecture deployment diagram	**(06 Hours)**
UNIT - V	**Architectural Styles:** Documenting Software Architectural Patterns Abstract Data Types and Object-Oriented, Main Program and Subroutine, Databases, Layered Systems, Client Server n-Tier, Interpreters, Pipes and Filters, Event-Based, Process Control, MVC style	**(06 Hours)**
UNIT -VI	**Software Architecture Case Study:** Client/Server Software Architecture Case Study: The design of a client/server system that consists of a bank server and several ATM clients. The design of the banking service is an example of a sequential object-oriented design. **Service-Oriented Architecture Case Study:** Online Shopping System	**(06 Hours)**

	Sample list of projects for project based learning:
1.	Draw the behavioral view diagram : State-chart diagram, Activity diagram for thermostat cooling system
2.	Draw the behavioral view diagram : State-chart diagram, Activity diagram for thermostat boiler system
3.	Draw implementation view diagram: Component diagram for the library management system.
4.	Draw implementation view: component dagram forElectronic Cash Counter/Point of sale
5.	Draw deployment diagram for the safe home system.
6.	Draw deployment diagram for the E-shopping system.
7.	Perform static modeling for web based Leave Management Tool.
8.	Perform static modeling for web based student attendance Management Tool

	Text Books:
1.	Hassan Gomaa, "Software Modeling and Design: UML, Use Cases, Patterns, and Software Architectures", Cambridge University Press; Illustrated edition (21 February 2011), ISBN-10: 0521764149
2.	Bernd Bruegge Allen H. Dutoit "Object Oriented Software Engineering using UML,patterns and Java", Third Edition, Pearson Education
3.	G. Booch, J.Rumbaugh, J. Jacobson, The Unified Modeling Language –User Guide Addison – Wesley

	Reference Books:
1.	Bass, L., P. Clements, & R. Kazman, "Software Architecture in Practice", 2 Ed, Prentice-Hall.
2.	Kai Qian Jones, Software Architecture Design Illuminated, Bartlett Publishers Canada, 2010
3.	R.S Pressman, Software Engineering: A Practitioner's Approach, 5/e, Mc Graw Hill International Edition
4.	Ion Gorton, Essentials of software Architecture , Second Edition, Springer-verlag, 2011

Syllabus for Unit Test:	
Unit Test -1	UNIT – I ,II and III
Unit Test -2	and UNIT – IV ,V and VI

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Lecture	04	University Examination	60	Theory	04
		Internal Assessment	40		
Practical	02	Term Work	25	Practical	01
		Oral	25		
Total	06	Total	150	Total	05

Course Objective:

This course aims at giving students a knowledge of Information Retrieval along with its applications in terms of the following:
- To understand the basics of Information Retrieval.
- Learn to evaluate information retrieval systems
- To understand the theoretical basis behind the standard models of IR (Boolean, Vector-space)
- To understand the use of performance evaluation metric for IR
- To understand the standard methods for Web indexing and retrieval

Prerequisite:
- Students must have the minimal concept of Data Base Management Systems
- They must also have the concept of different types of algorithms used for searching data
- They must also have the minimal knowledge of Natural language such as thesaurus, synonyms etc. to understand the concept of retrieving the textual information because text is the main data type used in Information Retrieval Systems

Course Outcomes:
On completion of the course, students will have the ability to:
1. Describe the objectives of information retrieval systems.
2. Describe models like vector-space, probabilistic and language models to identify the similarity of query and document
3. Understand relevance feedback in vector space model and Boolean retrieval model
4. Understand query, document, and phrase translation.
5. Design the method to build inverted index.
6. Design and implement a recommender system.

Unit I Introduction to information retrieval systems:	08 Hours
Goals and history of IR, Objectives of Information Retrieval Systems, The impact of the web on IR, Data vs Information Retrieval, Logical view of the documents, Relationship to Database Management Systems, Architecture of IR System	

Unit II Basic IR Models: Classes of Retrieval Model, overview of text retrieval model: Boolean retrieval model, Term weighting mechanism – TF, IDF, TF-IDF weighting, Cosine Similarity, Vector space model	
Unit III Text properties, operations and preprocessing:	**08 Hours**
Tokenization, Text Normalization, Stop-word removal, Morphological Analysis, Word Stemming (Porter Algorithm), Case folding, Lemmatization, Word statistics (Zipf's law, Heaps' Law), Index term selection, Inverted indices, Positional Inverted index,	
Unit IV Text Categorization:	**08 Hours**
Categorization algorithms: Rocchio, nearest neighbor, and naive Bayes. Applications to information filtering and organization	
Unit V Text classification & Text clustering	
The text classification problem, Naive Bayes text classification, k- nearest neighbors, Support vector Machine, Feature Selection, Vector-space clustering, K-means algorithm	
Unit VI Evaluation of IR:	**08 Hours**
Performance metrics:Precision, Recall, F-Measure, MAP (Mean Average Precision), Known-item Search Evaluation, Evaluations on benchmark text collections. **Recommender System:** personalization, Collaborative filtering recommendation, Content-based recommendation	
Textbooks:	
1.Introduction to Information Retrieval. Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schuetze, Cambridge University Press, 2007. 2. Modern Information Retrieval. Baeza-Yates Ricardo and Berthier Ribeiro-Neto. 2nd edition, Addison-Wesley, 2011. 3. Information Retrieval: Implementing and Evaluating Search Engines. Stefan Buttcher, Charlie Clarke, Gordon Cormack, MIT Press, 2010.	
Reference Books:	
1.Christopher D Manning, PrabhakarRaghavan, HinrichSchutze, An Introduction to Information Retrieval By Cambridge University Press, England, 2009. 2. Introduction to Information Retrieval. Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schuetze, Cambridge University Press, 2007.	
List of Assignments	
1.Introduction to information retrieval 2.Implementation of inverted index 3.Implementation of Boolean retrieval model 4.Study of various data structure for fast accessing of the data(Hash table,B-trees,sparse lists)	

| 5.To find out cosine similarity using Tf and IDf | |
| 6..Study of Zip's law .: Statistical and Mathematical study | |

Project Based Learning

1. Implementation of various classification algorithm on text.
2. Implementation of various Clustering algorithm on text
3. Implementation of sremming Porter stemmer algorithm.

Syllabus for Unit Tests:	
Unit Test -1	Unit – I, Unit – II, Unit – III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

Elective-I: User Experience

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Lecture:	04 Hours/Week	University Examination:	60 Marks		
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	Theory	04
		Term Work	25 Marks	Practical	01
		Oral	25 Marks		
		Total	150 Marks	Total	05

Course Objective:

This course aims at giving students a knowledge of
- User Interface and Experience
- Trends in UX
- Emerging Technologies in UX

Prerequisite:
- Basic knowledge about concept of Human Computer Interaction
- Basic knowledge designing languages and tools

Course Outcomes: On completion of the course, students will have the ability to:
1. Understand the Concept User Interface and Experience
2. To understand the user's interaction with the environment, people and culture. To take part in different UX domains and societies
3. Exploring different user research methodologies ensuring appropriate solution
4. The tools for user research become familiar
5. Practice to learn the tools required to design wireframes and prototypes.

Unit I	06 Hours
Introduction to UX Design Evolution of UX Design, Processes and Methodologies, Tools and Technology in UX Design, Multiple Domains and Trends in UX Design	

Unit II	06 Hours
Technology in experience design Technology for digital experience, Technological feasibility and viability, Details of Internet of Things, Augmented reality and virtual reality, ATM, KIOSK.	

Unit III	06 Hours
UX Design Advance: UX methodologies, Heuristic evaluation, Understanding product UX lifecycle.	

Unit IV	06 Hours
UX & Digitalization Understand by case studies how technology and digitalization is transforming different industry segments BFSI, manufacturing, retail, automotive, media, FMCG, logistics, oil & gas.	

Unit V	06 Hours
Business, UX & Design management	
Business UX : Understanding How a UX approach can help any business, The Business Value of UX Design, Strategy building, Aspects of key guidelines in UX business	

Unit VI	06 Hours
Design Management: What is design management, Different types, Taking Charge of Processes and People The Evolution of Design Management, Areas of Design Management, Why Does Design Management Matter?, Where Does Design Management Fall Within Businesses?	

Textbooks

1. Sketching the User experiences - Bill Buxton
2. Augmented Reality: Principles and Practice - Dieter Schmalstieg

Reference Books

1. Augmented Reality: An emerging technologies guide - Gregory Kipper and Joseph Rampolla

List of Assignments

1. Describe aspects of user interaction and cognition as they relate to UX.
2. Explain the role and importance of Standards, Technologies, and Guidelines in the UX process.
3. Describe methods including experiment design, application, and the ethical process
4. Select and apply appropriate methods for analysing a design
5. Select and apply the relevant descriptive statistical tests associated with UX Engineering;
6. Analyse and critique UX work, experimental studies, and computer interfaces
7. Analyse problems associated with different designs and suggests solutions for their resolution.

Project Based Learning

- Select any current example and apply appropriate methods for analysing designs

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

ELECTIVE-I: STORAGE AREA NETWORK

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Lecture	04	University Examination	60	Theory	04
Practical	02	Internal Assessment	40		
		Term Work	25	Practical	01
		Oral	25		
Total	06	Total	150	Total	05

Course Objective:

The aim of this course is to help the students to attain the following industry identified competency through various teaching learning experience-.

1. Ability to demonstrate the storage area networks and their products Ability to provide the mechanisms for the backup/recovery.

Prerequisite:

1. Computer Networks, Operating System, Cloud Computing.

Course Outcomes: On completion of the course, students will have the ability:

1. To understand Storage Area Networks characteristics and components.
2. To study the basics of Intelligent Storage Systems.
3. To use, interpret and examine various SAN technologies.
4. To evaluate different SAN management strategies to fulfill business continuity requirements.
5. To classify the applications as per their requirements and select relevant SAN solutions.
6. To apply Security and management concepts/techniques for Storage Infrastructure.

Unit I	08 Hours

Introduction to Storage System :

Storage Area Networks Architecture Overview: Creating Network for storage; Hardware devices: Fibre Channel Switch, Host Bus Adaptors, Putting the Storage in SANs, Fabric Operation from a hardware perspective, SAN hardware considerations, Evolution of storage architecture, key data center elements, virtualization, and cloud computing, virtual storage provisioning.

Unit II	08 Hours

Data Protection and Intelligent disk subsystems: Intelligent Disk Subsystem - architecture of Intelligent Disk Subsystems; Hard disks and Internal I/O Channels, JBOD, Storage virtualization using RAID and different RAID levels. Compare and contrast integrated and modular storage systems.

Intelligent Storage Systems: Components of an Intelligent Storage System, Types of Intelligent Storage Systems. Fibre Channel Storage Area Networks - Fibre Channel: Overview, The SAN and Its Evolution, Components of FC SAN, NAS, and IP-SAN.

Unit III	08 Hours
Storage Networking technologies and Virtualization: Fibre Channel SAN components, connectivity options, and topologies including access protection mechanism 'zoning", FC protocol stack, addressing and operations, Network Attached Storage (NAS) - components, protocol and operations. **Virtualization**: Definition of Storage virtualization: Implementation Considerations: Storage virtualization on Block or file levels; Storage virtualization on various levels of the storage network; Symmetric and Asymmetric storage virtualization in the network.	
Unit IV	08 Hours
Backup, Archive, and Replication : Information availability and business continuity solutions in both virtualized and non-virtualized environments. Business continuity terminologies, planning and solutions, Clustering and multipathing architecture to avoid single points of failure, Backup and recovery - methods, targets and topologies, Data de-duplication and backup in virtualized environment, Fixed content and data archive, Local replication in classic and virtual environments, Remote replication in classic and virtual environments, Three-site remote replication and continuous data protection.	
Unit V	08 Hours
Cloud Computing Characteristics: Definition of Cloud computing, Characteristics of Cloud computing, Cloud Enabling Technologies, Cloud Service Models, Cloud Deployment Models, Cloud Computing Infrastructure, Cloud Challenges and Cloud Adoption Considerations. Steps involved in transitioning from Classic data center to Cloud computing environment Services and deployment models, Cloud infrastructure components, Cloud migration considerations.	
Unit VI	08 Hours
Securing and Managing Storage Infrastructure: Framework and domains of storage security along with covering security. Implementation at storage networking. Security threats, and countermeasures in various domains Security solutions for FC-SAN, IP-SAN and NAS environments, Security in virtualized and cloud environments, Monitoring and managing various information infrastructure components in classic and virtual environments, Information lifecycle management (ILM) and storage tiering, Cloud service management activities.	
Textbooks	
1. Storage Virtualization, Author: Clark Tom, Publisher: Addison Wesley Publishing Company ISBN : 9780321262516	
2. Information Storage and Management,Author :EMC Education Services, Publisher: Wiley ISBN: 9781118094839	

3. EMC Education Services, "Information Storage and Management", Wiley India Publications, 2009. ISBN: 9781118094839.

Reference Books

1. Ulf Troppens,Wolfgang Muller-Friedt,Rainer Wolafka, Storage Networks Explained Wiley Publication.
2. Paul Massiglia, Richard Barker, "Storage Area Network Essentials: A Complete Guide to Understanding and Implementating SANs Paperback", 1st Edition, Wiley India Publications, 2008
3. G. Somasundaram, Alok Shrivastava, Information Storage and Management, EMC Education services, Wiley Publication.
4. Marc Farley : Building Storage Networks, 2nd Edition, Tata McGrawHill, Osborne, 2001.
5. Meeta Gupta : Storage Area Network Fundamentals, 2nd Edition, Pearson Education Limited, 2002.

List of Laboratory Exercises

1. Configuring a Storage Area Network (SAN) using iSCSI technology.
2. Setting up a Network Attached Storage (NAS) environment.
3. Implementing a storage tiering strategy in a SAN environment.
4. Investigating the use of compression and deduplication in a SAN environment.
5. Exploring the use of Storage Virtualization techniques in a SAN environment
6. Studying the role of Storage Resource Management (SRM) tools in a SAN environment.
7. Evaluating the security features of SAN and implementing secure data access
8. Studying the impact of network topology on SAN performance.
9. Exploring the use of flash storage in a SAN environment and evaluating its performance.

Project Based Learning

1. Evaluating the performance of SAN using various benchmarking tools.
2. Configuring and using Snapshots and Remote Replication in a SAN environment.
3. Investigating the impact of network congestion on SAN performance and implementing congestion control techniques.
4. Implementing a backup and recovery strategy in a SAN environment.
5. Studying the role of object storage in a SAN environment and evaluating its performance.
6. Exploring the use of cloud storage services in a SAN environment and evaluating their performance.
7. Evaluating the impact of network latency on SAN performance and implementing optimization techniques.
8. Evaluating the impact of different caching algorithms on SAN performance.
9. Implementing disaster recovery and business continuity in a SAN environment.
10. Evaluating the impact of different types of disk arrays on SAN performance.

Syllabus for Unit Tests:	
Unit Test -1	Unit – I, Unit – II, Unit – III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

Subject : Information Technology Laboratory –V

Teaching Scheme	Examination Scheme	Credit Allotted
Practical : 02 Hrs/Week	Term Work:25 Marks	Total Credits: 01
	Prat/Oral : 25 Marks	
Total: 02 Hours	Total: 50 Marks	

Course Objectives:

To provide students foundation knowledge of DevOps environment, supportive automation tools, scripting language and hands on assignments to understand the DevOps workflow.

Course Prerequisites:

Students should have prior knowledge of software development life cycle, basics of cloud computing and Linux operating system.

Course Outcome:

Students will be able to:

1) Understand the benefits of DevOps over other software development processes

2) Interpret working of the DevOps workflow

3) Apply cloud computing services in DevOps environment

4) Implement Linux commands in DevOps environment

5) Implement Shell scripting for DevOps

6) Perform various Git commands associated with version controlling

UNIT-I	Introduction to DevOps	
	DevOps: concepts, history of DevOps, objectives, difference between DevOps and traditional Software Development Life Cycle and Agile Model, benefits of working in a DevOps environment, roles, responsibilities and skills of a DevOps Engineer	
UNIT-II	DevOps Architecture	
	Continuous Development, Continuous Integration, Continuous Testing, Continuous Deployment, Continuous Monitoring, Continuous Feedback, Continuous Operations, DevOps Pipeline, DevOps principles, overview of DevOps Automation Tools, Benefits of the DevOps lifecycle	

UNIT-III	Cloud Computing Services	
	Concept, Cloud Computing services, DevOps linking with cloud computing, Public Clouds: Amazon Web Services, Microsoft Azure, Google Cloud Services AWS: AWS DevOps Architecture, AWS CloudFormation, AWS EC2, AWS CloudWatch, AWS CodePipeline	
UNIT-IV	LINUX Basic and Admin	
	Linux OS Introduction, Importance of Linux in DevOps, Linux Basic Command Utilities, Linux Basic Command Utilities, Linux Administration, Environment Variables, Networking, Linux Server Installation, RPM and YUM Installation	
UNIT-V	Shell Scripting for DevOps	
	Introduction, Variables, Flow Controls, Loops, Functions, Lists, Manipulating Strings, Reading and Writing Files, Positional Parameters	
UNIT-VI	Version Control with Git	
	Version control architecture- introduction, features, benefits Source code management, Virtual private network, Types of version control systems. Git: Git Installation, commonly used commands in Git, Git workflow, Git branching and Merging, Working with Remote repository	

Assignment List:	
1)	Open free tier account for AWS and launch EC2 instance of t2.micro.
2)	Create AMI and take EBS snapshot of EBS volume.
3)	Configure AWS CloudWatch
4)	Launch EC2 instance and attach EBS volume to instance
5)	Create user and group of a user and assign permission to them.
6)	Create a new file using Vi editor and combine file using Linux command and apply links on that file (hard links and soft links).
7)	Write shell script for calculator function. And understand the difference between different types of variables (environmental, special, and local variable).
8)	Write shell script for the httpd server to launch one application (create html file on web server).
9)	Create git repository and manage branches using branching strategies.
10)	Solve merge conflict problem and understand the difference between pull, fetch and revert command by creating new git remote repository.

Text Books:	
1)	Jennifer Davis and Ryn Daniels, Effective DevOps, O'Reilly Publisher, 2022
2)	Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation" by Jez Humble and David Farley:

Reference Books:	
1)	The Phoenix Project: A Novel about IT, DevOps, and Helping Your Business Win" by Gene Kim, Kevin Behr, and George Spafford
2)	Infrastructure as Code: Managing Servers in the Cloud" by Kief Morris

B.Tech. (Information Technology)

Semester-VIII

Information Security

Teaching Scheme		Examination Scheme		Marks	Credit Scheme	Credits
	Hours/Week			Marks		Credits
Lecture:	04 Hours/Week	University Examination:		60 Marks	Theory	04
Practical:	02 Hours/Week	Internal Assessment:		40 Marks		
		Term Work		25 Marks	Practical	01
		Practical		25 Marks		
Total : 06 Hours/Week		Total		150 Marks	Total	05

Course Objective:
1. To understand the basics of Information Security
2. To know the legal, ethical, and professional issues in Information Security
3. To know the aspects of risk management
4. To become aware of various standards in this area
5. To know the technological aspects of Information Security

Prerequisite:

Fundamentals of Computer Networks

Course Outcomes: On completion of the course, students will have the ability to:
1. Discuss the basics of information security
2. Illustrate the legal, ethical and professional issues in information security
3. Understand Information Security Policies.
4. Become aware of various security threats.
5. Design and implementation of security in OS and web applications.
6. Understand current trends in information security.

Unit I INTRODUCTION	08 Hours
Introduction to Information Security: Attacks, Vulnerability, Security Goals, Security Services and mechanisms. Critical Characteristics of Information, Components of an Information System, Securing the Components, Balancing Security and Access. Need of Information Security, Basic Principles of Confidentiality, Integrity, Policies, Procedures, Guidelines, Standards Administrative Measures and Technical Measures, People, Process, Technology	

Unit II SECURITY ELEMENTS	08 Hours
Authorization and Authentication - Types, Policies and techniques, Security Certification, Security Monitoring and Auditing, Security Requirements Specifications, Security Policies and Procedures, Firewalls, IDS, Log Files, Access Control, Trusted Computing and multilevel security, Security models, Trusted Systems, Software security issues, Physical and infrastructure security, Human factors, Security awareness, training , Email and Internet use policies.	

Unit III INFORMATION SECURITY POLICIES	08 Hours
Introduction to Information Security Policies, Importance and need of Policies, Data security consideration, Backups, Archival storage and disposal of data,	

Intellectual Property rights and Policies, Incident Response and Forensics, Management Responsibilities.	
Unit IV SECURITY THREATS	**08 Hours**
Threat Management: Threat Modelling, Sources of security threats, Threat identification, Threat Analysis, Target Assets and vulnerabilities, Consequences of threats, E-mail threats, Web threats, Threat awareness Intruders and Hackers, Insider threats, Risk Assessment, Forensic Analysis, Vulnerability sources and assessment tools.	
Unit V SECURITY IN OS and WEB APPLICATIONS	**08 Hours**
Windows and Linux security: Types of Audits in Windows Environment, Server Security, Active Directory (Group Policy), Anti-Virus, Mails, Malware, End point protection, Shadow Passwords, SUDO users, etc. **Web Application Security:** OWASP, Common Issues in Web Apps, What is XSS, SQL injection, CSRF, Password Vulnerabilities, SSL, CAPTCHA, Session Hijacking, Local and Remote File Inclusion, Audit Trails, Web Server Issues, etc	
Unit VI CURRENT TRENDS	**08 Hours**
Current Trends in information Security, Cloud Computing: benefits and Issues related to info Sec. Standards available for InfoSec: Cobit, Cadbury, ISO 27001, OWASP, OSSTMM, etc - An Overview, Certifiable Standards	

Textbooks

1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Vikas Publishing House, New Delhi, 2003
2. William Stallings and Lawrie Brown, "Computer Security: Principles and Practice", Prentice Hall, 2008.

Reference Books

1. Nina Godbole, Information Systems Security-Security Management, Metrics, Frameworks and Best Practices, Wiley, 2009
2. Swiderski, Frank and Syndex, "Threat Modeling", Microsoft Press, 2004.

List of Experiments

1. Write a program to Analyze Cyber Threats and Attacks in Data Traffic
2. Write a program to examine Security Attack Impact on User Privacy
3. Write a program for Assessing Correlation of multi-layered Security Approaches and Protocols
4. Write a program for Network visualization Strategies for Attack Detection
5. Write a program for analysis of Normal and Abnormal Network Pattern in Traffic
6. Write a program to implement SQL injection
7. A case study on security in web application
8. A case study on latest trends in information security

Project Based Learning
1. Graphical Password Authentication System using Intuitive Approach
2. Online Transaction Fraud Detection using Backlogging on E-Commerce Website
3. Secure File Sharing Using Access Control
4. Blockchain-based Transaction and Settlement System
5. Blockchain based Personal Identity Security System
6. Signature verification System using Python
7. Electronic Voting System using Blockchain
8. Three Level Image Password Authentication
9. Android Text Encryption Using Various Algorithms
10. E Authentication System Using QR Code & OTP
11. Detecting Phishing Websites Using Machine Learning
12. Card Payment Security Using RSA
13. Detecting Data Leaks via Sql Injection Prevention on an E-Commerce
14. School Security System (SSS) using RFID

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

INTERNET OF THINGS

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		**Marks**		**Credits**
Lecture	04	**University Examination**	60	**Theory**	04
Practical	02	**Internal Assessment**	40		
		Term Work	25	**Practical**	01
		Practical	25		
Total	06	**Total**	150	**Total**	05

Course Objective:

The aim of this course is to help the students to attain the following industry identified competency through various teaching learning experience-
1. To Provide a strong foundation of fundamentals of Internet of Things and need of IoT Security.
2. To design and implement application of IoT using various sensors.
3. To detailed understanding of present scope of Internet of Things with case studies.

Prerequisite:
1. Computer networking, Embedded systems, Cloud Computing.

Course Outcomes: On completion of the course, students will have the ability:
1. To understand the fundamentals about IoT.
2. To understand the working of Embedded IoT devices.
3. To use IoT protocol to upload sensor data and to control devices.
4. To study the basics of Cloud Platforms for IOT and supporting services.
5. To apply Security concepts/techniques for IoT applications.
6. To design and implement IoT system for real time applications.

Unit I	08 Hours

Introduction to Internet of and Things (IoT):
Understanding IoT fundamentals, IOT Architecture and protocols, IoT World Forum (IoTWF) standardized Architecture, Physical design of IoT, Logical Design of IoT, Various Platforms for IoT, Overview of IoT components and IoT Communication Technologies and Models, IoT Communication API"s, IoT Issues and Challenges- Planning, Costs and Quality ,Security and Privacy, Risks, Interdependencies of IoT and cloud computing, Web of things.

Unit II	08 Hours

Embedded IoT devices:
Sensors and actuators for IoT applications, IoT components and implementation, IoT system building blocks ,Programming of NodeMCU and Raspberry PI, Implementation of IoT with Edge devices, Reading sensor data and transmit to cloud, Controlling devices through cloud using mobile application and web application, Types and configurations of gateways, Specifications of IoT gateways, RFID

Unit III	08 Hours
IoT PROTOCOLS: IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.11ah, Network Layer/ Internet layer: IP versions, Constrained Nodes and Constrained Networks, Transport layer protocols, Application Layer Protocols: Hypertext transfer protocol (HTTP), Systematic HTTP access methodology, Web Socket, Constrained application protocol CoAP), Message Queue Telemetry Transport Protocol (MQTT), XMPP, DDS, AMQP CoAP and MQTT.	
Unit IV	08 Hours
Cloud Platforms for IOT: Virtualization concepts and Cloud Architecture,Cloud computing, benefits,Cloud services — SaaS, PaaS, IaaS, Cloud providers & offerings, Study of IOT Cloud platforms, ThingSpeak API and MQTT, Interfacing ESP8266 with Web services. Computing Using a Cloud Platform for IoT/M2M Applications/Services, Everything as a service and Cloud Service Models.	
Unit V	08 Hours
IoT Security: Vulnerabilities Security Requirements and Threat Analysis, Misuse Cases, IoT Security Components, Key Management, Update Management, Challenges in IoT security, Tomography, and Layered Attacker Model, Identity Management and Establishment, Access Control, and Secure Message Communication, Security Models, IoT Security Protocols. Security in Service Management,	
Unit VI	08 Hours
IoT Applications and case study Broad categories of IoT applications: Consumer IoT, Commercial IoT, Industrial IoT, Infrastructure IoT, Military Things (IoMT), IoT applications in home, infrastructures, other IoT electronic equipments, Industry 4.0 concepts. **IoT Case studies**: Home automation with IoT, River water pollution monitoring, Smart city street light control and monitoring, Health care monitoring, Voice Apps on IoT device.	
Textbooks	
1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, ISBN: 0: 0996025510, 13: 978-0996025515.	
2. Raj Kamal, Internet of Things: Architecture and Design Principle" , ISBN-13: 978-93-5260-522-4, McGraw Hill Education (India) 2017.	
3. Lyla B. Das, "Embedded Systems: An Integrated Approach" Pearson , ISBN: 9332511675, 9789332511675	
4. Orchestrating and Automating Security for the Internet of Things: Delivering Advanced Security Capabilities from Edge to Cloud for IoT, by Anthony Sabella, Rik IronsMclean, Marcelo Yannuzzi, Publisher: Cisco Press, Release Date: June 2018,ISBN:	

	9780134756936
5.	Securing the Internet of Things, Shancang Li Li Da Xu, Syngress, 2017, Elsevier, ISBN: 978-0-12-804458-2
6.	IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017.

Reference Books

1.	Internet of Things: A Hands-on Approach, By Arshdeep Bahga and Vijay Madisetti Lee, Heather Schneider, Robbie Schell, Mobile Applications: Architecture, Design, and Development, Prentice Hall, April 2004, ISBN-13: 978-0131172630
2.	Lyla B. Das, "Embedded Systems: An Integrated Approach" Pearson , ISBN: 9332511675, 9789332511675
3.	Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill HigherEducation.
4.	Fei Hu, "Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations ", ISBN: 9781498723183, CRC Press, 2016. 6.
5.	The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012.
6.	Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012, ISBN:978-1-119-99435-0.
7.	David Hanes, IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, Cisco Press, ISBN-13: 978-1-58714-456-1, ISBN-10: 1-58714-456-5, 2017.

List of Assignments

1.	With neat diagram, explain simplified IOT architecture.
2.	Getting started with NodeMCU, Arduino with ESP8266 and ESP32 in the Arduino IDE.
3.	Familiarization with the concept of IOT, Arduino / Raspberry Pi and perform necessary software installation.
4.	Explain with neat diagram, The oneM2M IoT Standardized Architecture.
5.	Identify and analyse the security and privacy issues in IoT, particularly the issue of securing its wireless system.
6.	List out the different IOT applications and importance of IOT in present scenario.

List of Laboratory Exercises

1.	Excercise on Eclipse IoT Project.
2.	Exercise on smart object API Gateway service reference implementation in IoT
3.	Toolkit.
4.	Study and Install IDE of Arduino and different types of Arduino.
5.	Experiment on HTTP-to-CoAP semantic mapping Proxy in IoT Toolkit.
6.	Experiment on application framework and embedded software agents for IoT Toolkit.
7.	Study and Configure Raspberry Pi.
8.	Installing Windows 10 IoT Core on Raspberry Pi.

9. Experiment on connectivity of Rasberry Pi with existing system components.	
10. IoT based Web Controlled Home Automation using Raspberry Pi	
11. Implementation of Interfacing Raspberry Pi with RFID.	
Project Based Learning	
1. Internet of things enabled real time water quality monitoring system.	
2. Controlling Raspberry Pi with WhatsApp.	
3. Smart city IoT applications	
4. Turn your smartphone into an IoT device using the IBM Watson IoT platform cloud-hosted service.	
5. Implement a communication technology for IoT enable devices in a home network.	
6. Fingerprint Sensor interfacing with Raspberry Pi.	
7. Building Google Assistant with Raspberry Pi.	
8. Design a system to control the traffic signals through IOT	
Syllabus for Unit Tests:	
Unit Test -1	Unit – I, Unit – II, Unit – III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

DATA ENGINEERING

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Lecture:	03 Hours/Week	University Examination:	60 Marks		
Practical:	--	Internal Assessment:	40 Marks	Theory	03
				Practical	--
		Total	100 Marks	Total	03

Course Objective: Get a concise overview of the entire data engineering landscape

Prerequisite: Concepts of Querying, Data Warehousing, Data mining

Course Outcomes: On completion of the course, students will have the ability to:
1. Understand the data architecture and data engineering life cycle
2. Understand the source systems
3. Deduce various data storage systems for data engineering
4. Understand the ingestion phase of data engineering life cycle
5. Interpret the transformation and serving phase of data engineering life cycle
6. Recognise the future of data engineering

Unit I Data engineering described	**06 Hours**
What is data engineering? Data engineering skills and activities, data engineers inside an Organisation, What is the data engineering life cycle? The data life cycle versus the data engineering life cycle, Designing good Data Architecture	

Unit II Source systems	**06 Hours**
Data generation in source systems: How is data created? Source systems in detail, source systems practical details, Undercurrents and their impact on source systems	

Unit III Storage	**06 Hours**
Raw ingredients of data storage, Data storage systems, Data engineering storage abstractions, Big trends in storage	

Unit IV Ingestion	**06 Hours**
What is data injestion? Why to injest data? Key engineering considerations for the injestion phase, batch injestion consideration, message and stream injestion consideration	

Unit V Transformation and serving	**06 Hours**
Queries, modelling and transformations Serving data for Analytics machine learning and reverse ETL: General considerations for serving data, analytics, machine learning, ways to serve data for analytics and machine learning, reverse ETL	

Unit VI Security privacy and the future of data engineering	**06 Hours**
Security and privacy: People, Processes, Technology The future of data engineering: Decline of complexity and rise of easy to use data tools, The cloud scale data OS and improved interoperability, Enterprisey data engineering, Moving beyond the modern data stack towards the live data stack	

Textbooks

1. Joe Reis, Matt Housely, "Fundamentals of Data Engineering: Plan and Build Robust Data Systems", O'Reilly publication, 1st Edition, 2022	

Reference Books

1. Tobias Macey, "97 Things Every Data Engineer Should Know: Collective Wisdom from the Experts", O'Reilly Media, 2021
2. Andreas Kretz , "The Data Engineering Cookbook Mastering The Plumbing Of Data Science", 2019

List of Assignments

1. Compare the types of Data Architectures
2. Case study of data engineering using AWS
3. Case study of SAPRK as an ETL tool
4. Study of any one data ingestion tool and its architecture
5. Analysis of security in data engineering: Threats, Challenges, Considerations and best practices
6. Comparison of storage mechanism for various types of data engineering scenarios

Project Based Learning

Implement any of the following or similar project using any data engineering tools such as but not limited to: SPARK, AZURE, AWS, Python etc

1. Predicting flight delays
2. Data pipeline
3. Creating a data lake
4. Creating an enterprise data hub
5. Streaming analytics on fraud detection
6. In-game events auto-adjustment of complexity levels, target advertising, etc
7. Dataset analysis for any application such as airline, twitter, etc

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

ELECTIVE-II: SEMANTIC WEB MINING

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Lecture	04	University Examination	60	Theory	04
Practical	02	Internal Assessment	40		
		Term Work	25	Practical	01
		Oral	25		
Total	06	Total	150	Total	05

Course Objective:
1. Understand a detailed overview of the data mining process and techniques, specifically those that are relevant to Web mining.
2. Understand the basics of Information retrieval and Web search with special emphasis on web crawling.
3. Apply the use of machine learning approaches for Web Content Mining.
4. Understand the role of hyper links in web structure mining.
5. Learn the various aspects of web usage mining.

Prerequisite:
1. Concepts of data mining, Concepts of Web Technology/Web Engineering

Course Outcomes: On completion of the course, students will have the ability:
1. Build a sample search engine using available open source tools.
2. Identify the different components of a web page that can be used for mining
3. Apply machine learning concepts to web content mining.
4. Implement Page Ranking algorithm and modify the algorithm for mining information.
5. Design a system to harvest information available on the web to build recommender systems.
6. Analyse social media data using appropriate data/web mining techniques and modify an existing search engine to make it personalized.

Unit I : Introduction	08 Hours
Introduction – Web Mining – Theoretical background –Algorithms and techniques – Association rule mining – Sequential Pattern Mining -Information retrieval and Web search – Information retrieval Models-Relevance Feedback- Text and Web page Pre-processing – Inverted Index – Latent Semantic Indexing – Web Search – Meta-Search – Web Spamming. The Syntactic and the Semantic Web, Logics of the Semantic Web. The world of the semantic web-WWW-Meta data-Search engine-Search engine for traditional web-Semantic web-Search engine for semantic web-Traditional web to semantic web.	

Unit II : Semantic Web Technology	08 Hours
RDF,- Elements of RDF, Basic Syntax and Fundamental rules of RDF-Aggregation-Distributed information-RDFS-core elements of RDFS-Ontology-Taxonomy-Inferencing based on RDF schema**.** **OWL**: OWL syntax, OWL and RDF semantics, OWL document, Using OWL to	

define classes-Set operators-Enumerations-Define properties, ontology, matching-Three faces of OWL-Validate OWL.

Swoogle: FOAF-Semantic markup-Issues-prototype system-Design of Semantic web search engine-Discovery and indexation-prototype system-case study.

Unit III : Web Content Mining & Semantic Web Services	08 Hours

Web Content Mining – Supervised Learning – Decision tree - Naïve Bayesian Text Classification -Support Vector Machines - Ensemble of Classifiers. Unsupervised Learning - K-means Clustering -
Hierarchical Clustering –Partially Supervised Learning – Markov Models - Probability-Based Clustering - Evaluating Classification and Clustering – Vector Space Model – Latent semantic Indexing – Automatic Topic Extraction - Opinion Mining and Sentiment Analysis – Document Sentiment Classification. Introduction to web services- SOA, Limitations of web services. Semantic web services-OWL-S-Upper ontology-WSDL-S,OWL-S to UDDI mapping ,Design of the search engine, implementations.

Unit IV : Web Link Mining	**08 Hours**

Link mining, common link mining tasks, link-based object ranking
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

Unit V : Structured Data Extraction	**08 Hours**

Structured Data Extraction: Wrapper Generation – Preliminaries- Wrapper Induction- Instance-Based Wrapper Learning ·- Automatic Wrapper Generation: Problems - String Matching and Tree Matching - Multiple Alignment - Building DOM Trees - Extraction Based on a Single List Page and Multiple pages-Introduction to Schema Matching - Schema-Level Match -Domain and Instance-Level Matching – Extracting and Analysing Web Social Networks.

Unit VI : Web Usage Mining & Semantic Web Applications	**08 Hours**

Web Usage Mining - Click stream Analysis -Web Server Log Files - Data Collection and Pre-Processing - Cleaning and Filtering- Data Modelling for Web Usage Mining - The BIRCH Clustering Algorithm -Affinity Analysis and the A Priori Algorithm – Binning. Discovery and Analysis of Web Usage Patterns – Modelling user interests –Probabilistic Latent Semantic Analysis – Latent Dirichlet Allocation Model– Applications- Collaborative Filtering- Recommender Systems – Web Recommender systems based on User and Item – PLSA and LDA Models . Semantic Web applications and services, Semantic Search, e-learning, Semantic Bioinformatics, Knowledge Base ,XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods.

Textbooks
1. Bing Liu, "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data (Data-Centric Systems and Applications)", Springer; 2nd Edition 2009.
2. GuandongXu,Yanchun Zhang, Lin Li, "Web Mining and Social Networking: Techniques and Applications", Springer; 1st Edition.2010.
3. "Thinking on the Web" - Berners Lee, Godel and Turing, Wiley inter science, 2008.
4. "Social Networks and the Semantic Web", Peter Mika, Springer, 2007.
5. Foundations of Semantic Web Technologies, by Pascal Hitzler, Markus Krötzsch, Sebastian Rudolph, Publisher: Chapman and Hall; 1st edition (August 6, 2009).
6. Semantic Web Programming, by John Hebeler, Matthew Fisher, Ryan Blace, Andrew Perez-Lopez, and Mike Dean (Foreword). Publisher: Wiley; 1 edition (April 13, 2009).

Reference Books
1. Zdravko Markov, Daniel T. Larose, "Data Mining the Web: Uncovering Patterns in Web Content, Structure, and Usage", John Wiley & Sons, Inc., 2007.
2. Soumen Chakrabarti, "Mining the Web: Discovering Knowledge from Hypertext Data", Morgan Kaufmann; edition 2002.
3. Adam Schenker, "Graph-Theoretic Techniques for Web Content Mining", World Scientific Pub Co Inc , 2005.
4. Min Song, Yi Fang and Brook Wu, "Handbook of research on Text and Web mining technologies", IGI global, information Science Reference – imprint of :IGI publishing, 2008.

Journals
1. Journal of Web Semantics, Elsevier, http://www.elsevier.com/wps/find/journaldescription.cws_home/671322/description
2. International Journal On Semantic Web and Information Systems,IGI Global, https://www.igi-global.com/journal/international-journal-semantic-web-information/1092
3. Semantic Web – Interoperability, Usability, Applicability, http://www.semantic-web-journal.net/

Resources
1. W3C Semantic Web Activity, http://www.w3.org/2001/sw/
2. semanticweb.org, http://semanticweb.org
3. SemWebCentral, http://www.semwebcentral.org/
4. W3Schools, http://www.w3schools.com/
5. John F. Sowa's Ontology pages: http://www.jfsowa.com/ontology/
6. The Semantic Web in Ten Passages, http://www.dfki.uni-kl.de/~boley/sw10pass/sw10pass-en.htm

List of Laboratory Exercises
1. Discuss the Meta-Search and Web Spamming concepts in detail.
2. Determine the location of a resource with the help of ontologies and reasoning using router
3. Steps in designing a search engine. Take a case study of designing your own search engine.
4. Design a crawler program to list out the URL's on the page, modify the program for again crawl those founded URL's to find more URL's using High speed computer (Hint : call the **crawl_site** function to **crawl** a **URL**.).
5. Write a Script/ program to perform Analysis of User's Browsing Behavior and Their Categorization Using Markov Chain Model.
6. Applications of Semantic Web, Web Search Agents

Project Based Learning
Study, Analysis, Design, Development, Testing and Launching of a Search Engine This project should be distributed among groups of 5 students each, with any of the task defined above.

Syllabus for Unit Tests:	
Unit Test -1	Unit – I, Unit – II, Unit – III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

Elective-II: Social Analytics in Digital Marketing

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Lecture:	04 Hours/Week	University Examination:	60 Marks		
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	Theory	04
		Term Work	25 Marks	Practical	01
		Oral	25 Marks		
		Total	150 Marks	Total	05

Course Objective:

This course aims at giving students a knowledge of
- Social Media Analytics
- Digital Marketing

Prerequisite:
- Basic knowledge of Social media sites/ apps
- Basic knowledge of Digital Marketing tools

Course Outcomes: On completion of the course, students will have the ability to:
1. Understand the Concept of Social media
2. Understand the concept of Social media analytics
3. Analyse various types of social media platforms.
4. Understanding the concept of Digital marketing
5. Analyse and understanding use of social media analytics in digital marketing
6. Understanding the effectiveness of different social media tools/apps in social media analytics

Unit I	06 Hours
Introduction to Social Media Analytics (SMA): The social media landscape, Need for SMA; SMA in Small organizations; SMA in large organizations; Application of SMA in different areas	

Unit II	06 Hours
Network fundamentals and models: The social networks perspective - nodes, ties and influencers, Social network and web data and methods. Graphs and Matrices- Basic measures for individuals and networks. Information visualization	

Unit III	06 Hours
Making connections: Link analysis. Random graphs and network evolution. Social contexts: Affiliation and identity. Web analytics tools and techniques: Clickstream analysis, A/B testing, online surveys, Use of Google Analytics; Web crawling and Indexing; Natural Language Processing Techniques for Micro-text Analysis	

Unit IV	06 Hours
Facebook Analytics: Introduction, parameters, demographics. Analyzing page audience. Reach and Engagement analysis. Postperformance on FB, Use of Facebook Business Manager; Social campaigns. Measuring and Analyzing social campaigns, defining goals and evaluating outcomes, Network Analysis. (LinkedIn, Instagram, YouTube Twitter etc	

Unit V	06 Hours
Processing and Visualizing Data, Influence Maximization, Link Prediction, Collective Classification. Applications in Advertising and Game Analytics (Use of tools like Unity30 / PyCharm). Introduction to Python Programming, Collecting and analyzing social media data; visualization and exploration	

Unit VI	06 Hours
Analyzing Social media campaign: Analyzing the social media of any ongoing campaigns and present the findings.	

Textbooks

1. Mathew Ganis, Avinash Koihrkar :Social Media Analytics IBM Press
2. Jim Sterne Social Media Metrics Wiley

Reference Books

1. Oliver Blanchard Social Media ROI Que Publishing Latest 4
2. Marshall Sponder, Gorah F. Khan Digital Analytics for Marketing Routledge 2017 / 1st 5
3. Marshall Sponder Social Media Analytics McGraw Hill Latest 6
4. Tracy L. Tuten, Michael R. Solomon Social Media Marketing Sage 2

List of Assignments

1. Enlist and describe different social media platforms.
2. Describe the use of social media for any business
3. Describe the different types of data commonly found on social platforms
4. Understand the ethical sensitivities in obtaining and operating on social data
5. Use a social platform API to obtain data and understand the structure of those data
6. Explain and discuss the importance of Social Media Analytics.
7. Evaluate effectiveness of different social media campaigns using various analytical tools.
8. Examine how different industries across the globe are using social media analytics

Project Based Learning

1. Analyzing the social media of any ongoing campaigns and present the findings.

Syllabus for Unit Tests:

Unit Test -1	Unit - I, Unit - II, Unit - III
Unit Test -2	Unit - IV, Unit - V, Unit - VI

Elective-II: Management Information System

Teaching Scheme		Examination Scheme		Marks	Credit Scheme	Credits
	Hours/Week			Marks		Credits
Lecture	04	University Examination		60	Theory	04
		Internal Assessment		40		
Practical	02	Term Work		25	Practical	01
		Oral		25		
Total	06	Total		150	Total	05

Course Objective:

This course aims at giving students a knowledge of Information Management along with its applications in terms of the following:

- To understand the basics of Management Information System.
- Learn to evaluate information Management systems
- To describe the role of information technology and decision support systems in business and record the current issues with those of the firm to solve business problems.
- To provide the theoretical models used in database management systems to answer business questions.

Prerequisite:

- Students must have the minimal concept of Data Base Management Systems
- They must also have the concept of different types of algorithms used for searching data
- To knowledge of DBMS

Course Outcomes: On completion of the course, students will have the ability to:

1. Describe the objectives of Management information systems.
2. Relate the basic concepts and technologies used in the field of management information systems
3. Outline the role of the ethical, social, and security issues of information systems
4. Understand query, document, and phrase translation.
5. Apply the understanding of how various information systems like DBMS work together to accomplish the information objectives of an organization
6. Design and implement a recommender system.

Unit I Management information system in a digital firm:	08 Hours
Goals and history of MIS, Objectives of Management Information System, MIS concept - Definition –Role of the MIS.System View of Business, Process of MIS.Development of MIS within in organization.	
Unit - System analysis and design: **Implementation and controlling of management** Information System Approach and Introduction to Information System. Management as a control system. Impact of the MIS-MIS and the user. Need for system analysis. System analysis of a new requirements. System analysis of the existing system	

Unit III Technology of information system**:**	**08 Hours**
Data process- Transaction and application process Information system process; Unified communication and network. Computer Operation Of Manual Information System.Conversion of manual to Computer Based System. Resources and Components of Management information System.	
Unit IV Data base management system**:**	**08 Hours**
Objectives of data base approach. Characters of database Management systems Integration and Automation of Business Function and Developing. Components of DBMS packages. Data models.	
Unit V - Management Information system applications	
MIS applications, DSS – GDSS - DSS applications in E enterprise. Types of Applications. Features of Management System. e, E-communication, Business Process Engineering.Inout Output Design.	
Unit VI Architecture AND Design of IS:	**08 Hours**
Architecture Development and maintenance of Information System, Factor of Success and failure, Value and Risk of MIS.	
Textbooks:	
1. Management Information Systems: Managing the Digital Firm" by Kenneth C Laudon. 2. "Management Information System: Conceptual Foundations - Structure and Development" by Gordon Davis and Margrethe Olson 3. "Management Information Systems: Managerial Perspectives" by D P Goyal	
Reference Books:	
1. Jawadekar, W.S., "Management Information Systems", Tata McGraw Hill Private Limited, New Delhi, 2009 2. Mahadeo Jaiswal, Monika Mital: "Management Information System", Oxford University Press, New Delhi, 2008.	
1.Introduction to Management information System 2.Explain Types of Information. 3. Discuss Why do we need Computer Based System 4. Steps to Avail Management Information Systems (MIS) Assignment Help By Academic Expert. 5. Computer Operation Of Manual Information System. 6. Architecture Development and maintenance of Information System,	
Project Based Learning	
1. Implementation Management as a control system 2. Implementation Transaction and application process Information system	

3. Implementation Resources and Components of Management infortemmation System.	
Syllabus for Unit Tests:	
Unit Test -1	Unit – I, Unit – II, Unit – III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

Elective-II Cyber Security					
Teaching Scheme		**Examination Scheme**		**Credit Scheme**	
	Hours/Week		**Marks**		**Credits**
Lecture:	**04 Hours/Week**	**University Examination:**	**60 Marks**		
Practical:	**02 Hours/Week**	**Internal Assessment:**	**40 Marks**	**Lecture**	**04**
		Term Work & Oral	**50 Marks**	**Practical**	**01**
		Total	**150 Marks**	**Total**	**05**

Course Objective:

To understand threats and vulnerabilities to security.

To understand Information security models

To understand laws for cyber security

This programme aims to help the learners to navigate the foundations and skills necessary to build a career in the field of cyber security.

Prerequisite:

Basics of security

Knowledge of networking

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand Information security and it's threats.
2. Understand cyber vulnerability and network security
3. Discuss authentication tools and information security models
4. Implement various security methods for web and mobiles.
5. Understand cyber crimes
6. Understand cyber security laws

Unit I Introduction to Information Security and Potential Threats	**08 Hours**
Introduction to Cyber Space, Cyber Security and Information Systems, Cyber Attacks and their Classification, Types of Malware and Threats.	
Unit II Cyber Vulnerability and Network Security	**08 Hours**
Assessment of Vulnerability, Intrusion Detection and Prevention Systems, Internet Protocols, Operating System Security and Network Security.	
Unit III User Authentication Tools and Information Security Models	**08 Hours**
User Authentication Methods, Information Security Models and Security Mechanisms, Biometric Systems and Biometric Authentication Processes.	
Unit IV Web and Mobile App security Methods	**08 Hours**
Web Security and Email Security, Security of Mobile Devices and Cloud Space, Social Media Security and IoT Security	
Unit V Cyber Crimes and Digital Forensic Science	**08 Hours**
Cyber Crimes, Scams and Frauds, Digital Forensic Investigation Methods, Cyber Trails, Branches of Digital Forensics, Reporting, Management of Evidence	
Unit VI Laws for Cyber Security	**08 Hours**

Jurisdiction of Cyber Crime, Information Technology Act 2000 and its Amendments, Validity of Digital Communication Evidences (Call Records /Emails/SMS), RBI Act and IPR Act	

Textbooks

1. William Stallings, Computer Security: Principles and Practices, Pearson 6 Ed, ISBN 978-0-13-335469-0

2. Nina Godbole, Sunit Belapure , Cyber Security- Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiely India Pvt.Ltd, ISBN- 978-81-265-2179-1

Reference Books

1. Bruice Schneier , Applied Cryptography- Protocols, Algorithms and Source code in C, Algorithms, Wiely India Pvt Ltd, 2nd Edition, ISBN 978-81-265-1368-0.

2. CK Shyamala et el., Cryptography and Security, Wiley India Pvt. Ltd, ISBN-978-81-265-2285-9.

List of Experiments

1. Write a program to perform web security audit.
2. Write a program for Biometric authentication process.
3. Write a program to examine SQL injection attack.
4. Write a program to perform online and offline attacks of password cracking.
5. Evaluate network defense tools for DOS attack.
6. Evaluate network defense tools for IP spoofing.
7. A Case study on Cyber Crime.
8. A Case study on scams and Frauds.

Project Based Learning

1. Keylogging
2. Packet Sniffing
3. Breaking Caesar Cipher
4. SQL Injection
5. Hacking an Offline Device
6. Encrypting Images
7. Online Fund Transfers with DES Encryption
8. Detection and Intimation of Theft
9. Card Payment Security Using RSA
10. Detecting Data Leaks via Sql Injection Prevention on an E-Commerce

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Subject : ITL-VI		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 00 Hrs/Week	End Semester : 00 Marks Examination	Theory :00
Practical : 02 Hrs/Week	Internal Assessment : 50 Marks	Practical : 01
	Term Work:25 Marks	
	Practical : 25 Marks	
Total: 02 Hours/Week	Total :100 Marks	Total Credits: 01
Course Objectives:		
1) Design solution to deploy the application.		
2) Apply the configuration management mechanisms.		
Course Prerequisites:		
Students should have knowledge of		
Agile methodology, Basic Linux		
Course Outcome:		
Students will be able to:		
1) Understand the Agile using DevOps		
2) Apply Amazon AWS for containerization.		
3) Analyze monitoring and logging using Kibana		
4) Implement the CICD approach.		
5) Perform the configuration management with Ansible.		
6) Apply the kubernetics for Orchestration.		
…		
UNIT-I	**Dev Ops Essentials**	**(08 Hours)**
	Introduction to advances in Dev Ops, Linux commands and bash scripting which are frequently used by DevOps engineers.	
UNIT-II	**Containerization**	**(08 Hours)**
	Introduction to Containerization, concepts of docker and the di-erence between docker and VM. commands in docker and deployment of a monolithic application using Docker with AWS VM using AWS ECS service. setup and configure jobs on Jenkins	

UNIT-III	Monitoring and logging	(08 Hours)
	containerise applications at scale. Handling scalability issues with web applications by configuring load balancers, deciding server's geographical location, Application Monitoring using Kibana/ELK cluster. Site Reliability.	
UNIT-IV	CICD	(08 Hours)
	Automated Testing using Selenium and Jetkins, continuous integration, Tool, Applications using Maven, SonarQube. Continuous deployment using Amazon AWS.	
UNIT-V	System Provisioning and Configuration Management	(08 Hours)
	Introduction to Configuration Management via tools like Ansible and Terraform.	
UNIT-VI	Orchestration using Kubernetes	
	Orchestrate multiple docker containers using an orchestration tool like Kubernetes. Installation, component, architecutre, creating deployment, volumes, secret and creation of CICD pipeline involving kubernetes.	(08 Hours)

Assignment List:

1)	Implement all Linux command by deploying on VM
2)	Use Amazon AWS for containerization.
3)	Create Azure Pipeline
4)	Deploy the application using Nexus.
5)	Deploy Application using SonarQube.
6)	Use Amazon AWS for
7)	Implement Kibana for monitoring and logging.
8)	Implement the configuration management using Ansible.
9)	Deploy Docker Container app using Kubernetics.
10)	Design and deploy project using Microsoft Azure.

Text Books:

1)	DevOps Tools from Practitioner's Viewpoint Deepak Gaikwad, Willey.
2)	Docker for Developers: Develop and run your application with Docker containers using DevOps tools for continuous delivery Richard Mcguire, Pact.
3)	Hands-on DevOps with Linux, Mitesh Soni, bpb.

Reference Books:

1)	AWS Certified DevOps Engineer - Professional Certification and Beyond: Pass the DOP-C01 exam and prepare for the real world using case studies and real-life examples, Adam Book.
2)	Automated Deep Learning Using Neural Network Intelligence: Develop and Design PyTorch and TensorFlow Models Using Python, Ivan Gridin.
3)	Agile Model-Based Systems Engineering Cookbook: Improve system development by applying proven recipes for effective agile systems engineering , Dr. Bruce, Pacto