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B.TECH

CURRICULUM-2018

SCHOOL OF COMPUTING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

KALASALINGAM ACADEMY OF RESEARCH AND EDUCATION

(DEEMED TO BE UNIVERSITY)

(Under Section 3 of the UGC Act 1956)

Anand Nagar, Krishnankoil-626 126.

Srivilliputtur, Virudhunagar(Dist.),Tamil Nadu, India

(Website: www.kalasalingam.ac.in)

KALASALINGAM ACADEMY OF RESEARCH AND EDUCATION

VISION

To be a Center of Excellence of International Repute in Education and Research

MISSION

To Produce Technically Competent, Socially Committed Technocrats and Administrators through Quality Education and Research

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

VISION

To become a Centre of Excellence in Teaching and Research in the field of Computer Science and Engineering

MISSION

To prepare the students for a prospective career in IT industry and for higher learning. To carry out research in cutting edge technologies in computer engineering to meet the requirement of the industry and society

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PROGRAM EDUCATIONAL OBJECTIVES

PEO1: The graduates will demonstrate technical proficiency in Computer Science and Engineering during employment or higher studies.

PEO2: The graduates will imbibe problem solving skills through continuous learning and innovative mindset to provide sustainable solutions.

PEO3: The graduates will operate in a diverse environment as a professional or an entrepreneur to solve societal problems with professional ethics.

PROGRAM SPECIFIC OBJECTIVES (PSOs)

PSO1 : Problem-Solving Skills: The ability to apply mathematics, science and computer engineering knowledge to analyze, design and develop cost effective computing solutions for complex problems with environmental considerations.

PSO2 : Professional Skills: The ability to apply modern tools and strategies in software project development using modern programming environments to deliver a quality product for business accomplishment.

PSO3 : Communication and Team Skill: The ability to exhibit proficiency in oral and written communication as individual or as part of a team to work effectively with professional behaviors and ethics.

PSO4 : Successful Career and Entrepreneurship: The ability to create a inventive career path by applying innovative project management techniques to become a successful software professional, an entrepreneur or zest for higher studies.

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PROGRAMME OUTCOMES (POS)

PO1 : Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 : Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 : Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

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

PO5 : Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6 : The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7 : Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 : Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 : Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 : Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11 : Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 : Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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ABET STUDENT OUTCOMES
Computing Accreditation Commission (CAC)

CSO1 – Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.

CSO2 – Design, implement, and evaluates a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

CSO3 – Communicate effectively in a variety of professional contexts.

CSO4 – Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.

CSO5 – Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.

CSO6 – Apply Computer Science theory and software development fundamentals to produce computing-based solutions.

Engineering Accreditation Commission (EAC)

ESO1 – Ability to identify, formulate and solve complex engineering problems by applying principles of Engineering, Science, and Mathematics.

ESO2 – Ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

ESO3 – An ability to communicate effectively with a range of audiences.

ESO4 – Ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

ESO5 – Ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

ESO6 – Ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

ESO7 – Ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.Tech CSE - CURRICULUM STRUCTURE

S.No	Curriculum Components		Credits
I	Basic Science and Mathematics		
	Compulsory Courses	25	35
	Core (Mathematics)	4	
	Open Elective (Basic Science and Mathematics)	6	
II	Humanities and Social Science		3
	Soft Skills		3
	Humanities Elective		6
III	Basic Engineering		24
IV	Program Core		
	a)Core Courses	44	57
	b)Community Service Project	3	
	c)Project Work	10	
V	Professional Elective Courses		
	a)Professional Elective	18	30
	b)Open Elective	12	
VI	Internship/Industry Training		2
VII	Mandatory Courses		….
Total Credits			160

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I. BASIC SCIENCES AND MATHEMATICS

S.No	Course Code	Course Name	Course Type	L	T	P	C
1	PHY18R174	Semiconductor Physics	IC	3	1	2	5
3	CHY18R171	Chemistry	IC	3	1	2	5
4	MAT18R101	Calculus and Linear Algebra	T	3	1	0	4
5	MAT18R103	Multiple Integration, Ordinary Differential Equations and Vector Spaces	T	3	1	0	4
6	MAT18R202	Probability and Statistics	T	3	1	0	4
7	BIT18R101	Biology for Engineers	T	3	0	0	3
			Total Credits	25			

II. HUMANITIES AND SOCIAL SCIENCE

S.No	Course Code	Course Name	Course Type	L	T	P	C
1	HSS18R151	English for Technical Communication	TP	2	0	2	3
2	HSS18R101	Soft skills-I	T	3	0	0	1
3	HSS18R102	Soft skills-II	T	3	0	0	1
4	HSS18R201	Soft skills-III	T	3	0	0	1
5	HSS18R0XX	Humanities Elective – I	T	3	0	0	3
6	HSS18R0XX	Humanities Elective – II	T	3	0	0	3
			Total Credits	12			

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A. HUMANITIES ELECTIVES

S.	Course Code	Course Name	Type	L	T	P	Credits
1.	HSS18R001	Management Concepts and Techniques	T	3	0	0	3
2.	HSS18R002	Marketing Management	T	3	0	0	3
3.	HSS18R003	Organizational Psychology	T	3	0	0	3
4.	HSS18R004	Project Management	T	3	0	0	3
5.	HSS18R005	Stress Management and Coping Strategies	T	3	0	0	3
6.	HSS18R006	Economics For Engineers	T	3	0	0	3
7.	HSS18R007	Human Resource Management and Labour Law	T	3	0	0	3
8.	HSS18R008	Entrepreneurship Development	T	3	0	0	3
9.	HSS18R009	Cost Analysis and Control	T	3	0	0	3
10.	HSS18R010	Product Design and Development	T	3	0	0	3
11.	HSS18R011	Business Process Reengineering	T	3	0	0	3
12.	HSS18R012	Political Economy	T	3	0	0	3
13.	HSS18R013	Professional Ethics	T	3	0	0	3
14.	HSS18R014	Operations Research	T	3	0	0	3
15.	HSS18R015	Total Quality Management	T	3	0	0	3
16.	HSS18R016	Advanced Soft skills	T	3	0	0	3

III. BASIC ENGINEERING

S.No	Course Code	Course Name	Course Type	L	T	P	C
1	EEE18R172	Basic Electrical Engineering	IC	3	1	2	5
2	MEC18R151	Engineering Graphics and Design	TP	3	0	2	3
3	ECE18R221	Analog Electronics Circuits	T	3	0	0	3
4	CSE18R171	Programming for problem solving	IC	3	1	2	5
5	ECE18R277	Digital Electronics	IC	3	1	2	**5**
6	MEC18R152	Engineering Practices	TP	3	0	2	3
			Total Credits	24			

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IV   PROGRAM CORE

A. CORE COURSES

S.No	Course Code	Course Name	Course Type	Pre requisite	L	T	P	C
1	CSE18R172	Data Structure and Algorithms	IC	CSE18RR171	3	1	2	5
2	CSE18R181	Computer Hardware Laboratory	L	Nil	0	0	3	2
3	CSE18R173	Design and Analysis of Algorithms	IC	CSE18R172	3	0	2	4
4	CSE18R174	Computer Architecture and Organization	IC	Nil	3	0	2	4
5	MAT18R207	Discrete Mathematics	T	Nil	3	1	0	4
6	CSE18R252	Formal Language and Automata	TP	Nil	3	1	0	4
7	INT18R371	Data Base Management Systems	IC	Nil	3	0	2	4
8	CSE18R271	Object Oriented Programming	IC	Nil	3	0	2	4
9	CSE18R272	Java Programming	IC	Nil	3	0	2	4
10	CSE18R273	Operating Systems	IC	CSE18R174	3	0	2	4
11	CSE18R274	Compiler Design	IC	CSE18R252	3	0	2	4
12	CSE18R371	Computer Networks	IC	CSE18R273	3	1	2	5
				Total Credits	48			

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B. COMMUNITY SERVICE PROJECT

S.No	Course Code	Course Name	Credits
1	CSE18R399	Community Service Project	3

C. PROJECT WORK

S.No	Course Code	Course Name	Credits
1	CSE18R499	Project Work	10

V.   PROFESSIONAL ELECTIVE COURSES

S.No		Course Name	Course Type	Pre requisite	L	T	P	C
Stream : Networks and Security								
1	CSE18R352	Network and Information Security	TP	CSE18R371	3	0	1	3.5
2	CSE18R353	Ad hoc& Sensor Networks	TP	CSE18R371	3	0	1	3.5
3	ECE18R461	Wireless Communication for Computer Engineers	TP	CSE18R371	3	0	1	3.5
3	CSE18R354	Graph Theory and Its Applications	T	Nil	3	1	0	4
4	CSE18R355	Virtualization	TP	CSE18R371	3	0	1	3.5
5	CSE18R452	Cloud computing Techniques	TP	CSE18R371	3	0	1	3.5
6	CSE18R453	Applied cryptography and its applications	T	Nil	3	1	0	4
7	CSE18R454	Cyber security& forensics	TP	Nil	3	0	1	3.5
8	CSE18R455	Mobile and Wireless security	TP	CSE18R371	3	0	1	3.5

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		Stream : Software design and Development						
9	CSE18R256	Software Engineering	T	Nil	3	1	0	4
10	CSE18R351	Python and Script Programming	TP	Nil	3	0	1	3.5
11	CSE18R356	Software Testing	TP	CSE18R256	3	0	1	3.5
12	CSE18R357	Agile Methodology	T	Nil	3	1	0	4
13	CSE18R358	Free and Open Source Software	TP	Nil	3	0	1	3.5
14	CSE18R359	User Interface Design	TP	Nil	3	0	1	3.5
15	CSE18R456	Web Technology	TP	Nil	3	0	1	3.5
16	CSE18R457	Mobile Application Development	TP	CSE18R272	3	0	1	3.5
		Stream: Internet of Things						
17	CSE18R360	Internet of Things	TP	Nil	3	0	1	3.5
18	ECE18R265	Signals and Systems for computer Engineers	TP	Nil	3	0	1	3.5
19	ECE18R320	RFID and its Applications	T	Nil	3	1	0	4
20	ECE18R368	Digital Signal Processing For Computer Engineers	TP	ECE18R265	3	0	1	3.5
21	ECE18R369	Digital VLSI Design	TP	ECE18R221	3	0	1	3.5
22	CSE18R361	Embedded systems and its applications	TP	Nil	3	0	1	3.5
23	CSE18R362	Logic And Functional Programming	TP	CSE18R171	3	0	1	3.5
24	CSE18R363	IOT Applications and Communication Protocols	TP	CSE18R371	3	0	1	3.5
25	CSE18R364	Mobile Applications and Services	T	CSE18R271	3	1	0	4

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26	CSE18R458	Software Technology for pervasive computing	T	Nil	3	1	0	4
Stream : Graphics, Vision and Gaming								
27	CSE18R365	Artificial Intelligence	T	Nil	3	1	0	4
28	CSE18R366	Game theory	TP	Nil	3	0	1	3.5
29	CSE18R367	Virtual Reality	TP	Nil	3	0	1	3.5
30	CSE18R368	Computer Graphics & Multimedia Systems	TP	CSE18R171	3	0	1	3.5
31	CSE18R369	Computational Intelligence	TP	Nil	3	0	1	3.5
32	CSE18R459	Computer Vision and Digital imaging	T	Nil	3	1	0	4
33	CSE18R460	Natural Language Processing	TP	Nil	3	0	1	3.5
Stream : Data Science and Analytics								
34	INT18R353	Data Warehousing and Mining	T	INT18R371	3	1	0	4
35	CSE18R370	Big Data Analytics	T	Nil	3	1	0	4
36	CSE18R451	Machine Learning Techniques	T	Nil	3	1	0	4
37	CSE18R461	Bio Inspired Intelligence Techniques	TP	Nil	3	0	1	3.5
38	CSE18R462	Data Visualization	TP	Nil	3	0	1	3.5
39	CSE18R463	Analytic Tools	T	Nil	3	1	0	4
40	CSE18R464	Web Analytics and Development	TP	Nil	3	0	1	3.5
41	CSE18R465	Data Storage Technologies and Networks	T	CSE18R371	3	1	0	4

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OPEN ELECTIVE FROM CSE

S.No	Course Code	Course Name	Course Type	Pre requisite	L	T	P	C
1	CSE18R302	Fundamentals of Networking	T	Nil	3	0	0	3
2	CSE18R303	OOPS using C++	T	Nil	3	0	0	3
3	CSE18R304	OOPS using JAVA	T	Nil	3	0	0	3
4	CSE18R305	Introduction to Data Analytics	T	Nil	3	0	0	3
5	CSE18R306	Introduction to Software Engineering	T	Nil	3	0	0	3
6	CSE18R307	Fundamentals of operating systems	T	Nil	3	0	0	3
7	CSE18R308	Ethical Hacking	T	Nil	3	0	0	3
8	CSE18R309	Introduction to Python Programming	T	Nil	3	0	0	3
9	CSE18R310	PC and Troubleshooting	T	Nil	3	0	0	3
10	CSE18R311	Data and Word Processing	T	Nil	3	0	0	3
11	CSE18R312	Fundamentals of Computer Architecture	T	Nil	3	0	0	3
12	CSE18R313	Bio Inspired Algorithm	T	Nil	3	0	0	3
13	CSE18R401	Bio- Python	T	CSE18R309	3	0	0	3
14	CSE18R402	Internet Security and Computer Forensics	T	CSE18R302	3	0	0	3
15	CSE18R403	Introduction to Cloud Computing	T	CSE18R302	3	0	0	3
16	CSE18R404	Programming in C# and .Net	T	CSE18R303	3	0	0	3
17	CSE18R405	Android	T	CSE18R304	3	0	0	3

		Programming						
18	CSE18R406	Introduction to IOT	T	CSE18R302	3	0	0	3
19	CSE18R407	Vehicular Ad -Hoc Network	T	CSE18R302	3	0	0	3
20	CSE18R408	Wireless Sensor Network	T	CSE18R302	3	0	0	3

INTERNSHIP /INDUSTRY TRAINING

S.No	Course Code	Course Name	Course Type	Pre-requisite	L	T	P	C
1	CSE18R397/ CSE18R398	INDUSTRY TRAINING / INTERSHIP TRAINING						2

HONOURS ELECTIVES

S.No	Course Code	Course Name	Course Type	Pre-requisite	L	T	P	C
1	CSE18R322	Advanced computer Architecture	T	CSE18R174	3	0	0	3
2	CSE18R323	High performance computing	T	CSE18R371	3	0	0	3
3	CSE18R324	Augmented reality	T	Nil	3	0	0	3
4	CSE18R325	Visual Cryptography	T	Nil	3	0	0	3
5	CSE18R420	Video Analytics	T	CSE18R370	3	0	0	3
6	CSE18R42 1	Next generation Networks	T	CSE18R371	3	0	0	3
7	CSE18R422	Software Defined networking	T	CSE18R371	3	0	0	3
8	CSE18R423	Service Oriented Architecture	T	Nil	3	0	0	3
9	CSE18R424	Vulnerability management	T	CSE18R352	3	0	0	3

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MANDATORY COURSES

S.No	Course Code	Course Name
1	MAN18R001	Environmental Sciences
2	MAN18R002	Indian constitution
3	MAN18R003	Essence of Indian Traditional Knowledge

OPEN ELECTIVE (BASIC SCIENCE AND MATHEMATICS)

S.No	Course Code	Course Name	L	T	P	C
1	OEE18R009	Laser Technology	3	0	0	3
2	OEE18R003	Mathematical Biology	3	0	0	3
3	OEE18R005	Combinatorics	3	0	0	3
4	OEE18R008	Photonics and Optoelectronic Devices	3	0	0	3
5	OEE18R006	Industrial Chemistry for Engineers	3	0	0	3
6	OEE18R004	Mathematical Modelling	3	0	0	3

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BASIC SCIENCES AND MATHEMATICS

PHY18R174	SEMICONDUCTOR PHYSICS	L	T	P	Credit
		3	1	2	5
Pre-requisite : Basic knowledge in Physics	**Course Category :** Basic science and Mathematics **Course Type** : Integrated Course				

COURSE OBJECTIVES :
- To provide the students a firm understanding of the basics of Semiconductors.
- To introduce the students, the application of semiconducting materials and some of its measurements

COURSE OUTCOMES :
Upon successful completion of this course, students will be able to
CO1: Describe the theories of Electronic materials.
CO2: Understand the basic concepts of semiconducting materials.
CO3: Understand the basic knowledge on light based semiconductor interaction.
CO4: Understand the fundamental measurements in semiconducting materials.
CO5: Design, fabrication, and characterization of engineered semiconductor materials

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	M				M						L		S			
CO2	L		M			M					L		S			
CO3	M		L								L		S			
CO4	M	M									L		S			
CO5	M	L									L		S			

UNIT I: BASIC CONCEPTS AND ELECTRONIC MATERIALS

Free electron theory, Density of states and energy band diagrams, Kronig-Penny model (to introduce origin of band gap), Energy bands in solids, E-k diagram, Direct and indirect bandgaps, Types of electronic materials: metals, semiconductors, and insulators, Density of energy states, Occupation probability, Fermi level, Effective mass, Phonons.

UNIT II: SEMICONDUCTORS

Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Metal-semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for optoelectronic devices.

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UNIT III: LIGHT-SEMICONDUCTOR INTERACTION

Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulated emission; Joint density of states, Density of states for photons, Transition rates (Fermi's golden rule), Optical loss and gain; Photovoltaic effect, Exciton, Drude model.

UNIT IV: ENGINEERED SEMICONDUCTING MATERIALS

Density of states in 2D, 1D and 0D (qualitatively), Practical examples of low-dimensional systems such as quantum wells, wires, and dots: design, fabrication (lithiography,CVD), and characterization techniques(XRD, TEM) .

UNIT V: MEASUREMENTS : CONDUCTING AND SEMI CONDUCTING MATERIALS

Four-point probe and van der Pauw measurements for carrier density, resistivity, and hall mobility; Hot-point probe measurement, capacitance-voltage measurements, parameter extraction from diode I-V characteristics, band gap by UV-Vis spectroscopy .

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LIST OF EXPERIMENTS

1. Diode – V-I characteristics
2. Transistor Static characteristics – C.E. mode
3. Transistor characteristics – C.B. mode
4. Logic Gates – AND, OR, NOT – truth table verification – discrete components
5. Zener diode characteristics & Break down Voltage
6. Zener regulated power supply.
7. Hall co-efficient of a semiconductor sample
8. Resistivity of a semiconductor crystal with temperature by four probe method and to determine band gap.
9. Determination of band gap of a semiconductor using P.O box.

TEXT BOOK(S):

1. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Incorporation, 1995.
2. B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Incorporation, 2007
3. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley , 2008.

REFERENCE BOOKS:

1. Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications, Oxford University Press, New York ,2007
2. P. Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India, 1997
3. Online course: "Semiconductor Optoelectronics" by M R Shenoy on NPTEL
4. Online course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Gupta on NPTEL

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CHY18R171	CHEMISTRY	L	T	P	Credit
		3	1	2	5
Pre-requisite : Basic knowledge in chemistry	**Course Category :** Basic science and Mathematics **Course Type** : Integrated Course				

COURSE OBJECTIVE:

To introduce the fundamental concepts and applications of Chemistry to engineering students to understand, analyze and apply the same to complex technical issues.

COURSE OUTCOMES :

CO1 : Understand the significance and role of water quality parameters in the domestic and engineering applications and analyzing the same through modern methods.

CO2 : Elucidate and apply the principles of thermodynamics for solving engineering problems.

CO3 : Summarize the basic concepts of electrochemistry, batteries, corrosion and to apply the same for the betterment of society.

CO4 : Illustrate synthesis, characteristics and applications of technologically important polymers, composites and nano materials.

CO5 : Utilize the underlying principles, instrumentation and applications of analytical techniques.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	Pos												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S				M								S			
CO2	S												S			
CO3	S		M				M						S			
CO4	S										L		S			
CO5	S										L		S			

UNIT I: ATOMIC AND MOLECULAR STRUCTURE

Schrodinger wave equation: Derivation of time independent Schrodinger wave equation, Representation of Schrodinger wave equation in polar coordinates - Radial distribution function graphs of s, p, d and f orbitals. Molecular Orbital Theory: MOT concept, MO diagrams of homo-nuclear diatomic molecules (hydrogen, nitrogen and oxygen) and hetero-nuclear diatomic molecules (carbon monoxide and nitric oxide). Crystal field theory: CFT concept, weak and strong ligands, energy level diagrams of transition metal

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ions (Fe^{2+} & Fe^{3+}) in octahedral and tetrahedral complexes and their magnetic properties. Intermolecular forces - Ionic, dipolar and van der Waals interactions.

UNIT-II: PERIODIC PROPERTIES

Effective nuclear charge - Factors affecting effective nuclear charge: Penetration or shielding of orbitals - Variation of s, p, d and f orbital energies of atoms in the periodic table - Aufbau principle (Building-up principle): Application of Aufbau principle in writing electronic configuration, Deviation from Aufbau principle - Periodicity of properties in a periodic table - Periodic properties: Atomic and ionic sizes, ionization energies, electron affinity and electronegativity - Variation of periodic properties in the periodic table - Hard soft acids and bases: Concept and examples.

UNIT-III: FREE ENERGY AND CHEMICAL EQUILIBRIA

Thermodynamic functions: Definition and mathematical expression for Work, Energy, Enthalpy, Entropy and Free energy - Nernst equation: Derivation, apply Nernst equation to determine of solubility product, pH (glass electrode). Potentiometric titrations: Acid-Base, Redox and precipitation reaction - Water analysis: Hardness by EDTA method and chloride ion by Argentomentric method - Corrosion: Definition, types (dry & wet) and mechanism. and control of Dry and Wet corrosion.

UNIT-IV: ORGANIC REACTIONS

Nucleophilic substitution reactions: Definition, types and examples of nucleophile, Compare nucleophilicity and basicity of a nuceophile - Types of nucleophilic substitution (case RX and ArX): Mechanism of S_N1, S_N2, S_Ni and Benzyne. Electrophilic substitution reactions: Definition, types and examples of electrophile - Electrophilic substitution reactions of hydrocarbons: Halogenation, sulphonation, nitration. Friedel crafts alkylation and acylation reaction. Nucleophilic addition reactions (case aldehydes and ketones): Polarity of C=O bond. General mechanism of nucleophilic addition reactions on aldehydes and ketones: HCN, HOH, ROH and $NaHSO_3$ addition. Electrophilic addition reactions (case alkenes): General mechanism of electrophilic addition reactions on alkene - Addition of HBr [Markownikoff & Anti-Markownikoff (peroxide effect)] - Addition of alkene (polymerization of ethylene). Elimination reactions: Types of elimination reactions (case alkyl halides): Dehydrohalogenation of alkyl halides - E_1 and E_2 mechanism - Dehydration of alcohols to alkene and ethers. Greener synthesis of drug molecules (Aspirin and Ibuprofen)

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UNIT-V: STEREOCHEMISTRY & SPECTROSCOPIC TECHNIQUES

Stereochemistry **-** Definition with examples: Geometrical isomers (alkene) and stereoisomers, symmetry, chirality, enantiomers, diastereomers, meso and racemic mixture. Representation of 3D structures: Wedge formula, Fischer projections, Newmann and Sawhorse formula (upto 2 carbons) - Conformational analysis: Ethane, butane and cyclohexane - Configurational analysis: Rules of RS nomenclature and application of RS nomenclature to molecules containing one chiral centre. Electronic spectroscopy: Principle, instrumentation, selection rules and medicinal application of fluorescence spectroscopy. Nuclear magnetic resonance spectroscopy (^{1}H-NMR): Principle, instrumentation, chemical shift, coupling constant and application (structural identification of the compound C_3H_6O from ^{1}H-NMR data). X-ray diffraction: Principle, instrumentation and applications X-ray diffraction.

LIST OF EXPERIMENTS (ANY 10):

1. Determination of Viscosity by Ostwald Viscometer.
2. Determination of surface tension by stalagmometer.
3. Adsorption of acetic acid by charcoal.
4. Determination of chloride content of water.
5. Estimation of hardness of water by EDTA method.
6. Determination of the rate constant of a reaction
7. Thin layer chromatography.
8. Determination of the partition coefficient of a substance between two immiscible liquids
9. Determination of Saponification /acid value of oil.
10. Preparation of Aspirin
11. Potentiometric titration of strong acid vs strong base.
12. Potentiometric titration of weak acid vs strong base.
13. Determination of cell constant and conductance of solutions.

TEXT BOOKS

1. Engineering Chemistry, 2nd Edition, Wiley India (P) Ltd., 2018.

2. Stereochemistry of Organic Compounds, Ernest L. Eliel, Samuel H. Wilen Student edition, Wiley India (P) Ltd., 2017.

3. University Chemistry, by B. M. Mahan and R.J.Mayers, Pearson Publishers, 11th Edition, Noida, 2017.

4. Chemistry Laboratory Manual, Department of Chemistry, Kalasalingam University, 2018.

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REFERENCE BOOKS

1. Fundamentals of Molecular Spectroscopy, by C. N. Banwell and E.M. McCash, Tata McGraw-Hill Publishers, 4th Edition, New Delhi, 2008.

2. Physical Chemistry, by P. W. Atkins and J.D. Paula, W H Freeman & Co Publishers, 10th Edition, 2014.

3. Modern Inorganic Chemistry, R. D. Madan, 4th Edition S. Chand & Company Ltd., 2009.

4. Organic Chemistry, Paula Y. Bruice, 7th Edition, Pearson (Dorling Kindersley India (P) Ltd.) 2014.

5. Principles of Physical Chemistry, B. R. Puri, L. R. Sharma, M. S. Pathania, 47th Edition, Vishal Publishing Co., 2017.

6. Spectrometric Identification of Organic Compounds, Robert M. Silverstein, Francis X. Webster, David J. Kiemle, David L. Bryce, 8th Edition, Wiley India (P) Ltd., 2010.

7. Inorganic Chemistry, Peter Atkins, Mark Weller, Fraser Armstrong, Jonathan Rourke, Tina Overton, Michael Hangerman 5th Edition, Oxford press, 2015.

8. Organic Chemistry, Volume 1, I. L. Finar, 6th Edition, Pearson (Thomson press India (P) Ltd.) 2014.

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MAT18R101	CALCULUS AND LINEAR ALGEBRA	L	T	P	Credit
		3	1	2	5
Pre-requisite : Nil	**Course Category :** Basic science and Mathematics **Course Type** : Theory				

COURSE OBJECTIVE:

To enable the students to acquire knowledge and skills in basic components of calculus, to handle the situations involving multivariable calculus, and to diagonalize a symmetric matrix using eigenvalues and eigenvectors.

COURSE OUTCOMES :

Upon successful completion of this course, students will be able to

CO1. Understand the fundamental theorems such as Rolle's theorem, Mean value theorem, Taylor's theorem and its applications.

CO 2. Understand the basic concepts of limit, continuity, derivative, partial derivative and total derivative and its applications.

CO 3. Solve the real world problems using differentiation and integration.

CO4. Understand the concepts of sequence, convergent of sequences, series and testing of convergent of series using different methods.

CO5. Find the solution of simultaneous linear equations using matrices and to find the eigen values and eigen vectors of a matrix, Cayley-Hamilon theorem and orthogonal transformations.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	Pos												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S	M											S			
CO2	S	S		S	M		L						S			
CO3	S	S		S	M		L						S			
CO4	S	S		S	M		L						S			
CO5	S	S		S	M		L						S			

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UNIT I : CALCULUS:

Rolle's Theorem- Mean value theorems - Taylor's and Maclaurin theorems with remainders -indeterminate forms and L'Hospital's rule - Maxima and minima

UNIT II: MULTIVARIABLE CALCULUS (DIFFERENTIATION):

Limit, continuity and partial derivatives - directional derivatives - total derivative - Maxima, minima and saddle points - Method of Lagrange multipliers.

UNIT III : CALCULUS (APPLICATIONS):

Curvature (Cartesian coordinates) - Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

UNIT IV : SEQUENCES AND SERIES:

Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions;

UNIT V : MATRICES:

System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Cayley-Hamilton Theorem - Diagonalization of matrices - Orthogonal transformation- Reduction of Quadratic form to Canonical form.

TEXT BOOKS:

Grewal, B.S., Grewal, J.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi,43rd Edition, 2015.

REFERENCE BOOKS:

1. Kreyszig, E, Advanced Engineering Mathematics, John Wiley and Sons (Asia) Limited, Singapore, 10th Edition, 2001.

2. Ramana B. V., Engineering Mathematics, Tata McGraw-Hill Publishing Company Limited, New Delhi, Edition 2005.
3. Veerarajan,T., Engineering Mathematics (For First Year), Tata McGraw-Hill publishing company Limited, 2008.

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MAT18R103	MULTIPLE INTEGRATION, ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR SPACES	L	T	P	Credit
		3	1	2	5
Pre-requisite : Nil	**Course Category :** Basic science and Mathematics **Course Type** : Theory				

COURSE OBJECTIVE:

To enable the students to understand the concepts of multiple integrations and their application, vector spaces, linear system of equations, rank of matrix, and to solve ordinary differential equations.

COURSE OUTCOMES :

Upon successful completion of this course, students will be able to

CO1. Understand the concepts of double and triple integral and its applications.

CO2. Know about the applications of double and triple integral in vector calculus.

CO3. Know the methods of solving differential equations of first and second orders.

CO4. Find the solution of system of linear equations using matrix methods.

CO5. Understand the concept of vector space and linear independent and dependent of vectors, linear transformations and orthogonalization process.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	Pos												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S	M											S			
CO2	S	S		S	M		L						S			
CO3	S	S		S	M		L						S			
CO4	S	S		S	M		L						S			
CO5	S	S		S	M		L						S			

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UNIT I: MULTIVARIABLE CALCULUS (INTEGRATION):

Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volume; Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds;

UNIT II : INTEGRAL THEOREMS:

Gradient, curl and divergence - Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.

UNIT III : ORDINARY DIFFERENTIAL EQUATIONS:

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type. Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation.

UNIT IV : MATRICES:

Matrices, vectors: Linear systems of equations, linear Independence, rank of a matrix, Cramer's Rule, inverse of a matrix, Gauss elimination method and Gauss-Jordan elimination method.

UNIT V :VECTOR SPACES:

Vector Space, linear dependence of vectors, basis, dimension; Linear transformations (maps), Matrix associated with a linear map; range and kernel of a linear map, rank nullity theorem; Inner product spaces, Gram-Schmidt orthogonalization.

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TEXT BOOKS:

1. Grewal, B.S., Grewal, J.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 43rd Edition, 2015.

2. Dr. S. Arumugam, Modern Algebra, Scitech Publications, August , 2003

REFERENCE BOOKS:

1. Kreyszig, E, Advanced Engineering Mathematics, John Wiley and Sons (Asia) Limited, Singapore , 10th Edition., 2001.
2. Ramana B. V., Engineering Mathematics, Tata McGraw-Hill Publishing Company , New Delhi, Edition 2005.
3. Veerarajan,T., Engineering Mathematics (For First Year), Tata McGraw-Hill publishing company Limited, 2008.

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MAT18R202	PROBABILITY AND STATISTICS	L	T	P	Credit
		3	1	0	4

Pre-requisite : Nil	Course Category : Basic science and Mathematics Course Type : Theory

COURSE OBJECTIVE:

To enable the students to acquire skills to handle bivariate distributions and to solve real world problems using statistical methods.

COURSE OUTCOMES :

Upon successful completion of this course, students will be able to

CO1. Understand the concepts of probability, random variable, distribution function and expectation.

CO2. Learn standard distributions and its applications.

CO3. Evaluate the moments, skewness and kurtosis for standard distributions and to know about the correlation and regression.

CO4. Solve the physical world problems using small and large sample theory.

CO5. Solve real world problems using analysis of variance

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S	M											S			
CO2	S	S		S	M		L						S			
CO3	S	S		S	M		L						S			
CO4	S	S		S	M		L						S			
CO5	S	S		S	M		L						S			

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UNIT I : BASIC PROBABILITY AND RANDOM VARIABLES:

Axiomatic definition of Probability - Conditional probability – Independent events - To
probability – Bayes theorem - Random variables – Discrete random variable - Probabil
mass function – Continuous random variable - Probability density functions – Cumulat
distribution function-Properties- Expectation.

UNIT II: STANDARD DISTRIBUTIONS AND BIVARIATE DISTRIBUTIONS:

Binomial, Poisson, Uniform, Exponential and Normal distributions and their properties.
Two dimensional random variables – Joint probability density function – Cumulative
distribution function – Marginal density function

UNIT I II: STATISTICS:

Measures of Central tendency: Moments, skewness and Kurtosis - evaluation of
statistical parameters for Binomial, Poisson and Normal distributions, Correlation and
regression – Rank correlation- Curve fitting by the method of least squares- fitting of
straight lines, second degree parabolas and more general curves.

UNIT IV : APPLIED STATISTICS:

Test of significance: Large sample test for single proportion, difference of proportions,
single mean, difference of means, and difference of standard deviations. Small samples:
Test for single mean, difference of means- Chi-square test for goodness of fit and
independence of attributes.

UNIT V: DESIGN OF EXPERIMENTS:

Analysis of variance – One way classification –Completely Randomised Design(C R D)–
Two-way classification –Randomised Block Design(R.B.D)– Latin Square Design(L S D).

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TEXT BOOKS:

T. Veerarajan, Probability, Statistics and Random process, Fourth edition,
Tata McGraw-Hill Education (India) Pvt. Ltd., 2016.

REFERENCE BOOKS:

4. Flynn M., Probability, Random variables and random processes, Harper & R
   Publishers, New York, 1982.
5. Gupta, S.C, and Kapur, J.N., Fundamentals of Mathematical Statistics, Sultan Cha
   New Delhi, 11th Edition., 2006.

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BIT18R101	BIOLOGY FOR ENGINEERS	L	T	P	Credit
		3	0	0	3
Pre-requisite : Nil	Course Category : Basic science and Mathematics Course Type : Theory				

COURSE OUTCOMES :

CO1: Describe the fundamentals of cell structure and cell cycle
CO2: Understand the classification and functions of biomolecules
CO3: Elaborate the basic cellular mechanisms such as replication, transcription and translation
CO4: Describe the underlying concepts of infection and immunity.
CO5: Explain various applications of biology

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	Pos												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S	M											S			
CO2	S	S		S	M		L						S			
CO3	S	S		S	M		L						S			
CO4	S	S		S	M		L						S			
CO5	S	S		S	M		L						S			

UNIT I: INTRODUCTION
Fundamental difference between science and engineering- comparison between eye and camera, Bird flying and aircraft; major discoveries in biology- ; Classification based on: Cellularity- Unicellular and Multicellular; Ultra structure - prokaryotes and eukaryotes; three major kingdoms of life; Cell structure, intracellular organelles and their functions, comparison of plant and animal cells- Overview of Cell cycle and cell division

UNIT II: BIOMOLECULES
Chemistry of biomolecules: Carbohydrates, Lipids, Proteins; classification of amino acids; classification of proteins based on structure and functions; Nucleic acids -types, structure and function of DNA and RNA

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UNIT III: GENES TO PROTEINS

Gene, Genome and chromosome; Central dogma of molecular biology; Classical experiments of DNA: Griffith and, Avery, McCarty and MacLeod, Meselson and Stahl - DNA replication, Transcription and Translation

UNIT IV: MICROBIOLOGY

Microscopy; Microbes as infectious agents - malaria, tuberculosis, typhoid, polio, dengue, AIDS;; cultivation of bacteria. Immunity - innate and acquired immunity - organs and cells of the immune system - classification of antibodies - types of T cells - transplantation, autoimmunity overview

UNIT V: APPLICATIONS OF BIOLOGY

Healthcare-antibiotics, vaccines, monoclonal antibodies, insulin and interferons; Beneficial bacteria - probiotic bacteria, nitrogen fixing bacteria, fermentation and fermented foods and products Environmental - waste water treatment, bioremediation; Biomaterials and biopolymers for medical and environmental applications; Biosensors;

TEXT BOOKS:

1. De Robertis, E.D.P. and De Robertis, E.M.F. - Cell and Molecular Biology- Lippincott Williams & Wilkins- Philadelphia- USA- 8th Edition- 2010.
2. Voet, D., Voet, G., - Biochemistry - John Wiley and Sons, Singapore - 3rd Edition- 2001.
3. Pelczar MJ, Chan ECS and Krieg NR - Microbiology - Tata McGraw Hill, India- 7th Edition- 2010

REFERENCES:

1. Friefelder. D. -Molecular Biology- McGraw-Hill Companies- New York, USA- 5th Edition- 2013.

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HUMANITIES ELECTIVES

HSS18R001	MANAGEMENT CONCEPTS AND TECHNIQUES	L	T	P	Credit
		3	0	0	3
Pre-requisite : NIL	Course Category : Humanities Elective Course Type : Theory				

COURSE OBJECTIVES :

1. To introduce students about the definition of management, its characteristics, evolution and importance as well as the functions performed by managers-planning, organizing, directing and controlling in order to achieve the organizational goals.
2. To illustrate students about the applications of management functions in various enterprises in the field of marketing, finance, personnel, production, etc.

COURSE OUTCOMES :

CO1 : Understand the historical backdrop and fundamentals of management thoughts vital for understanding the conceptual frame work of Management as a discipline.
CO2 : Apply various concepts of planning, decision making and controlling to help solving managerial problems
CO3 : Understand the concepts of Ethics, Delegation, Coordination and Team work
CO4 : Understand the management concepts and styles in Global context
CO5 : Understands about emerging concepts in management thought and philosophy

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1							L				M			M	L	L
CO2		M				S	S	S		M				M	L	L
CO3								S		L	S			M	L	L
CO4						M		L	L	L		S		M	L	L
CO5											S			M	L	L

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UNIT I   DEVELOPMENT OF MANAGEMENT THOUGHTS

Scientific Management Movement - Administrative Movement - Human Relations Movement -Decision Movement - Behavioral Science Movement - Systems Movement - Contingency Movement.

UNIT II   ESSENTIALS OF PLANNING

Planning Objectives – Goals - Programmed Decisions and Unprogrammed Decisions; Decision – Making - Creativity in Decision - Making, Forecasting and Strategy to Formulation.

UNIT III   EFFECTIVE ORGANIZING

Span of Control – Departmentation - Authority; Responsibility - Bureaucracy and Adhocracy; Group Dynamics.

UNIT IV   STAFFING AND DIRECTING

Staffing: Manpower Planning – Recruitment Sources – Selection Procedure – Training Methods – Performance Evaluation Methods – Executive Development Programs - Directing: Communication Process and Barriers – Motivation Techniques – Financial and Non – Financial Motivation- Leadership Qualities and Styles.

UNIT V   CONTROLLING AND RECENT CONCEPTS

Controlling: Meaning and Process - Requisites of Effective Control - Control Techniques. Emerging Issues in Management: Japanese and American Management – Management by Objectives – Knowledge Management – Technology Management – Business Process Outsourcing- Social Responsibility and Business Ethics.

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TEXT BOOKS:

1. Harold Koontz & Heinz Weihrich, Essentials of Management: An International, Innovation and Leadership Perspective, 10th Edition, McGraw Hill Education (India) Private Ltd. New Delhi, 2016.
2. Stephen P. Robbins, Mary A. Coulter, Management, 13th Edition, Pearson Education Limited, New Delhi, 2016

REFERENCE BOOKS:

1. C.B.Gupta, Management Theory and Practice, 19th Revised Edition, Sultan Chand & Sons, New Delhi.2017.
2. L.M.Prasad, Principles and Practices of Management, 9th Edition, Sultan Chand and Sons Private Limited, 2015.
3. K.Aswathappa, Essentials of Business Environment: Text Cases and Exercises 12th, edition, Himalaya Publishing House, Mumbai, 2014.
4. Tripathi & Reddy, Principles of Management, 5th Edition, Tata McGraw Hill publishing company Ltd, New Delhi, 2012.

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HSS18R002	MARKETING MANAGEMENT	L	T	P	Credit
		3	0	0	3
Pre-requisite : NIL	**Course Category :** Humanities Elective **Course Type** : Theory				

COURSE OBJECTIVES :

1. To develop students understanding the gap between how organizations match the requirements of consumers in competitive environments, and develop strategies to create the competitive edge.
2. To familiarize students with analysis, planning, implementation, and control, as well as the marketing mix, exportation, and the social aspects of marketing.

COURSE OUTCOMES :

CO1 : Understand marketing concepts, philosophies and historical background.
CO2 : Understand of marketing operations and complexities for students to apply in practical business situations.
CO3 : Understand concepts related to segmentation, targeting and positioning, product attributes, and pricing strategies prevalent in domestic and international scenario.
CO4 : Apply various tools and techniques of promoting the products in ethical manner.
CO5 : Understand emerging concepts of marketing in the emerging global markets

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1						S	S		L	M	M	L		M	L	L
CO2						S			M	S				M	L	L
CO3						L	S	S	L	S	M	L		M	L	L
CO4						S	S		L	M	M	L		M	L	L
CO5						S				S				M	L	L

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UNIT I   MARKETING

Meaning - concept - functions - marketing Planning & implementation marketing Programmes - Marketing environment – Market Segmentation and consumer behaviour – Influencing factors, Decision process –Marketing mix – Marketing department.

UNIT II   PRODUCT

Meaning - Product planning - policies - positioning - New product development Product life cycle – BCG Matrix - branding. Packing, labeling.

UNIT III   PRICING

Pricing objectives – Setting and modifying the price – Different pricing method Product line pricing and new product pricing.

UNIT IV   DISTRIBUTION

Nature of Marketing channels - Types of Channel flows – Channel functions - Channel co-operation, conflict and competition - Direct Marketing Telemarketing, Internet shopping.

UNIT V   PROMOTION

Promotion Mix - Advertisement - Message - copy writing – Advertisement - budgeting - Measuring advertisement effectiveness - Media strategy - sales promotion - Personal selling steps, publicity and direct marketing.

TEXT BOOKS:

1. Philip.T.Khotler, Kevin Lane Keller, Marketing Management, 15th Edition, Pearson Education, New Delhi, 2016.
2. Ramaswamy.VS & Namakumari. S, Marketing Management – Global Perspective, Indian Context, McGraw Hill Education (India) Private Limited, New Delhi, 2013.

REFERENCE BOOKS:

1. Rajan Saxena, Dorector, Jain S.P., Marketing Management, 1st edition, Tata McGraw Hill, New Delhi, 2006.
2. K.S.Chandrasekar, Marketing Management, Text & Cases, 1st edition, Tata McGraw hill Education Pvt. Ltd. 2013.
3. Tapan K.Panda, Marketing Management Text and Cases, 2nd Edition, Excel Books.2008.

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HSS18R003	ORGANIZATIONAL PSYCHOLOGY	L	T	P	Credit
		3	0	0	3
Pre-requisite : NIL	**Course Category :** Humanities Elective				
	Course Type : Theory				

COURSE OBJECTIVES :

1. To clarify the principles and basic concepts of organizational psychology based on efficiency and quality of employee life. It also aims at enhancing the quality of life of employees.
2. To make students to understand organization's aspects in terms of psychological assessment, personnel decisions in line with training and development, organizational change and organizational health in specific the intrinsic problems

COURSE OUTCOMES :

CO1 : Apply basic concepts of industrial and organizational psychology
CO2 : Illustrate different ways of achieving organizational effectiveness through individual behavior.
CO3 : Examine the concepts relating to individual behavior to achieve group target and achieve leadership position in organization.
CO4 : Understand the organizational changes and means to evaluate based on nature of organizations.
CO5 : Analyze implications of changes aligning the interest of individual, group and organization as a whole.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1						M		S		S		M		M	L	M
CO2						L	S		M		L			M	L	M
CO3						M		L						M	L	M
CO4						M		S		M				M	L	M
CO5						L	S		S		L	M		M	L	M

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UNIT I   FOCUS AND PURPOSE
Organizational Behaviour - Need and importance, nature and scope, framework.

UNIT II   INDIVIDUAL BEHAVIOUR

Personality – types – factors influencing personality – theories – learning – types of learners – learning theories – organizational Behaviour modification. Attitudes – characteristics –components – formation – measurement. Perceptions – importance – factors influencing perception – interpersonal perception.

UNIT III   GROUP BEHAVIOUR

Organization structure – formation – groups in organizations – influence – group dynamics – emergence of informal leaders and working norms – group decision making techniques – interpersonal relations –communication process and Group Communication.

UNIT IV   LEADERSHIP

Leadership styles – theories – Qualities - leaders Vs managers – sources of power – power centers – power and Organisational Politics- Motivation.

UNIT V   ORGANISATIONAL DEVELOPMENT

Organizational development - Importance, characteristics, objectives, stability Vs change, proactive vs reaction change , the change process, resistance to change, managing change, team building - Organizational effectiveness, perspective, effectiveness Vs efficiency, approaches, the time dimension, achieving organizational effectiveness

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TEXT BOOKS:

1. Stephen P.Robins and Timothy A . Judge, Organisational Behavior, Peason Education, 17th edition, 2017.

2. Fred Luthans, Organisational Behavior, McGraw Education, 12th Edition, 2010.

REFERENCE BOOKS:

1. Aswathappa, Organisational Behavior, Himalaya Publishing House, 12th edition, 2016.
2. P.Subba Rao, Management and Organisational behavior: Text, Cases and Games, Himalaya Publishing House, 1st edition, 2010.
3. Mullins, Organisational Behavior, Pearson Education Limited, 9th edition, 2010.
4. L.M.Prasad, Organisational Behaviour, 5th edition, Sultan Chand and Sons, New Delhi, 2014.

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HSS18R004	PROJECT MANAGEMENT	L	T	P	Credit
		3	0	0	3
Pre-requisite : NIL	**Course Category :** Humanities Elective				
	Course Type : Theory				

COURSE OBJECTIVES :

1. To describe concepts relating to project management and enable students to evolve project objectives appropriately with relevance to business proposals.
2. To make students to understand about evaluation of project by testing the technical feasibility, financial viability, market acceptability and social desirability of projects.
3. To give an account on risk and profitability analysis that facilitates the making of the effective project proposal and guides learners in project planning, implementation and control and also emancipates the scope of project management in undertaking foreign collaboration projects

COURSE OUTCOMES :

CO1 : Understand and have clarity about the concept of project and steps in project management.

CO2 : Prepare business proposals.

CO3 : Evaluate the technical feasibility, financial viability, market acceptability and social desirability of projects.

CO4 : Analyze the Risk and profitability of the project proposals

CO5 : Empathize oneself as a project manager and also as part of project teams and enable effective decision making.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1							M				S			M	L	M
CO2						L		S	S	L		S		M	L	M
CO3											M			M	L	M
CO4						M		L				M		M	L	M
CO5										M	S	L		M	L	M

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UNIT I   INTRODUCTION TO PROJECT MANAGEMENT

Projects - Project ideas and preliminary screening. Developments - Project planning to Project completion - Pre-investment phase, Investment phase, operational phase - Governmental Regulatory framework. Capital Budgeting .

UNIT II   STAGES OF PROJECT MANAGEMENT

Opportunity studies - prefeasibility studies, functional studies or support studies, feasibility study expansion projects, data for feasibility study. Market and Technical Appraisal : Market and Demand analysis, Market Survey, Demand forecasting. Technical analysis- Materials and inputs, Choice of Technology, Product mix, Plant location, capacity, Machinery and equipment.

UNIT III   APPRAISAL PROCESS

Concepts. Time value of money - Present and future value. Appraisal criteria - Urgency, Payback period, Rate of return, Debt service coverage ratio, Net present value, Benefit cost ratio, Internal rate of return, Annual capital charge, Investment appraisal in practice.

UNIT IV   RISK AND PROFITABILITY ANALYSIS

Risk analysis- Measures of risk, Sensitivity analysis, and Decision tree analysis. Means of financing, Term Loans, Financial Institutions. Cost of capital. Profitability - Cost of Production, Break-even analysis. Assessing the tax burden and financial projections.

UNIT V PROJECT PLANNING, IMPLEMENTATION, AND CONTROL

Forms of Project Organization, Project Planning, Implementation, and Control - Network construction, CPM, PERT, Development of Project schedule, Crashing of Project Network. Introduction to Foreign collaboration projects - Governmental policy framework, Need for foreign technology, Royalty payments, Foreign investments and procedural aspects.

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TEXT BOOKS:

1. Prasanna Chandra, Projects: Planning, Analysis, Selection, Financing, Implementation, 8th Edition, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2014.
2. M.R. Gopalan, Project Management Core Textbook,(Paper Back) 2nd edition, Wiley India, 2015

REFERENCE BOOKS:

1. Harold Kerzne, Project Management - Best Practices: Achieving Global Excellence, 3edition, Wiley Publications, 2013
2. George Ritz, Sidney Levy, Project Management in Construction, Sixth Edition, Mc. Graw Hill Education, 2011.
3. Gary Heerkens, Project Management, Second Edition, Mc. Graw Hill Education, 2013
4. P.Gopalakrishnan and V.E.Rama Moorthy Text Book of Project Management,1st Edition, Macmillan India Ltd., New Delhi, 2014.
5. John M. Nicholas, Herman Steyn, Project Management for Engineering, Business and Technology, 5th Edition, Routledge, 2016.

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HSS18R005	STRESS MANAGEMENT AND COPING STRATEGIES	L	T	P	Credit
		3	0	0	3
Pre-requisite : NIL	**Course Category :** Humanities Elective				
	Course Type : Theory				

COURSE OBJECTIVES :

1. To make students to approach stress and its effect in the right manner and to develop the skills required to understand and to overcome the same.
2. To make them to be aware of the intricacies of stress and overcoming it through appropriate approaches.

COURSE OUTCOMES :

CO1 : Understand the responsibility of tackling stress
CO2 : Identify and modify the approaches of stress accordingly while dealing with team in workplace.
CO3 : Analyze to tackle stress appropriately without ignoring who are prone to face high- pressure working conditions.
CO4 : Implement a stress-free work environment.
CO5 : Understand the way of behavior and personality as a whole and ensure professional working condition and balanced quality of life.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1								M		M				M	L	M
CO2						S			M					M	L	M
CO3							L	S		L				M	L	M
CO4								S		S		S		M	L	M
CO5						L		M	L	L	L	S		M	L	M

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UNIT I UNDERSTANDING STRESS

Meaning - Symptoms: Biological and Behavioural - Work Related Stress - Individual Stress – Reducing Stress – Burnout.

UNIT II COMMON STRESS FACTORS TIME

Common Sources of Stress Biological, Personality and Environmental – Time Management – Techniques – Importance of planning the day – Time management schedule – Developing concentration – Organizing the Work Area - Prioritizing – Beginning at the start – Techniques for conquering procrastination – Sensible delegation – Taking the right breaks – Learning to say 'No'.

UNIT III   CRISIS MANAGEMENT

 Implications – People issues – Structure issues, environmental issues, psychological fall outs – Learning to keep calm – Preventing interruptions – Controlling crisis – Importance of good communication – Taking advantage of crisis – Pushing new ideas – Empowerment

UNIT IV WORK PLACE HUMOUR

 Developing a sense of Humour – Learning to laugh, role of group cohesion and team spirit, using humour at work, reducing conflicts with humour. Coping Styles Defensive Behaviours and Problem-Solving.

 UNIT V SELF DEVELOPMENT

 Improving Personality – Leading with Integrity, enhancing creativity – Effective Decision Making – Sensible Communication – The Listening Game – Managing Self - Meditation for Peace – Yoga for Life.

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TEXT BOOKS:

1. D. Girdano and G. Everly., "Controlling Stress and Tension", 9 th Edition, Prentice-Hall, 2013.
2. Greenberg Jerrold S., Comprehensive Stress Management, 14th Edition, McGraw Hill Education, 2017.

REFERENCE BOOKS:

1. Dr. P.K.Dutta, "Stress Management" Himalaya Publishing House, First Edition 2010.
2. Schafer, Stress Management, 4th Edition, Cengage Learning, Delhi, 2008
3. Wolfgang Linden, Stress Management, Sage Publication, 1st Edition 2005.
4. Daniel Girdano, Dorothy Dusek and George S. Everly, Controlling Stress and Tension, 8th Edition, Pearson Education, 2009.
5. Brian Luke Seaward, Essentials of managing Stress, 1st edition, Jones & Bartlett Publishers, 2013.

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HSS18R006	ECONOMICS FOR ENGINEERS	L	T	P	Credit
		3	0	0	3
Pre-requisite : NIL		Course Category : Humanities Elective			
		Course Type : Theory			

COURSE OBJECTIVES :

1. To introduce students to a broad range of economic concepts, theories and analytical techniques by considering both microeconomics and macroeconomics.
2. To analyze demand and market structure at the firm level by understanding government policies and market failures in various levels using case studies.

COURSE OUTCOMES :

CO1 : Identify and learn economic concepts into market economies.

CO2 : Understand the pricing methods; interpret the market factors to determine the price for products or services and to making decisions based on demand factors.

CO3 : Understand the major characteristics of different market structures and the implications for the behavior of the firm.

CO4 : Measure living standards, inflation, and unemployment for use as economic indicators.

CO5 : Understand the role of international trade; analyze the determinants of the relative strengths of monetary policy for sustainable growth of our nation and International Trade.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1						S		M		M		M		M	L	M
CO2							L	M			S	M		M	L	M
CO3						S			M			L		M	L	M
CO4							L	M			L	M		M	L	M
CO5						L		M		M		M		M	L	M

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UNIT I   DEFINITION AND SCOPE OF ECONOMICS

Definitions by A. Smith, A. Marshal and L. Robbins, P.Samuels on and their critical examination - Nature and scope of Economics - Micro-economics in relation to other branches of Economics.

UNIT II PRICING AND LAW OF DEMAND

Demand, Factors influencing demand, Elasticity of demand - price, income and cross, concepts and measurement - Break Even Analysis – Law of Demand - Price, income and substitution effects - Giffen goods- Pricing Methods.

UNIT III MARKET STRUCTURE

Definition of market. Concepts of product and factor markets. Different types of market: perfect competition, monopoly, imperfect competition, monopolistic, competition and oligopoly. Demand and Supply schedules. Price determination under perfect competition in long and short run. Price determination under monopoly. Discriminating monopoly.

UNIT IV MACRO-ECONOMICS

Meaning, Macro-economic Policy and Its Objectives and Instruments - National Income and Social Accounting - Concepts, components, and measurement - Basic circular flow of income model, Unemployment, trade cycle, Inflation - causes, types, effects and control.

UNIT V COMMERCIAL AND CENTRAL BANKS

Credit creation, monetary policy and tools - Balance of payments - Items in the balance of payments account, equilibrium in the balance of payments.

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TEXT BOOKS:

1. Gupta, S.B., Monetary Economics, S. Chand & Co., New Delhi, 2nd Edition, 2009.
2. Ruddar Datt and K.P.M.Sundharam, Indian Economy, 70th Edition, S.Chand & Company Ltd., New Delhi, 2013.

REFERENCE BOOKS:

1. D.N.Dewedi, Managerial Economics, 8th Edition, S.Chand & Company Ltd., New Delhi, 2005.
2. Gupta, G.S. Macroeconomics, Theory and Applications, 2nd edition, Tata McGraw-Hill publishing company Ltd., New Delhi, 2004.
3. Macroeconomic –Theory and policy, 3rd Edition, Tata McGraw-Hill publishing company Ltd., New Delhi, 2010.
4. Micro Economics, Mas Colell, 1st edition, Oxford Press, Delhi, 2012.

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HSS18R007	HUMAN RESOURCE MANAGEMENT AND LABOUR LAW	L	T	P	Credit
		3	0	0	3

Pre-requisite : NIL	Course Category : Humanities Elective
	Course Type : Theory

COURSE OBJECTIVES :

1. To explore key issues related to the management, performance, and development of human resources in the workplace.
2. To emphasis on making decisions and developing plans that will enable managers to make the best possible use of their human resources,
3. To gain knowledge about manpower planning, analysis and evaluation, recruitment and selection, wages and salaries, training and management development, performance appraisal, and industrial relations.

COURSE OUTCOMES :

CO1 : Develop skills for employment relations and knowledge to resolve the issues.
CO2 : Design an appropriate and suitable role of HR specialist for implementing Human Resource Management policies.
CO3 : Manage the manpower to motivate and attract them to retain in the organization.
CO4 : Develop the skills necessary to hold responsibility of employer and legal system to manage the employment relations
CO5 : Understand the applicability of business law on various functional domains this in turn enhancing a strong human relation.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1						S	L		L	L	L			M	L	M
CO2							L	M	S	S	L			M	L	M
CO3							S					M		M	L	M
CO4						L			M	L	M			M	L	M
CO5									S	M		L		M	L	M

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UNIT I   FUNDAMENTALS OF HRM

Human Resource Development Systems-HR environment in India-Functions and Operations of a Personnel Office - Emerging HR Trends - HR information system

UNIT II HRM FUNCTIONS

Job analysis and job design - HR planning – Recruitment - selection and induction- Staff Training and Development-Career planning and Development- Job Evaluation-Performance Appraisal and Potential Evaluation-Wage determination; salary structure-Wage policies and Regulations-Employee benefits and services

UNIT III MOTIVATING HUMAN RESOURCES

Team and Team work - Collective Bargaining Employee Morale – Participative Management – Quality Circle – Empowerment –counseling and mentoring.

UNIT IV MAINTENANCE OF WORKERS

Compensation Management- Reward system – Labour relations –Employee Welfare, Safety and Health – Employee benefits and services – Promotion , Transfers and separation – Ethical issues in HR Management and International Human Resource Management - Legal Aspect of Labour

UNIT V   BUSINESS LAW

Factories Act, 1948 - Industrial Dispute Act, 1947 – Industrial employment – Standing Orders Act, 1946 – Trade Union Act, 1926 - Workmen Compensation Act, 1923, Employees State Insurance Act, 1948, Employees Provident Fund and Miscellaneous Provision Act, 1952, Payment of Gratuity Act, 1972. Payment of Wages Act 1936, Minimum wages Act, 1948– Payment of Bonus Act, 1965.Tamil Nadu Shops and Establishments Act.

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TEXT BOOKS:

1. Decenzo and Robbins, Human Resource Management, Wilsey, 12th edition, 2015.
2. Prasad L.M., Human Resource Management, 3rd edition, Sultan Chand, New Delhi, 2014.

REFERENCE BOOKS:

1. Biswajeet Pattanayak, Human Resource Management, 3rd edition, Eastern Economy Edition, New Delhi, 2010.
2. C.B. Gupta, Human Resource Management, 13th Edition, Sultan Chand, New Delhi 2011.
3. V.S.P. Rao, Human Resource Management, 3rd edition, Excel Books, New Delhi, 2010.
4. Frank B. Cross and Roger LeRoy Miller, The Legal Environment of Business Text and cases, 9th Edition, Cengage Learning, 2015.

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HSS18R008	ENTREPRENEURSHIP DEVELOPMENT	L	T	P	Credit
		3	0	0	3

Pre-requisite : NIL	Course Category : Humanities Elective
	Course Type : Theory

COURSE OBJECTIVES :

1. To focus on the entrepreneurial process and the different kinds of entrepreneurial outcomes by making students to understand about opportunity identification through analysis of industry niches, skills needed in order to turn an opportunity into reality, business plans, launch decisions, and obtaining risk capital.
2. To deal with the problems and challenges facing the management of businesses in raising funds, marketing products and services, improving effectiveness and flexibility, and achieving growth.

COURSE OUTCOMES :

CO1 : Understand the concept of entrepreneurship and which in turn leads to think creatively for new business opportunities to sustain individual as well as social goals.

CO2 : Realize entrepreneurial spirit and provide a framework of successful business world with relation to agencies to promote employment opportunities.

CO3 : Understand women entrepreneurship and promote a successful business models and explains operational implementations for investment details.

CO4 : Understand the role of government in promoting the entrepreneurship among the individuals and organizations as a whole

CO5 : Understand emerging concepts of marketing in the emerging global markets and provide more insights into project management and venture promotion

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1						S		S		S		S		M	L	S
CO2						M	L	S		L	M	L		M	L	S
CO3						L	L	M	S	L		S		M	L	S
CO4						M		M			M	S		M	L	S
CO5										L				M	L	S

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UNIT I INTRODUCTION

Concepts of entrepreneur, entrepreneurship and entrepreneur - Characteristics and competencies of a successful entrepreneur - General functions of an entrepreneur - Type of entrepreneurs - Role of entrepreneur in economic development - Distinction between an entrepreneur and a manager - Entrepreneur and Intrepreneur.

UNIT II GROWTH OF ENTREPRENEURSHIP

Emergence of entrepreneurship - Economic and non economic factors for stimulating entrepreneurship development - Obstacles to entrepreneurship development in India - Growth of entrepreneurship in India.

UNIT III   WOMEN AND ENTREPRENEURSHIP

Concept of women entrepreneurship - Reasons for growth of woman entrepreneurship - Problems faced by them and remedial measures.

UNIT IV ROLE OF THE GOVERNMENT IN ENTREPRENEURSHIP DEVELOPMENT

Concept and meaning of entrepreneurship development - Need for entrepreneurship development programmes (EDPs) - Objectives of EDPs - Organizations for EDPs in India; NIESBUD, SISI – their roles and activities.

UNIT V   VENTURE PROMOTION AND PROJECT FORMULATION

Concept of projects classification of projects and project report - Project identification and selection - Constraints in project identification - Techniques of Project Identification, Significance – contents - formulation of project report - Need for Project Formulation - Elements of project Formulation

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TEXT BOOKS:

1. Michael H Morris, Corporate Entrepreneurship and Innovation in Corporations, 7th Edition, CENGAGE Learning, Delhi, 2010
2. Jerry Katz, Entrepreneurship Small Business, 5th edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2007.

REFERENCE BOOK:

1. Khanka S.S., Entrepreneurial Development, 1st edition, S.Chand and Company Limited, New Delhi, 2013.
2. Prasama Chandra, Projects: Planning, Analysis, Selection, Implementation and Reviews, 2nd edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 1996.
3. Robert D. Hisrich, Entrepreneurship, 10th edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2017.

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HSS18R009	COST ANALYSIS AND CONTROL	L	T	P	Credit
		3	0	0	3
Pre-requisite : NIL		ourse Category : Humanities Elective			
		Course Type : Theory			

COURSE OBJECTIVES :

1. To exhibit the concepts on costing by describing its elements, types and cost sheet preparation.
2. To encompasses the analytical framework that can be applied in cost analysis like Marginal costing, CVP analysis, Break even analysis, etc enabling the students to make decisions on cost parameters.
3. To enable students to apply techniques like standard costing, activity based costing, etc to manage and control cost effectively.

COURSE OUTCOMES :

CO1 : Understand the basics of Costing and preparation of Cost sheet.
CO2 : Analyze the cost by applying tools like marginal costing, CVP analysis and other applications.
CO3 : Evolve budgets for controlling cost in manufacturing or production centers.
CO4 : Define cost standards and critically examining the application of standard costing in a production Centre.
CO5 : Understand the application of various strategic cost alternatives including Activity based costing.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1						M		S			L	S	M	M		M
CO2							M		S			L	M	M		M
CO3						L				S		M	M	M		M
CO4						M		S			L	S	M	M		M
CO5							M		S			L	M	M		M

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UNIT I   INTRODUCTION TO COSTING

Costing, Elements of costing, Types of cost, Preparation of cost sheet.

UNIT II   COST ANALYSIS

Marginal costing, Cost - volume – Profit analysis, Break-Even- Analysis, Break –Even - Chart, Applications.

UNIT III   CONTROL TECHNIQUES

Budgeting and Budgetary control, Types of Budgets , Preparation of purchase Budget, Flexible budgets, Cash Budget, Sales Budget, Materials Budget, Master Budget, Zero based Budgeting.

UNIT IV   STANDARD COSTING

Types of Standards, Setting up of standards, Advantages and Criticism of Standard Costing –Control through variances.

UNIT V   ACTIVITY BASED COSTING

Transfer Pricing, Target costing, Life Style Costing, Activity Based Costing (only theory).

TEXT BOOKS:

1. K.Saxena & C.D. Vashist, Advanced Cost Accounting and Cost Systems, 2nd Edition, V.Sultan Chand & Sons Publishers. 2014
2. S.P. Jain & K. L. Narang, Advances Cost Accounting Kalyani Publishers, 1st Edition, 2017.

REFERENCE BOOKS:

1. J. Blocher, K. H. Chen, G. Cokins and T. W. Lin., Cost Management: A Strategic Emphasis, Irwin/McGraw-Hill, 3d edition, 2008
2. Don R. Hansen, Maryanne M. Mowen, Cornerstones of Cost Management, 6th Edition,Cengage Learning, 2015
3. Roger Hussey, Audra Ong, Strategic Cost Analysis, Business Expert Press, 2012

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HSS18R010	PRODUCT DESIGN AND DEVELOPMENT	L	T	P	Credit
		3	0	0	3
Pre-requisite : NIL		Course Category : Humanities Elective			
		Course Type : Theory			

COURSE OBJECTIVES :

1. To understand the principles and basic concepts of product design and development.
2. To study about product's mechanical architecture, selection of materials and production processes and engineering the various components necessary to make the product work.
3. To make students to identify market opportunity, creation of product to appeal to the identified market, and finally, testing, modifying and optimizing the product until it is ready for production.

COURSE OUTCOMES :

CO1 : Understand about the basic concepts related to design and development of New product

CO2 : Understand the structured approach towards incorporating quality, safety, and reliability into design.

CO3 : Analyze concepts relating to simulating product performance and manufacturing processes.

CO4 : Discover the technologies related to computer aided group technology

CO5 : Correlate implications of changes related to Economic analysis.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1						S	M	L	M		M	L		M	L	S
CO2						S	S		S	M		M		M	L	S
CO3						S	M					S		M	L	S
CO4							M					M		M	L	S
CO5							M	S		L		M		M	L	S

UNIT I   NEW PRODUCT IDEA

Definition – Design by Evolution and by Innovation - factors to be considered for product design – Production-Consumption cycle – The morphology of design – Primary design Phases and flowcharting. Role of Allowance, Process Capability, and Tolerance in

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Detailed Design and Assembly Product strategies, Market research – identifying customer needs – Analysis of product – locating ideas for new products, Selecting the right product, creative thinking, curiosity, imagination and brain storming - product specification.

UNIT II   NEW PRODUCT DESIGNING

Task - Structured approaches – clarification – search – external and internal – systematic exploration – conception, selection - methodology benefits. The value of appearance - principles and laws of appearance – incorporating quality, safety, and reliability into design. Man-machine considerations – Designing for ease of maintenance.

UNIT III   ROLE OF TECHNOLOGY IN DESIGNING

Integrating CAE, CAD, CAM tools – Simulating product performance and manufacturing process – Needs for industrial design-impact – Industrial design process – Technology driven products - user driven products – assessing the quality of the product.

UNIT IV   METHODS AND PRINCIPLES OF DESIGNING

Methodologies and tools - Design axioms - Design for assembly and evaluation - Minimum part assessment - Taguchi Method - Robustness assessment - Manufacturing process rules - Designer's tool kit - Computer aided group process rules - Designer's tool kit - Computer aided group technology - Failure Mode Effective Analysis – Design for minimum number of parts – Development of modular design – Minimising part variations – Design of parts to be multifunctional, multi-use, ease of fabrication – Poka Yoka principles. (12 hours)

UNIT V   FEASIBILITY ANALYSIS   Estimation
of manufacturing cost – cost procedures – Value Engineering - reducing the component cost and assembly cost – minimizing the system complexity – Basics and Principals of prototyping – Economic Analysis: Break even analysis. Classes of exclusive rights – Patents – Combination versus aggregation – Novelty and Utility – Design patents – Paten disclosure – Patent application steps - Patent Office prosecution - Sales of paten rights - Trade marks – copy rights. (12 hours)

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TEXT BOOKS:

1. Karl.T.Ulrich, Steven D.Eppinger, Product Design and Development, McGraw Hill International, 6th Edition, 2016.
2. A.K.Chitale and R.C.Gupta, Product Design and Manufacturing, 3rd edition, Prentice Hall of India Private Limited, New Delhi, 2005.

REFERENCE BOOKS:

1. Richard Crowson, Product Design and Factory Development, 2nd Edition, crc Press, 2005.
2. Thomke, Stefan, and Ashok Nimgade. "IDEO Product Development." Boston, MA: Harvard Business School Case 9-600-143, June 22, 2000.
3. George E.Dieter, Linda C.Schmidt, "Engineering Design", McGraw-Hill Higher Education, 4th Edition, 2012.
4. Kevin Otto, Kristin Wood, "Product Design", Indian Reprint 2004, Pearson Education

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HSS18R011	BUSINESS PROCESS REENGINEERING	L	T	P	Credit
		3	0	0	3
Pre-requisite : NIL		**Course Category :** Humanities Elective			
		Course Type : Theory			

COURSE OBJECTIVES :

1. To clarify the principles and basic concepts of Business Process Engineering by focusing on both quantitative and qualitative analytical skills and models essential to operations process design, management, and improvement in both service and manufacturing oriented companies.
2. To prepare the students to play a significant role in the management of a world class company which serves satisfied customers through empowered employees, leading to increased revenues and decreased costs.

COURSE OUTCOMES :

CO1 : Explain the basic concepts related to Business Process Reengineering.
CO2 : Apply the methodologies and tools used for Business Process Reengineering.
CO3 : Analyze the concepts relating to benefit/cost analysis and its impact on the business organizations.
CO4 : Understand the need for assessment of business re-engineering and the factors contributing to its success.
CO5 : Identify the best practices used in Business Process Reengineering with illustrations from corporate world.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1						S	M		L	M	L	M		M	L	S
CO2						L		L	M	M	S	S		M	L	S
CO3							S	L	L	L				M	L	S
CO4						S	L			M				M	L	S
CO5						S	M	L	M	M	M	L		M	L	S

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UNIT I   BASIC CONCEPTS

Introduction to BPR Definition; the paradigm shifts in production; the positioning concept; the re-engineering visions; the benefits of business re-engineering.

UNIT II   METHODOLOGIES FOR BPR

Methodologies and Tools for BPR, Process management; dynamic business re-engineering change framework; steps to reengineer the process.

UNIT III   MODELLING THE BUSINESS

Tools used in Modelling the Business: flow-charting, business activity maps, relational diagrams, benefit/cost analysis. The enabling role of information technology in business re-engineering.

UNIT IV   CHANGE MANAGEMENT

Change Management, Planned changes in business re-engineering projects; challenges of business change; business change development. Success factors in re-engineering. The assessment of business re-engineering.

UNIT V   BEST PRACTICES IN BPR

Best Practices in BPR, Case studies: Bell Atlantic, Nissan, Chrysler, Xerox, and Hewlett Packard etc.

TEXT BOOKS:

1. Ali K. Kamrani, Maryam Azimi (2011). New Methods in Product Design: New Strategies in Reengineering (Engineering and Management Innovation). CRC Press. 1st ed.

2. Bassam Hussein (2008). PRISM: Process Reengineering Integrated Spiral Model. VDM

   Verlag Dr. Mueller e.K.

REFERENCE BOOKS:

1. Harmon, P. (2007), Business Process Change : A Guide for Business Managers and BPM and Six Sigma Professionals, Elsevier/Morgan Kaufmann Publishers.

2. R. Anupindi et al. (2006), Managing Business Process Flows: Principles of Operations Management, Pearson Education Inc.

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HSS18R012	POLITICAL ECONOMY	L	T	P	Credit
		3	0	0	3
Pre-requisite : NIL	**Course Category :** Humanities Elective				
	Course Type : Theory				

COURSE OBJECTIVES :

1. To provide an introduction to the political economy of India.
2. To examine the interplay of politics and economics and explore the key themes such as globalization, economic reform, poverty, redistribution, federalism, political protest, public goods delivery, gender, and ethnic politics.
3. To discuss a number of the themes likes functions of institutions, rights, Party Systems and challenges.

COURSE OUTCOMES :

CO1 : Explain the key concepts of political economy analyze the significant developments in the political ideologies.

CO2 : Describe the salient features of the constitution of India and its functions and also interpret, integrate and critically analyze the fundamental rights duties and responsibilities.

CO3 : Understand the Political party system their evolution and role in the economy

CO4 : Understand the various ideological of Indian Political Thoughts

CO5 : Understand and appreciate situations of India undergoing major economic and social transformation

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1						S	S		L	M	M	L		L	L	S
CO2						S				S				L	L	S
CO3						L	S	S	L	S	M	L		L	L	S
CO4						S	S		L	M	M	L		L	L	S
CO5						S				S				L	L	S

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UNIT I   INTRODUCTION TO POLITICAL ECONOMY

Political Economy as a Method, perspectives, Politics as Reproduction of Social Relations, State and Social Opportunity, Politics of Rent Seeking -Evolution of State in India: Historical Roots of planning, Redistribution.

UNIT II   INDIAN CONSTITUTION

The Pre-ample- Fundamental rights and duties, Directive Principles- Offices of the President, Prime Minister, Cabinet Government, Chief Election Commissioner, and Governor – Parliamentary system and Procedures - The Judiciary system.

UNIT III   PARTY SYSTEM

National and regional political parties, ideological and social bases of parties; patterns of coalition politics; Pressure groups, trends in electoral behaviour; changing socio-economic profile of Legislators.

UNIT IV   INDIAN POLITICAL THOUGHT

Political Ideologies**:** Liberalism, Socialism, Marxism, Fascism, Gandhism and Feminism - Dharamshastra, Arthashastra and Buddhist traditions; Sir Syed Ahmed Khan, Sri Aurobindo, M.K. Gandhi, B.R. Ambedkar, M.N. Roy.

UNIT V   CHALLENGES TO INDIAN DEMOCRACY

Uneven Development of Regions in India – Communalism – Regionalism – Violence – Corruption – environmental degradation- illiteracy –Population.

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TEXT BOOKS:

1. Charles Sackrey, Geoffrey Schneider, Janet Knoedler, Introduction to Political Economy, Dollars & Sense, 8th Edition, 2016.
2. Robert.S.Dimand, Review of Political Economy: An Introductory Text, 1st Edition, Routledge, 2008.

REFERENCE BOOKS:

1. Barry R. weingast and Donald a.Wittman, Handbook of Political Economy, 1st Edition, Oxford University Press, New York, 2006.
2. Ed. Sanjay Ruparelia; Sanjay Reddy; John Harriss & Stuart Corbridge, Understanding India's New Political Economy: A Great Tranformation, Routledge 1st Edition edition 2011.
3. M.Laxmikanth, Indian Polity, 4th Edition, McGraw Hill Education, New Delhi,2017.
4. Niraja Gopal Jayal, Pratap Bhanu Mehra, The Oxford Companion to Politics in India: Student Edition, Oxford Press, 2011.

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HSS18R013	PROFESSIONAL ETHICS	L	T	P	Credit
		3	0	0	3
Pre-requisite : NIL	**Course Category :** Humanities Elective				
	Course Type : Theory				

COURSE OBJECTIVES :

1. To have an understanding of the ethical problems and principles through theory, historical case studies and research and presentation.
2. To allow students to explore the relationship between ethics and engineering and apply classical moral theory and decision making to engineering issues encountered in academic and professional careers.

COURSE OUTCOMES :

CO1 : Identify the multiple ethical interests at stake in a real-world situation or practice
CO2 : Assess their own ethical values and the social context of problems
CO3 : Develop critical thinking skills and professional judgment and understand practical difficulties of bringing about change
CO4 : Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work
CO5 : Manage differing opinions on complex ethical scenarios. It's important for those confronted with ethical challenges to be able to hold multiple conflicting points of view, without necessarily adhering to any of them.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1						L		S	M	M		L		M	S	M
CO2									S	M	M	L		M	S	M
CO3						M		L		L				M	S	M
CO4							S			M				M	S	M
CO5								M		M				M	S	M

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UNIT I   ENGINEERING ETHICS

Functions of Being a Manager – Stock holder and stakeholder management – Ethical treatment of employees - ethical treatment of customers- supply chain management and other issues.

UNIT II   ENGINEERING AS SOCIAL EXPERIMENTATION

Senses of Ethics – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional ideals and virtues – Theories about right action – Self-interest – Customs and religion – Use of Ethical Theories.

UNIT III   ENGINEER RESPONSIBILTY FOR SAFETY

Corporate social responsibility - Collegiality and loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Discrimination.

UNIT IV RESPONSIBILITY AND RIGHTS

Moral imagination, stake holder theory and systems thinking - One approach to management Decision – making Leadership.

UNIT V GLOBAL ISSUES

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Sample code of conduct.

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TEXT BOOKS:

1. Mike Martin and Roland Schinzinger, Introduction to Engineering Ethics, 2nd Edition, McGraw Hill Higher Education, New Delhi, 2010.

2. Charles D Fledderman, Engineering Ethics, 4th Edition, Pearson Education, Delhi, 2011.

REFERENCE BOOKS:

1. R.S.Naagarazan, Text book on Professional Ethics and Human Values, New Age International, 2007.
2. Gail Baura, Engineering Ethics- An Industrial Perspective, 1st Edition, Academic Press, 2006.
3. Charles e. Harris , Michael s. Pritchard and Michael J. Rabins Texas , Engineering Ethics- Conecpts and Cases, 4th Edition, Cengage Learning, 2009.
4. Charles Byms Fleddermann, Engineering Ethics, 3rd Edition, Pearson Prentice Hall, 2008.
5. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2013.
6. Dr.V.Jeyakumar, Professional Ethics in Engineering, Lakshmi Publication, Chennai, 2014.

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HSS18R014	OPERATIONS RESEARCH	L	T	P	Credit
		3	0	0	3
Pre-requisite : NIL	**Course Category :** Humanities Elective **Course Type** : Theory				

COURSE OBJECTIVES :

1. To provide students with ability to understand and analyze managerial problems in industry so that they are able to use resources like capitals, materials, staffing, and machines more effectively.
2. To provide the knowledge of formulating mathematical models for quantitative analysis of managerial problems in industry.
3. To enhance the skills in the use of operations research approaches and computer tools in solving real problems in industry.

COURSE OUTCOMES :

CO1 : Identify and develop operational research models from the verbal description of the real System.
CO2 : Build and solve Transportation Models and Assignment Models
CO3 : Evolve mathematical software to solve the proposed models.
CO4 : Develop a report that describes the model and the solving technique, analyze the results and propose recommendations in language understandable to the decision making processes in Management Engineering.
CO5 : Design new simple models, like: CPM, MSPT to improve decision –making and develop critical thinking and objective analysis of decision problems.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1						S	M		S			S	S			
CO2						L		L		S		L	S			
CO3					M	M				S		L	S			
CO4						S	M		S	S		M	S			
CO5						S	M		S			S	S			

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UNIT I   INTRODUCTION TO LINEAR PROGRAMMING

Introduction to applications of operations research in functional areas of management - Linear Programming - formulation, solution by graphical and simplex methods (Primal - Penalty, Two Phase), Special cases - Dual simplex method.

UNIT II   TRANSPORTATION MODELS AND ASSIGNMENT

Transportation Models (Minimising and Maximising Cases) – Balanced and unbalanced cases – Initial Basic feasible solution by N-W Corner Rule, Least cost and Vogel's approximation ethods - Check for optimality - Solution by MODI / Stepping Stone method - Cases of degeneracy - Transshipment Models - Assignment Models (Minimising and Maximising Cases) – Balanced and Unbalanced Cases - Solution by Hungarian and Branch and Bound Algorithms - Travelling Salesman problem - Crew Assignment Models.

UNIT III   INTEGER LINEAR PROGRAMMING AND GAME

Solution to pure and mixed integer programming problem by Branch and Bound and cutting plane algorithms - Game Theory - Two person Zero sum games - Saddle point, Dominance Rule, graphical and LP solutions.

UNIT IV   REPLACEMENT MODELS AND DECISION THEORY

Replacement Models-Individuals replacement Models (With and without time value of money) – Group Replacement Models - Decision making under risk – Decision trees – Decision making under uncertainty.

UNIT V   PROJECT MANAGEMENT METHOD AND SIMULATION

PERT / CPM – Drawing the network, computation of processing time, floats and critical path. Resource leveling techniques - Application of simulation techniques for decision making.

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TEXT BOOKS:

1. Kalavathy S, Operations Research, Vikas Publishing House, 4TH Edition, 2013.
2. Paneerselvam R., Operations Research, Prentice Hall of India, 2ND Edition, 2006.
3. Tulsian P.C, Vishal Pandey, Quantitative Techniques (Theory and Problems), Pearson Education, Asia, First Indian Reprint 2002.

REFERENCE BOOKS:

1. D.S.Hira, Problems in Operations Research, Kindle Edition, S.Chand, 2010.
2. Prem Kumar Gupta and D.S. Hira, Operations Research,S.Chand, 2016.
3. R.C.Mishra,Principles of Operations Research, 1st Edition, New Age International 2011.
4. Kanti Swarup, P.K.Gupta and Man Mohan, Operations Research, 15th Edition, Sultan Chand and Sons 2010.

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HSS18R015	TOTAL QUALITY MANAGEMENT	L	T	P	Credit
		3	0	0	3

	Course Category : Humanities Elective
Pre-requisite : NIL	
	Course Type : Theory

COURSE OBJECTIVES :

1. To provide students with the knowledge to understand the philosophy and core values of Total Quality Management (TQM).
2. To determine the voice of the customer and the impact of quality on economic performance and long-term business success of an organization; apply and evaluate best practices for the attainment of total quality.
3. To make students to critically appraise management techniques, choose appropriate statistical techniques for improving processes and write reports to management describing processes and recommending ways to improve them.

COURSE OUTCOMES :

CO1 : Understand the role and nature of quality in evolving international economic conditions
CO2 : Apply the Principles of Quality Management for real time problems.
CO3 : Analyze the quality encounter process, including supporting facilities and customer requirements/characteristics
CO4 : Classify quality measurement methods and continuous improvement process
CO5 : Design Management strategy methods, including identification, development, implementation and feedback processes

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	L					S				L	L			S		
CO2	M						L			L		M		S		
CO3						M	M	L	L	L	L			S		
CO4	S	L							S	L	M	S		S		
CO5							M	L	L	L	L	L		S		

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UNIT I   INTRODUCTION TO QUALITY MANAGEMENT

Definitions – TOM framework, benefits, awareness and obstacles - Quality – vision, mission and policy statements - Customer Focus – customer perception of quality, Translating needs into requirements, customer retention. Dimensions of product and service quality. Cost of quality.

UNIT II   PRINCIPLES AND PHILOSOPHIES OF QUALITY MANAGEMENT

Overview of the contributions of Deming, Juran Crosby, Masaaki Imai, Feigenbaum, Ishikawa, Taguchi, Shingeo and Walter Shewhart - Concepts of Quality circle, Japanese 5S principles and 8D methodology.

UNIT III STATISTICAL PROCESS CONTROL AND PROCESS CAPABILITY

Meaning and significance of statistical process control (SPC) – construction of control charts for variables and attributed - Process capability – meaning, significance and measurement – Six sigma concepts of process capability - Reliability concepts – definitions, reliability in series and parallel, product life characteristics curve - Business process re-engineering (BPR) – principles, applications, reengineering process, benefits and limitations.

UNIT IV TOOLS AND TECHNIQUES FOR QUALITY MANAGEMENT   Quality

functions development (QFD) – Benefits, Voice of customer, information organization, House of quality (HOQ), building a HOQ, QFD process. Failure mode effect analysis (FMEA) – requirements of reliability, failure rate, FMEA stages, design, process and documentation.

UNIT V   TAGUCHI TECHNIQUES

Taguchi techniques – introduction, loss function, parameter and tolerance design, signal to noise ratio - Seven old (statistical) tools - Seven new management tools - Bench marking and POKA YOKE.

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TEXT BOOKS:

1. Poornima M.Charantimath., Total quality management, Pearson Education, 2ᴺᴰ Edition, 2011.
2. Dale H.Besterfield et al, Total Quality Management, Perarson Education, Thrid edition, (First Indian Reprints 2004).

REFERENCE BOOKS:

1. Shridhara Bhat K, Total Quality Management – Text and Cases, Himalaya Publishing House, First Edition, 2002.

2. Jams R. Evans, Total Quality: Management, Organisation and strategy, 4th Edition, South- Western College, 2004.

3. Vincent K.Omachonu, Joel E.Ross, Principles of Total Quality, 3rd Edition, CRC Press, 2004.

4. S.Rajaram, M.Sivakumar, Total Quality Management, Wiley Publishers, 1st Edition, 2008.

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HSS18R016	ADVANCED SOFT SKILLS	L	T	P	Credit
		3	0	0	3

Pre-requisite : NIL	Course Category : Humanities Elective
	Course Type : Theory

EFFECTIVE COMMUNICATION

Comprehending Ability, Business Vocabulary, Speed Reading, Non-Verbal Communication, Cross Cultural Communication, Meeting Management, Technology trend awareness

QUANTITATIVE ABILITY

Time & Work, Time-Speed-Distance, Permutation & Combination Probability, Geometry & Mensuration, Number Properties, Ratio & Proportion, Mixtures & Alligation, Percentages, Profit-Loss-Discount, Averages, Progression, Higher Mathematics

LOGICAL ABILITY

Non-Verbal Reasoning, Deductive & Inductive Reasoning, Binary Logic, Number Series, Clocks, Calendars

VERBAL ABILITY

Reading Comprehension, Parajumbles, Critical Reasoning, Subject-Verb Agreement, Synonyms & Antonyms, Grammar Reading Comprehension & Logic Miscellaneous Verbal questions

DATA INTERPRETATION
Line Charts, Bar Charts, Pie Charts, Venn diagrams, Caselets, Data tables.

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BASIC ENGINEERING

EEE18R172	BASIC ELECTRICAL ENGINEERING	Credits			
		L	T	P	Total
		3	1	2	5
Pre-requisite: -- Nil		Course Category: Basic Engineering			
		Course Type: Integrated Course			

COURSE OBJECTIVE(S):

To focus the fundamental ideas of the Electrical Engineering by providing wide exposure to the basic concepts of Electrical Engineering such as DC Circuits, AC Circuits, electrical machines, and Electrical installations etc.

COURSE OUTCOMES :

CO1: Apply basic laws of electricity in DC circuits

CO2: Apply the basic laws of electricity in AC circuits

CO3: Study the construction and working principles of DC Machines and Transformers.

CO4: Study the construction and working principle of AC Machines

CO5: Study the basic components of Low Voltage Electrical Installations

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

CO / PO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	M	M		M	M	L		L	L	L			M		
CO2	S	M		M	M								M		
CO3	S	M		M	M			S	S	S			S		
CO4	S	M						S	S	S			M		
CO5	S	S	L	M	M	L	L	L	L	L			M		

UNIT I: DC CIRCUITS

DC Circuits: Electrical quantities – Electric Circuit Elements - Resistors - Inductors - Ccapacitors - Ohm's Law - Kirchhoff's Laws - Series and Parallel circuits - Analysis of DC circuits – Mesh - Nodal – Superposition - Thevenin - Norton Theorems - Simple problems

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UNIT II: AC CIRCUITS

Sinusoidal functions - Phasor representation - Real power - Reactive power - Aapparent power - Power factor - RMS value - Average value - Form and Peak factors - Analysis of single-phase AC series circuits consisting of RL, RC, RLC combinations – Problems - concept of three phase system.

UNIT III: DC MACHINES AND TRANSFORMERS

DC Machines: Construction and working principle of DC Generator and DC Motor - EMF equation – Torque equation - Related problems

Transformer: Construction - working and types - Ideal and practical transformer - Equivalent circuit - Losses in transformers - Regulation and Efficiency –problems

UNIT IV: AC MACHINES

Synchronous machine: Construction - working of alternator – EMF Equation – Problem – Working principle of synchronous motor

Three phase induction motor: Constructional details - Principle of operation – Types - Torque-slip characteristics - Starting torque - Relation between torque and slip - Losses and efficiency.

Single phase induction motor: Construction – Working principle - Types of single phase induction motor

UNIT V: ELECTRICAL INSTALLATIONS

Components of LT Switchgear - Switch Fuse Unit (SFU) – MCB – ELCB – MCCB - Domestic wiring - accessories - types - Staircase wiring - Fluorescent tube circuits – Earthing - Types of Batteries - Important Characteristics for Batteries - Elementary calculations for energy consumption - power factor improvement and battery Backup

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LIST OF EXPERIMENTS

1. Verification of Kirchoff's Laws.
2. Verification of Mesh and Nodal analysis
3. Verification of Thevinin's and Norton's theorems
4. Measurement of electrical quantities-voltage current, power & power factor in RL and RC series circuits
5. Determine the power and power factor of RLC series circuit
6. Open circuit and load characteristics of Separately excited DC Generator
7. Open circuit and load characteristics of Self excited DC Generator
8. Draw the characteristic between output power versus efficiency of DC shunt motor
9. Verification of turns ratio on single phase transformer
10. Load test on single phase transformer
11. Load test on three phase squirrel cage induction motor.
12. Load test on single phase induction motor.
13. Load test on Alternator
14. Study of basic electrical installation components for LT switchgear
15. Residential house wiring using fuse, two way switches and lamp
16. Wiring layout for Fluorescent lamp
17. Experiment for Calculation of charging and discharging current of battery

TEXT BOOK(S):

1. V.K. Mehta, "Principles of Electrical Engineering and Electronics", S. Chand & Company Ltd, 2012
2. Kothari D P and Nagrath I J, "Basic Electrical Engineering", McGraw Hill, 2009.
3. Mithal G K, Electronic Devices & Circuits, Khanna Publications, 1997

REFERENCE(S):

1. T. Thyagarajan, "Fundamentals of Electrical and Electronics Engineering", SciTech publications (Ind.) Pvt. Ltd., 3rd Edition, 2015.
2. Muraleedharan K.A, Muthususbramanian R and Salivahanan S, "Basic Electrical, Electronics and Computer Engineering" Tata McGraw Hill, 2006.
3. Sunil S.Rao., Switchgear Protection and Power system, Khanna Publishers, New Delhi, 13th Edition, 1999.
4. Ravindranath B., Chander, N., Power Systems Protection and Switch Gear, Wiley Eastern (P) Ltd., Second Edition, 2011.

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MEC18R151	ENGINEERING GRAPHICS & DESIGN	Credits			
		L	**T**	**P**	**Total**
		3	**0**	**2**	**3**
Pre-requisite: Nil		**Course Category:** Basic Engineering			
		Course Type: Theory with Practical			

COURSE OBJECTIVE(S):

This course aims to introduce the concept of graphic communication, develop the drawing skills for communicating concepts, ideas and designs of engineering products, Demonstrate skills in interpreting, and producing engineering drawings accurately and to give exposure to national standards relating to engineering drawing

COURSE OUTCOME(S):

After completing this course, the student will be able to:

CO1: Create the projection of points in all quadrants and straight lines
CO2: Construct the projections of planes and solid objects with refer to reference planes
CO3: Illustrate the true shape of truncated solids in both the manual and computerized manner
CO4: Develop surfaces of truncated solids in both the manual and computerized man
CO5: Apply orthographic and isometric projections in both the manual and computerized man

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

CO/ PO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2		2												
CO2		3										1			
CO3	2		3		3		3					2			
CO4	1	2			3		3					3			
CO5	3		3		3		3					3			

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UNIT I: PROJECTION OF POINTS AND STRAIGHT LINES

Importance of graphics – use of drafting instruments – BIS conventions and specifications – size, layout and folding of drawing sheets – lettering dimensioning and scales - Projection of points, located in all quadrants - projection of straight lines located in the first quadrant, determination of true lengths and true inclinations

UNIT II: PROJECTION OF PLANES AND SOLIDS

Projection of polygonal surface and circular lamina located in first quadrant inclined to one or both reference planes-Projection of solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method

UNIT III: SECTION OF SOLIDS

Section of simple solids like prisms, pyramids, cylinder and cone in vertical position by cutting planes inclined to any one of the reference planes, obtaining true shape of section

UNIT IV: DEVELOPMENT OF SURFACES

Development of lateral surfaces of simple and truncated solids – prisms, pyramids, cylinders and cones

UNIT V: ORTHOGRAPHIC AND ISOMETRIC PROJECTION

Orthographic principles – missing view - free hand sketching in first angle projection from pictorial views. Principles of isometric projection – isometric view and projections of simple solids, truncated prisms, pyramids, cylinders and cones. Introduction to CAD software – menus and tools – drafting platform demonstration

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LIST OF EXPERIMENTS :

1. Construction of conic sections using CAD software
2. Construction of simple planes using exclusive commands like extend, trim etc.,
3. Construction of 3D model – solids and sectional views
4. Generating 2D orthographic blue prints from 3D part models
5. Vectorization of simple building plan and elevation

TEXT BOOK(S):

1. Basant Aggarwal and C. Aggarwal, Engineering Drawing, McGraw-Hill, 2013.
2. N.S. Parthasarathy, Vela Murali, Engineering Drawing, Oxford University Press, 2015.
3. K. Venugopal, Engineering Drawing + AutoCAD, New Age; Fifth edition, 2011.

REFERENCE(S):

1. Shah, M.B., and Rana, B.C., Engineering Drawing, Pearson 2009
2. Natarajan, K.V., A Text Book of Engineering Graphics, 21st Edition, Dhanalakshmi Publishers, Chennai, 2012.
3. Paul Richard, Jim Fitzgerald., Introduction to AutoCAD 2017: A Modern Perspective, Pearson, 2016.
4. Bhatt, N.D., Engineering Drawing, Charotar publishing House, New Delhi, 53trd Edition, 2014.
5. Luzadder and Duff, "Fundamentals of Engineering Drawing", Prentice Hall of India Pvt. Ltd., 2009.
6. Venugopal, K., Engineering Graphics, New Age International (P) Limited, 2009.

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ECE18R221	ANALOG ELECTRONIC CIRCUITS	L	T	P	C
		3	0	0	3

Pre-requisite: -- Nil	Course Category: Programme Core
	Course Type:Theory

COURSE OUTCOME(S):

At the end of the course, the students will be able to:

CO1: Design and develop diode-based circuits in the required applications

CO2: Design Bipolar device-based circuits using the knowledge gained on them

CO3: Use Field Effect Transistor in the context of electrical engineering applications

CO4: Design amplifiers and oscillators using the knowledge gained on transistors and linear integrated circuits.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												S			
CO2	S			S	S								S			S
CO3	S	S		S	S						M		S	S		
CO4	S	S		S	S								S	S		
CO5	S	S	S	S	S	M	M				M	M	S	S		S

UNIT I DIODE CIRCUITS

P-N junction diode, I-V characteristics of a diode; half-wave and full-wave Rectifiers, clamping and clipping circuits Zener diodes and its applications

UNIT II BJT CIRCUITS

Structure and I-V characteristics and configurations of a BJT; BJT as a switch. BJT as an amplifier: small-signal model, biasing circuits, current mirror; common-emitter, common-base and common collector amplifiers; Small signal equivalent circuits, high-frequency equivalent circuits.

UNIT III MOSFET CIRCUITS

MOSFET structure and I-V characteristics. MOSFET as a switch. MOSFET as an amplifier: small-signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, transconductance, high frequency equivalent circuit.

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UNIT IV DIFFERENTIAL, MULTI-STAGE AND OPERATIONAL AMPLIFIERS

Differential amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, non-ideal op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product), Idealised analysis of op-amp circuits

UNIT V APPLICATIONS OF OP-AMP

Inverting and non-inverting amplifier, instrumentation amplifier, integrator, differentiator, Comparators, Zero Crossing Detector, Peak detector, Precision Rectifier

TEXT BOOK(S):

1. David A. Bell., "Electronic Devices and Circuits" Oxford University Press, 5th Edition, 2008
2. Jacob. Millman, Christos C.Halkias and Sathyabrata Jit, "Electronic Devices and Circuits", McGraw Hill, New Delhi, 2010

REFERENCES:

1. Robert Boylestad and Luis Nashelaky "Electronic Devices and Circuit Theory" 11th Edition, Pearson, 2010
2. S. Sedra and K. C. Smith, "Microelectronic Circuits", OxfordUniversityPress, 2012.
3. J. V. Wait, L. P. Huelsman and G. A. Korn, "Introduction to Operational Amplifier theory and applications", McGraw Hill, 1992.
4. J. Millman and A. Grabel, "Microelectronics", McGraw Hill, 2002.
5. P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1989.
6. P. R. Gray, R. G. Meyer and S. Lewis, "Analysis and Design of Analog Integrated Circuits", Wiley, 2001.

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CSE18R171	PROGRAMMING FOR PROBLEM SOLVING	L	T	P	Credit
		3	1	2	5
Pre-requisite : NIL	Course Category : Basic Engineering Course Type : Integrated Course with Tutorial				

COURSE OBJECTIVES :

To make the students to understand the basic concepts of programming language, rules to be followed while writing a program and how to compile and execute C programs.

COURSE OUTCOMES :

CO1: Understand the basic programming concepts and syntax of C language

CO2:Develop efficient code using pointers, arrays and dynamic memory allocation techniques

CO3:Create user defined data types and functions to solve given problems.

CO4:Design an efficient algorithm for a given problem

CO5:Build efficient code to solve the real world problem

CO6:Elucidate the programming constructs of C during interviews

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	S	S		S					M	M			S	S		
CO2		S		S		M	M						S	S		
CO3	S	S			M		S	S	M		M	M			S	
CO4	S	S	S								S	S	S	M	S	M
CO5		S		S	S		M						S		S	M
CO6	S	S		M		S					S	M				S

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UNIT I INTRODUCTION TO PROGRAMMING

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.), Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/ Pseudocode with examples, From algorithms to programs; source code, variables (with data types) variables and memory, locations, Syntax and Logical Errors in compilation, object and executable code, Arithmetic expressions and precedence, Conditional Branching and Loops, Writing and evaluation of conditionals and consequent branching, Iteration and loops.

UNIT II ARRAYS AND STRINGS

Introduction - One dimensional and two dimensional arrays – Declaration of arrays – Initializing and Accessing array elements – Strings: One dimensional character arrays - Declaration and String Initialization - String Manipulation - Multidimensional Arrays - Arrays of Strings

UNIT III FUNCTION

Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference, Recursion, Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc.

UNIT IV BASIC ALGORITHMS

Searching, Basic Sorting Algorithms (Bubble, Insertion, Selection, Quick sort and Merge sort), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

UNIT V STRUCTURE, POINTERS & FILE HANDLING

Structures, Defining structures and Array of Structures, Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation), File handling (only if time is available, otherwise should be done as part of the lab)

TEXT BOOKS

1.Pradip Dey and Manas Ghosh,Programming in C,Oxford University Press, Third Edition 2018.
2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill, Third Edition, 2010

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REFERENCE BOOKS

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India, Second Edition 1988
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill, Seventh Edition 2017

LIST OF EXPERIMENTS

Tutorial 1: Problem solving using computers:
Lab1: Familiarization with programming environment
Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions
Tutorial 3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures
Tutorial 4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series
Tutorial 5: 1D Arrays: searching, sorting:
Lab 5: 1D Array manipulation
Tutorial 6: 2D arrays and Strings
Lab 6: Matrix problems, String operations
Tutorial 7: Functions, call by value:
Lab 7: Simple functions
Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration):
Lab 8 and 9: Programming for solving Numerical methods problems
Tutorial 10: Recursion, structure of recursive calls
Lab 10: Recursive functions
Tutorial 11: Pointers, structures and dynamic memory allocation
Lab 11: Pointers and structures
Tutorial 12: File handling:
Lab 12: File operations

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ECE18R277	DIGITAL ELECTRONICS	L	T	P	C
		3	1	2	5
Pre-requisite: -- Nil	**Course Category:** Basic Engineering **Course Type:** Integrated Course				

COURSE OBJECTIVE:

Digital Electronics is the study of electronic circuits that are used to process and control digital signals. In contrast to analog electronics, where information is represented by a continuously varying voltage, digital signals are represented by two discreet voltages or logic levels. This distinction allows for greater signal speed and storage capabilities and has revolutionized the world electronics. Digital electronics is the foundation of all modern electronic devices such as cellular phones, MP3 players, laptop computers, digital cameras, high definition televisions, etc.

COURSE OUTCOMES : (COs):

CO1: Recall the different number systems and demonstrate the simplification of Boolean expressions using Boolean algebra & K-Map method.
CO2: Demonstrate the working of logic families with its characteristics.
CO3: Design combinational digital circuits to meet a given specification and to represent logic functions in multiple forms.
CO4: Illustrate the concept of sequential circuits with its characteristic equation and excitation Table.
CO5: Explain the role of memory in computer and the different types of memory.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2	S	S	M	M								
CO3	S	S	M						M			M
CO4							M					
CO5									M			M

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UNIT I NUMBER SYSTEMS AND BOOLEAN ALGEBRA

Number Systems, Arithmetic and Codes: Positional number system, Base conversions, signed numbers, Fixed and floating-point numbers, Basic Arithmetic Operations, Error Detection and Correction Codes, Alphanumeric Codes, Boolean algebra and Switching Functions: Boolean functions, Logic gates, Simplification of switching functions: 4-variable K-map.

LOGIC FAMILIES

Logic Families and Characteristics, MOS inverter, RTL, DTL, TTL, ECL, I^{2}C, CMOS, BiCMOS Logic, TTL to CMOS interface, CMOS to TTL interface, IEEE/ANSI representation of Logic families.

COMBINATIONAL LOGIC

Combinational Logic: Analysis Procedure and Synthesis Procedure, Combinational Circuits: Arithmetic circuits, Binary adders: Half adder, Full adder, Half Substractor, Full Substractor, Magnitude Comparator, Encoders and Decoders, Multiplexer and Demultiplexer, Code Converters, Parity Bit Generators and Checkers.

SEQUENTIAL LOGIC

Basic Bistable Element, Latches, Pulse-Triggered Flip-Flops, Edge-Triggered Flip-Flops, Asynchronous inputs, Applications of Flip-flops, States, State Diagram, Characteristic equation and Excitation Table of Flip-flops, Shift Registers –Ripple Counters, Synchronous Counters, Counter Applications.

MEMORIES

Role of Memory in a computer, Memory types, Semiconductor RAMs, Memory Expansion, Non-Volatile RAMs, Sequential Memories, Magnetic Memories, Charge-coupled devices.

EXPERIMENTS:

1. Implementation of Logic Gates
2. Design of Half-adder/ Full-adder
3. Design of Comparator
4. Design of Multiplexer / De-multiplexer
5. Design of Decoders and Encoders
6. Design of Parity Checkers/Generators
7. Design of Code Converter
8. Design of Flip-Flop
9. Study of Shift register
10. Study of Counters

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TEXT BOOK(S)

1. S. SALIVAHANAN, S. ARIVAZHAGAN, "DIGITAL CIRCUITS AND DESIGN", OXFORD UNIVERSITY PRESS, INDIA, 2018(5TH EDITION), ISBN: 978019948868
2. ANAND KUMAR A., "FUNDAMENTALS OF DIGITAL CIRCUITS", PHI, 2016 (4TH EDITION), ISBN: 9788120352681

REFERENCES

1. DONALD P LEACH, ALBERT PAUL MALVINO AND GOUTAM SAHA, "DIGITAL PRINCIPLES AND APPLICATIONS", MCGRAW HILL, 2014(8TH EDITION, SIE), ISBN: 9789339203405
2. M. RAFIQUZZAMAN, "FUNDAMENTALS OF DIGITAL LOGIC AND MICROCOMPUTER DESIGN", WILEY, 2005(5TH EDITION), ISBN: 9788126522590
3. MORRIS M. MANO, "DIGITAL LOGIC AND COMPUTER DESIGN, PEARSON EDUCATION", 2016, ISBN: 9789332542525
4. A. SAHA, N. MANNA, "DIGITAL PRINCIPLES AND LOGIC DESIGN: FUNDAMENTALS AND MODERN APPLICATIONS", JONES AND BARTLETT PUBLISHERS, 2010, ISBN: 9780763773731
5. THOMAS L. FLOYD, "DIGITAL FUNDAMENTALS", PEARSON EDUCATION, 2011(10TH EDITION), ISBN: 9788131734483

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EC18R152	ENGINEERING PRACTICE	Credits			
		L	**T**	**P**	**Total**
		3	**0**	**2**	**3**
Pre-requisite: Nil		**Course Category:** Basic Engineering			
		Course Type: Theory with Practical			

COURSE OUTCOMES :

Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.

Lectures & videos:

Detailed contents

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing

methods **(3 lectures)**

2. CNC machining, Additive manufacturing **(1 lecture)**

3. Fitting operations & power tools **(1 lecture)**

4. Carpentry **(1 lecture)**

5. Plastic moulding, glass cutting **(1 lecture)**

6. Metal casting **(1 lecture)**

7. Welding (arc welding & gas welding), brazing **(1 lecture)**

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Suggested Text/Reference Books:

(i) Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.

(ii) Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.

(iii)Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.

(iv) Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.

(v) Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

(ii) Workshop Practice:

1. Machine shop **(10 hours)**

2. Fitting shop **(8 hours)**

3. Carpentry **(6 hours)**

4. Welding shop **(8 hours (Arc welding 4 hrs + gas welding 4 hrs)**

5. Casting **(8 hours)**

6. Smithy **(6 hours)**

7. Plastic moulding & Glass Cutting (6 hours)

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

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Laboratory Outcomes

- Upon completion of this laboratory course, students will be able to fabricate components with their own hands.
- They will also get practical knowledge of the dimensional accuracies and dimensional
  tolerances possible with different manufacturing processes.
- By assembling different components, they will be able to produce small devices of their interest.

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PROGRAM CORE – CORE COURSES

CSE18R172	DATA DTRUCTURE AND ALGORITHMS	L	T	P	Credit
		3	1	2	5

Pre-requisite: CSE18R171 / Programming For Problem Solving	Course Category : CORE Course Type : Integrated Course

COURSE OBJECTIVES :

1. To make the students to follow the systematic way of solving real world problems by selecting an appropriate data structures.

COURSE OUTCOMES :

CO1 : Perceive the role of algorithms and programming constructs as a systematic and efficient way of solving problems.
CO2 : Evaluate and create Abstract Data Types and linear data structures
CO3 : Design and implement non-linear data structures such as trees
CO4 : Interpret and analyze efficiency of various searching and sorting techniques.
CO5 : Construct solutions to various real life applications using graphs.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												S			
CO2	S			S	S								S			
CO3	S	S		S	S						M		S	S		
CO4	S	S		S	S								S	S		
CO5	S	S	S	S	S	M	M				M	M	S	S		S

UNIT I INTRODUCTION
Basic Terminologies: Elementary Data Organizations, Data Structure, Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. **Searching:** Linear Search and Binary Search Techniques, and their complexity analysis.

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UNIT II LINKED LISTS, STACKS AND QUEUES

Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis. ADT Stack and its operations: Algorithms and their complexity, analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

UNIT III TREES

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.

UNIT IV – SORTING AND HASHING

Objective and properties of different sorting algorithms, Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort ,Performance and Comparison among all the methods, Hashing.

UNIT V - GRAPHS

Basic Terminologies and Representations Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms –Floyds, Warshall, Transitive closure, Minimum Spanning Tree, Prims, Kruskals, Topological sorting,

LIST OF EXPERIMENTS :

1. Programs using structures, arrays, pointers to structures and passing them as parameters to functions.
2. Programs for various types of recursion.
3. Program for linked list and its operations.
4. Program for array implementation of stack and queue.
5. Program for various applications of stack.
6. Program for linked list implementation of stack and queue.
7. Program for binary search tree and its operations.
8. Program for various sorting and searching techniques.
9. Program for Dijikstra's shortest path algorithms in graphs.
10. Program for finding minimum spanning tree in using Kruskal and Prim algorithms

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TEXT BOOKS :

1. "Fundamentals of Data Structures", Third Edition by Ellis Horowitz, Sartaj
Sahni, Computer Science Press,2010
2. "Fundamental Data Structures and Algorithm ",P.Deepalakshmi, Shasi Anand
Sridharan ,First Edition, Pearson Education,2019

REFERENCE BOOKS

1. Algorithms, Data Structures, and Problem Solving with C++", Third Edition
   by Mark Allen Weiss, Addison-Wesley Publishing Company ,2011
2. "How to Solve it by Computer", 2nd Impression by R. G. Dromey, Pearson press,2010

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CSE18R181	COMPUTER HARDWARE LABORATORY	L	T	P	Credit
		0	0	3	2

Pre-requisite : NIL	**Course Category :** CORE
	Course Type : Laboratory Course

COURSE OBJECTIVES :

1. To make the students to understand and handle the parts of a computer, to install an operating system and handle the issues through hardware and software trouble shooting.
2. To make the students to realize the need for computer security, firewalls, antivirus software and familiarize them with basic office automation software.

COURSE OUTCOMES :

CO1 : Inspect various components of a computer and its technological development.
CO2 : Identify, assemble and troubleshoot the components of a computer.
CO3 : Evaluate, analyze and solve the problems in installation of Operating System, Hardware, Software and internet connectivity
CO4 : Configure firewalls and install antivirus software to provide security to computers.
CO5 : Create documents and presentations with office automation software.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S		S										M			
CO2			S										M			
CO3			S										M			
CO4			S										M			
CO5										S			M			

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LIST OF EXPERIMENTS:

45 Hours

1. Study of peripherals of a computer, components in a CPU and its functions.

2. Assembling and disassembling of PC

3. Installation of Operating Systems – Windows

4. Installation of Operating Systems –LINUX

5. Hardware Troubleshooting

6. Software Troubleshooting

7. Providing Internet connectivity

8. Understand modern application development

9. Configuring Firewalls and installation of Antivirus software

10. Introduction to office automation software in Windows and Linux environment

REFERENCE BOOK(S):

1. Mike Meyers' CompTIA A+ Guide to Managing and Troubleshooting PCs, Fifth Edition, 2016.

2. B GOVINDARAJALU,IBM PC and Clones: Hardware, Troubleshooting and Maintenance 2nd Ed,

3. Upgrading and Repairing PCs (18th Edition) 18th Edition, by Scott Mueller, 2010.

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CSE18R173	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	Credit
		3	0	2	4

Pre-requisite: CSE18R172

/Data Structure and algorithms

Course Category : Program Core
Course Type   : Integrated course

COURSE OBJECTIVE:

- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations

COURSE OUTCOMES :

CO1 : Apply the fundamentals of algorithms and design techniques
CO2 : Analyze algorithms and express their complexity using asymptotic notations
CO3 : Propose algorithm for given problem using design techniques
CO4 : Evaluate the complexity of different techniques and problem solving methods
CO5 : Formulate any problem as a class of NP problems and propose approximation algorithms

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S											M	S			
CO2	S			S	S							S	S			
CO3	S	S		S	S						M	S	S	S		
CO4	S	S		S	S					M	S	S	S	S		
CO5	S	S	S	S	S	M	M				M	S	S	S		S

UNIT I : INTRODUCTION TO ALGORITHMS AND ANALYSIS
Introduction: 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: FUNDAMENTAL ALGORITHMIC STRATEGIES
Brute-Force, Greedy Techniques – Elements of greedy strategy - Theoretical foundation of greedy methods - Single source shortest path - Huffman tree – Task Scheduling problem- Dynamic programming – Principal of optimality - Longest common subsequence – Optimal binary tree

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UNIT III: BACKTRACKING AND BRANCH AND BOUND
Backtracking – n-Queen's Problem – Hamiltonian Circuit problem – Subset-Sum problem -Branch and Bound – Assignment Problem – Knapsack Problem – Traveling Salesman Problem- Illustrations of these techniques for Problem-Solving , Bin Packing, Heuristics – characteristics and their application domains.

UNIT IV: TRACTABLE
Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques.

UNIT V: ADVANCED TOPICS
Approximation algorithms, Randomized algorithms - Class of problems beyond
 NP – P SPACE

LIST OF EXPERIMENTS :

Implement in C / Python / Matlab Code

1. Matrix Chain Multiplication and analyze its time complexity
2. Longest Common Subsequence problem and analyze its time complexity
3. Prisoners Escape using greedy Approach
4. Huffman coding and analyze its time complexity
5. Subset sum problem using Branch and Bound technique
6. String matching algorithms using randomized technique
7. TSP problem for approximation algorithm

TEXT BOOKS:

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, Fourth Edition , PHI Pvt. Ltd., 2012
2. Anany Levitin, Introduction to the Design and Analysis of Algorithm, Third Edition , Pearson Education Asia, 2012.

REFERENCE BOOKS:

1. A.V.Aho, J.E. Hopcroft and J.D.Ullman, The Design and Analysis Of Computer Algorithms, Third Edition , Pearson Education Asia, 2011
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, Fourth Edition, Universities Press, Hyderabad, 2010.
3. Kenneth A. Berman and Jerome L. Paul, Algorithms, Third Edition, Cengage learning India, New Delhi, 2010.
4. Sara Baase and Allen Van Gelder, Computer Algorithms – Introduction to Design & Analysis, Third Edition, Pearson Education, New Delhi, 2000

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CSE18R174	COMPUTER ARCHITECTURE AND ORGANIZATION	L	T	P	Credit
		3	0	2	4
Pre-requisite: Nil		**Course Category :** Program Core			
		Course Type : Integrated course			

COURSE OBJECTIVES :

To make acquainted the students about the functional units of computer and how each unit works along with the architectural and performance issues.

COURSE OUTCOMES :

CO1 : Examine functional units of computer, bus structure and addressing mode
CO2 : Apply the knowledge of algorithms to solve arithmetic unit problems.
CO3 : Demonstrate single bus, multiple bus organization and pipelining concepts
CO4 : Analyze RAM, ROM, Cache memory and virtual memory concepts
CO5 : Evaluate the various I/O interfaces

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												S			
CO2	S			S	S								S			S
CO3	S	S		S	S						M		S	S		
CO4	S	S		S	S								S	S		
CO5	S	S	S	S	S	M	M				M	M	S	S		S

UNIT I BASIC STRUCTURE OF COMPUTERS
Functional Units - Basic Operational Concepts - Bus Structures - Software Performance – Memory Locations and Addresses – Memory Operations – Instruction and Instruction Sequencing – Addressing Modes – Assembly Language – Basic I/O Operations – Stacks and Queues.

UNIT II ARITHMETIC UNIT
Addition and Subtraction of Signed Numbers – Design of Fast Adders – Multiplication of Positive Numbers - Signed Operand Multiplication and Fast Multiplication – Integer Division – Floating Point Numbers and Operations.

UNIT III BASIC PROCESSING UNIT
Fundamental Concepts – Execution of a Complete Instruction – Multiple Bus Organization – Hardwired Control – Micro Programmed Control - Pipelining – Basic Concepts – Data Hazards – Instruction Hazards – Influence on Instruction Sets – Data Path and Control Consideration – Superscalar Operation.

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UNIT IV MEMORY SYSTEM

Basic Concepts – Semiconductor Rams - Roms – Speed - Size and Cost – Cache Memories - Performance Consideration – Virtual Memory - Memory Management Requirements – Secondary Storage.

UNIT V I/O ORGANIZATION

Accessing I/O devices – Interrupts – Direct Memory Access – Buses – Interface Circuits – Standard I/O Interfaces (PCI, SCSI, USB).

List of Experiments

1. Implementation of booth algorithm
2. Implementation of sequential circuit binary multiplier
3. Implementation of bit pair recording
4. Implementation of carry save addition
5. Implementation of Integer restoring division
6. Implementation of Integer Non restoring division
7. Implementation of twos complement addition
8. Implementation of twos complement subtraction
9. Design of half adder circuit using basic gates
10. Design of full adder circuit using basic gates
11. Design of ripple carry adder
12. Design of carry look ahead adder

TEXT BOOK:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, Computer Organization, McGraw-Hill, 5th Edition 2016.

REFERENCE BOOKS:

1. William Stallings, Computer Organization and Architecture – Designing for Performance, PHI pvt Ltd, 10th Edition, 2016.
2. J L Hennessy,David A Patterson,Computer Architecture A quantitative approach, Elsevier,4th Edition 2010.
3. David A.Patterson and John L.Hennessy, Computer Organization and Design: The hardware software interface, Morgan Kaufmann, 4th Edition, , 2009.
4. John P.Hayes, Computer Architecture and Organization, McGraw Hill, 3rd Edition, 2017.

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MAT18R207	DISCRETE MATHEMATICS	L	T	P	Credit
		3	1	0	4

PRE - REQUISITE: Nil

Course Category: Program Core
Course Type : Theory with Tutorial

COURSE OBJECTIVES :

To enable the students to understand the concept of sets, relations, functions, logic and algebraic structures, and basic graph theory and its applications.

COURSE OUTCOMES :

Upon successful completion of this course, students will be able to

CO1.Understand the concepts of cartesian product, binary operation, partially order, relation, function and its   properties.

CO2. Know about the pigeon-hole principle, inclusion and exclusion principles, tautology and normal forms.

CO3. Understand the concepts of lattice, homomorphism, modular and distributive lattices.

CO4. Understand the concepts of semi group, group, Boolean algebra, Boolean ring and duality.

CO5. Understand the concepts in graph theory such as walk, cycle, path, trees, Hamiltonian and Eulerian graphs.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S	M											S			
CO2	S	S		S	M		L						S			
CO3	S	S		S	M		L						S			
CO4	S	S		S	M		L						S			
CO5	S	S		S	M		L						S			

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UNIT I:

Operations and Laws of Sets - Cartesian Products - Binary Relation -Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function - Size of a Set, Finite and infinite Sets, Countable and uncountable Sets – The well-Ordering Principle - Recursion.

UNIT II:

Basic counting techniques-inclusion and exclusion- pigeon-hole principle- permutation and Combination- Propositional Logic: Introduction – TF(True/ False) Statements – Connectives –Atomic and Compound statements – Truth table of a formula – Tautology – Tautological implications – Equivalence of formulae – Replacement process – Normal forms – Principal normal forms – Theory of Inference.

UNIT III:

Lattices – Hasse Diagrams - Some properties of lattices – Duality principle – Lattice through Algebraic operations - Lattice Homomorphisms – Product lattice of two lattices - Modular and Distributive lattices – Boolean Algebras.

UNIT IV :

Algebraic Structures with one Binary Operation, Semi Groups, Groups - Congruence Relation and Quotient Structures - Boolean Algebra and Boolean Ring - Identities of Boolean Algebra - Duality, Representation of Boolean Function - Disjunctive and Conjunctive Normal Form

UNIT V :

Graphs and their properties - Degree, Connectivity - Path, Cycle, Sub Graph, Isomorphism - Eulerian and Hamiltonian Walks - definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distances.

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TEXT BOOKS:

1. M. K. Venkataraman, N. Sridharan and N. Chandrasekaran, Discrete Mathematics, National Publishing   Company, 2009.

REFERENCE BOOKS:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and It's Application to Computer Science", TMG Edition, TataMcgraw-Hill Publishing Company, 2001.
2. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill Publishing Company, 1999.

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CSE18R252	FORMAL LANGUAGE AND AUTOMATA	L	T	P	Credit
		3	0	1	4
Pre-requisite: Nil	**Course Category :** Program Core				
	Course Type : Theory with Practical				

COURSE OBJECTIVES :

1. To introduce students about the mathematical foundations of computation including automata theory, the theory of formal languages and grammars, the notions of algorithm, decidability, complexity, and computability,
2. To enhance/develop students' ability to understand and conduct mathematical proofs for computation and algorithms.

COURSE OUTCOMES :

CO1 : Distinguish Finite Automata, Deterministic Finite Automata and Non Deterministic Finite Automata

CO2 : Derive regular languages and expressions to a given problem.

CO3 : Formulate context free grammar (CFG) to describe programming languages and evaluate the equivalence of push down automata and CFG.

CO4 : Evaluate the operations of Turing machine for different languages and simple computations

CO5 : Prove undecidable problem in regular expression and Turing machine

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S			S	S								S			
CO2	S			S	S								S			
CO3	S	S		S	S						M		S	S		
CO4	S	S		S	S								S	S		
CO5	S	S	S	S	S	M	M				M	M	S	S		S

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UNIT I   AUTOMATA

Introduction to formal proof – Additional Forms of Proof – Inductive Proofs –Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Finite Automata with Epsilon Transitions.

UNIT II REGULAR EXPRESSIONS AND LANGUAGES

Regular Expression –Finite Automata and Regular Expressions – Properties of Regular languages: Pumping Lemma for Regular Languages and Applications – Closure Properties of Regular Languages- Equivalence and Minimization of Automata

NIT III CONTEXT-FREE GRAMMAR AND PUSH DOWN AUTOMATA

Context-Free Grammar (CFG) – Application- Parse Trees – Ambiguity in Grammars and Languages – Pushdown Automata – Languages of a Pushdown Automata – Equivalence of Pushdown Automata and CFG - Deterministic Pushdown Automata

UNIT IV PROPERTIES OF CFL AND TURING MACHINE

Normal Forms for CFG – Pumping Lemma for CFL –Applications Properties of CFL – Turing Machines – Programming Techniques for TM: Multiple Stacks, Subroutines- Extensions to the Basic Turing Machine

UNIT V UNDECIDABILITY

IA language that is not Recursively Enumerable (RE) – An Undecidable problem that is RE – Undecidable Problems about Turing Machine – Post's Correspondence Problem - The classes P and NP - NP complete-Complements of Languages in NP

LIST OF EXPERIMENTS

1. Create the Deterministic Finite Automata using JFLAP simulator
2. Create the Non-Deterministic Finite Automata using JFLAP simulator
3. Construct a regular expression using JFLAP. Use Convert→Convert FA to RE.
4. Construct a Grammar using JFLAP.
5. Convert regular expressions to FA
6. Create Regular Grammar and convert to Finite Automaton
7. Create a PDA that accepts strings that contains the language L = $\{a^x cb^{2x} \mid$ where $x \geq 0\}$ using the alphabet Σ = {a,b,c}.
8. Create each PDA with at least five test results with the following languages over alphabet: $\square$= {a,b}

        a)   L = $\{a^n b^n \mid$ where n > 0}
        b)   L = $\{a^n b^n c^n \mid$ where n > 0}
9. Construct PDA for any given grammar.

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TEXT BOOK:

1. Hopcroft J.E,Motwani R and Ullman J.D, Introduction to Automata Theory, Languages and Computations, Third Edition, 2006.

REFERENCE BOOKS:

1. Martin J, Introduction to Languages and the Theory of Computation, Third Edition, TMH, 2003
2. Lewis H. R and Papadimitriou C.H , "Elements of The theory of Computation, United States Edition, 1997.

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INT18R371	DATABASE MANAGEMENT SYSTEMS	L	T	P	Credit
		3	0	2	4

Pre-requisite : Nil	Course Category : Program Core
	Course Type: Integrated course

COURSE OBJECTIVES

1. To make students to understand the different issues involved in the design and implementation of a database system.
2. To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server)

COURSE OUTCOMES :

CO1 : Apply the database management system concepts.

CO2 : Design relational and ER model for database design

CO3 : Examine issues in data storage and query processing and frame appropriate solutions.

CO4 : Analyze the role and issues like efficiency, privacy, security, ethical responsibility and strategic advantage in data management

CO5 : Build applications to schedule concurrent executions with recovery mechanisms.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S			S							M	M	S			
CO2	S	S	S	S	S								S	S		M
CO3	S					S							S			
CO4	S	S	S	S	S	S	S	S			M	M	S	S		M
CO5	S	S	S	S	S						M	M	S	S		M

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UNIT I   INTRODUCTION

Introduction to File Systems - Introduction to Database Systems - Database System Structure – Views of Data - Data Models - Types of Data Models – Database Languages - Database Users and Administrator–– ER Model - E-R Diagrams.

UNIT II   RELATIONAL MODEL

Relational Model – Catalog – Types – Keys - Relational Algebra- Domain - Tuple Relational Calculus **-** SQL – Data Definition - Queries In SQL – Updates - Views – Integrity and Security – Sub Queries - Correlated Sub Queries - Relational Database Design – Functional Dependences And Normalization For Relational Databases (up to BCNF).

UNIT III   DATA STORAGE AND QUERY PROCESSING

Record Storage and Primary File Organization - Secondary Storage Devices- Operations on Files - Heap File - Sorted Files - Hashing Techniques – Index Structure for Files – Different Types Of Indexes – B-Tree - B+Tree – Database Tuning - Query Processing.

UNIT IV   TRANSACTION MANAGEMENT

Transaction Concepts – Transaction Recovery – ACID Properties –Need for Concurrency Control - Schedule and Recoverability- Serializability and Schedules – Concurrency Control – Types of Locks- Two Phases locking- Deadlock- Time Stamp based Concurrency Control – Recovery Techniques – Concepts - Immediate Update - Deferred Update - Shadow Paging.

UNIT V   DATABASE SECURITY AND ADVANCED DATABASES

Data Classification - Threats and Risks – Database Access Control – Types of Privileges – Cryptography - Statistical Databases - Distributed Databases – Architecture - Transaction Processing - Relevance Ranking - Crawling and Indexing Web-Object Oriented Databases - XML Databases.

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LIST OF EXPERIMENTS

Implementation of DDL commands in RDBMS.

1. Implementation of DML and DCL commands in RDBMS.
2. Implementation of Date and Built in Functions of SQL.
3. Implementation of Simple Programs.
4. Implementation of High-level language extension with Cursors.
5. Implementation of High level language extension with Triggers
6. Implementation of stored Procedures and Functions.
7. Embedded SQL.
8. Database design using E-R model and Normalization.
9. Database Connectivity using ADO
10. Database Connectivity using ODBC
11. Database Connectivity using JDBC

TEXT BOOK:

1. Abraham Silberschatz, Henry F., Korth and Sudarshan S, "Database System Concepts", McGraw-Hill, Sixth Edition, 2010.

REFERENCE BOOKS:

1. Ramez Elmasri and Shamkant B. Navathe, "Fundamental Database Systems", Pearson Education, Fifth Edition 2008.
2. Raghu Ramakrishnan, "Database Management System", Tata McGraw-Hill Publishing Company, 2003.
3. Hector Garcia–Molina, Jeffrey D.Ullman and Jennifer Widom, "Database System Implementation", Pearson Education, Second Edition, 2009.
4. C.J.Date, A.Kannan and S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
5. Atul Kahate, "Introduction to Database Management Systems", Pearson Education, New Delhi, 2006.
6. Alexis Leon and Mathews Leon, "Database Management Systems", Vikas Publishing House Private Limited, New Delhi, 2003.

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CSE18R271	OBJECT ORIENTED PROGRAMMING	L	T	P	Credit
		3	0	2	4
Pre-requisite: NIL		**Course Category:** Program Core			
		Course Type : Integrated Course			

COURSE OBJECTIVES :

1. To make the students to understand the object-oriented concepts and get familiar with the syntax and semantics of C++.
2. To facilitate the students in acquiring the problem solving skills by applying object oriented concepts to real world problems and realize the importance of standard template library to create generic code,

COURSE OUTCOMES :

CO1 : Elaborate the concepts of Object Oriented Programming.
CO2 : Create programs by applying various OOP features of C++
CO3 : Examine and design reusable components.
CO4 : Select and use objects from standard template libraries
CO5 : Develop programs with fault tolerant capability.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												S			
CO2	S	S	S	S	S	S	S				M		S	M		L
CO3	S	S	S	S	S	S	S				M	M	S	M		L
CO4	S	S	S	S	S	S	S				M	M	S	M		L
CO5	S	S	S	S	S	S	S				M	M	S	M		L

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UNIT I INTRODUCTION

Introduction to OOP – Basic Concepts of OOP – Applications of OOP- Introduction to C++ - Introduction to C++ - C++ Input and Output – Declarations in C++ - Creating New Data Types in C++ -Namespaces - Function Prototypes – Inline Functions – Reference Parameters – Const Qualifier – Dynamic Memory Allocation – Default Arguments – Unary Scope Resolution Operator.

UNIT II CLASSES, CONSTRUCTORS AND FRIEND CLASS

Introduction – Comparing Class with Structure – Class Scope – Accessing Members of a Class – Constructor – Destructor – Passing and Returning Objects From Functions - Const Objects – Const Member Functions – Friend Class – Friend Function – This Pointer – Static Members

UNIT III OVERLOADING & INHERITANCE

Function overloading - Operator Overloading – Fundamentals – Restrictions – Overloading Stream Insertion and Extraction operators – Overloading Unary & Binary operators – Converting between Types – Overloading ++ and -- Inheritance – Introduction – Protected members – Casting Base Class Pointers to Derived Class Pointers – Overloading Base Class Members in a Derived Class – Public, Protected and Private inheritance – Direct and Indirect Base Classes – Constructors and Destructors in Derived Classes – Implicit Derived Class Object to Base Class Object Conversion.

UNIT IV VIRTUAL FUNCTIONS, STREAMS AND FILES

Introduction – Virtual Functions – Abstract Base Classes and Concrete Classes – Polymorphism – Dynamic Binding – Virtual Destructors. C++ Stream I/O: Streams – Stream Input – Stream Output – Unformatted I/O – Stream manipulators – Stream Format States – Stream Error States - Files: File Operations, File pointers, Error Handling during File Operations.

UNIT V TEMPLATES, STL AND EXCEPTION HANDLING

Templates – Function templates – Class templates – Overloading template functions – Class template and Non-Type parameters –Templates with Multiple parameters - STL - Exception Handling - Basic of C++ exception, Catching and rethrowing an Exception, Exception Specifications.

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LIST OF EXPERIMENTS:

1. Programs using reference parameters, DMA, inline functions, namespaces, default arguments.
2. Programs to demonstrate classes, various constructors and objects.
3. Programs using friend class and friend function.
4. Programs to implement Function Overloading.
5. Programs to overload Unary & Binary Operators using member, friend function.
6. Programs to overload new, delete and stream operators.
7. Programs to implement various types of inheritance
8. Programs for Function Overriding /Virtual Function / Pure virtual function
9. Programs on Class Templates and STL.
10. Programs using Files, Streams and Manipulators.

REFERENCE BOOKS:

1. Bjarne Struoustrup, "The C++ Programming Language", Fourth Edition, Addison-Wesley, 2013.
2. Bjarne Struoustrup, "A Tour of C++", Addison-Wesley, 2014.
3. D.S.Malik, "C++ Programming Language", CENGAGE Learning, 2009.
4. John R.Hubbard, "Programming with C++", Schaums outline series, TMH 2003.
5. Deitel H.M., and Deitel P.J., "How to program C++", PHI 2003.

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CSE18R371	COMPUTER NETWORKS	L	T	P	Credit
		3	1	2	5

Pre-requisite: CSE18R272 / Operating System	Course Category : Program Core
	Course Type : Integrated Course with Tutorial

COURSE OBJECTIVES :

1. To provide students with an overview of the concepts and fundamentals of data communication and computer networks.
2. To introduce students to local, metropolitan and wide area networks using the standard OSI reference model as a framework and to the Internet protocol suite and network tools and programming using various networking technologies.

COURSE OUTCOMES :

CO1 : Inspect the basics of data communication and various categories of networks
CO2 : Identify the technologies for error free transmission of data over internet
CO3 : Apply various routing protocols to select optimal path and relate addressing entities in Network Layer
CO4 : Implement different transport and application layer protocols which enables data communication over internet
CO5 : Configure intermediate devices used in networks

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												S	M		M
CO2	S												S	M		M
CO3	S	S	S	S	S	M	L				S	M	S	M		M
CO4	S	S	S	S	S	M	L				S	M	S	M		M
CO5	S	S	S	S	S	M	L				S	M	S	M		M

UNIT I INTRODUCTION TO NETWORKS AND PHYSICAL LAYER

Introduction: Networks, Uses of Networks, Network Topology, Transmission Modes - Network Hardware - Transmission technology - Categories of Networks - Network Software - Protocol Hierarchy - Design issues for the layers – Services - Reference Model: TCP/IP and OSI - Internet: Architecture of Internet - Physical Layer: Need and Issues, Data Communication, Guided transmission media, Wireless Transmission, Communication Satellites, Multiplexing and Switching.

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UNIT II DATA LINK LAYER

DLL: Need and Issues - Error Detection and Correction - Protocol Verification and Data Link Layer protocols - MAC Sub layer - Channel Allocation Problem - Multiple Access Protocols – Ethernet - Wireless LANs and VLAN - Data Link Layer Switching - Connectivity Devices - Configuration of Switches.

UNIT III NETWORK LAYER

Network Layer - Need and Issues - Routing algorithms - Congestion Control Algorithms – QOS - Network Layer in Internet - Network Addressing - Configuration of Router - ARP and RARP.

UNIT IV TRANSPORT LAYER

Transport Layer - Need and Issues - Transport service - Elements of Transport Protocols - Simple Transport Protocol - TCP and UDP.

UNIT V   APPLICATION LAYER

Application Layer - Need and Issues – DNS - Electronic Mail – FTP – HTTP – WWW - RPC - RMI.

LIST OF EXPERIMENTS

1. Study of Socket Programming
2. Socket Programming for Client-Server Communication
3. Configuration of Switch
4. Configuration of Router
5. Implementation of ARP and RARP
6. Network Protocol analysis using Wireshark.
7. Study of Network Simulator-3 or NetSim.
8. Simulation and Analysis of TCP using Netsim.
9. Measuring Network Performance using NS-3 .
10. Simulation and Analysis of RIP & OSPF using Netsim.
11. Download a File from HTTP Server.

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TEXT BOOKS:

1. Andrew S Tanenbaum, David J. Wetherall, "Computer Networks", Fifth Edition Pearson Education, 2011

2. Behrouz A. Forouzan, "Data Communications and Networking",Seventh Edition,, McGraw-Hill, 2017

REFERENCE BOOKS:

1. Larry Peterson Bruce Davie , "Computer Networks - A Systems Approach", Fifth Edition by, Morgan Kaufmann , 2011

2. Todd Lammle, "CCNA Cisco Certified Network Associate Study Guide", 7th Edition, 2011

3. B. S. Manoj, C. Siva Ram Murthy , "Ad Hoc Wireless Networks Architectures and Protocols", Prentice Hall, 2004

4. Behrouz A. Forouzan, "Data Communications and Networking" Fourth Edition,, McGraw-Hill, 2006

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CSE18R272	JAVA PROGRAMMING	L	T	P	Credit
		3	0	2	4
Pre-requisite: Nil	**Course Category :** Program Core				
	Course Type : Integrated Course				

COURSE OBJECTIVES :

To enhance knowledge on object-oriented programming using JAVA language with more emphasis on event-driven and network programming.

COURSE OUTCOMES :

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

CO1 :Develop Java programs using OOP principles
CO2: Develop Java programs with the concepts inheritance and interfaces
CO3 :Build Java applications using exceptions and I/O streams
CO4 : Develop Java applications with threads and generics classes
CO5 :Develop interactive Java programs using swings

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												S			
CO2	S	S	S	S	S	S	S				M		S	M		L
CO3	S	S	S	S	S	S	S				M	M	S	M		L
CO4	S	S	S	S	S	S	S				M	M	S	M		L
CO5	S	S	S	S	S	S	S				M	M	S	M		L

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS

Object Oriented Programming - Abstraction – objects and classes - Encapsulation-Inheritance - Polymorphism- OOP in Java – Characteristics of Java – The Java Environment - Java Source File -Structure – Compilation. Fundamental Programming Structures in Java – Defining classes inJava – constructors, methods -access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays , Packages - JavaDoc comments.

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UNIT II INHERITANCE AND INTERFACES

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes-the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning -inner classes, Array Lists - Strings

UNIT III EXCEPTION HANDLING AND I/O

Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files

UNIT IV MULTITHREADING AND GENERIC PROGRAMMING

Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations.

UNIT V EVENT DRIVEN PROGRAMMING

Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes - actions - mouse events - AWT event hierarchy - Introduction to Swing – layout management - Swing Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes.

TEXT BOOKS:

1. Herbert Schildt, ―Java The complete reference, 8 th Edition, McGraw Hill Education, 2011.

2. Cay S. Horstmann, Gary cornell, ―Core Java Volume –I Fundamentals, 9 th Edition, Prentice Hall, 2013.

REFERENCES:

1. Paul Deitel, Harvey Deitel, ―Java SE 8 for programmers, 3 rd Edition, Pearson, 2015.

2. Steven Holzner, ―Java 2 Black book‖, Dreamtech press, 2011.

3. Timothy Budd, ―Understanding Object-oriented programming with Java, Updated Edition, Pearson Education, 2000.

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CSE18R273	OPERATING SYSTEMS	L	T	P	Credit
		3	0	1	4
Pre-requisite: CSE18R174 **/**Computer Architecture and Organization	**Course Category :** Program Core **Course Type** : Integrated Course				

COURSE OBJECTIVE :

- To learn the mechanisms of OS to handle processes and threads and their Communication
- To learn the mechanisms involved in memory management in contemporary OS
- To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
- To know the components and management aspects of concurrency management

COURSE OUTCOMES :

CO1: Interpret Operating System Structure, Operations, Services and Process
CO2: Elaborate Multithreaded Programming, Process Scheduling and Synchronization
CO3: Evaluate different memory management schemes
CO4: Design and implement File system functionalities
CO5: Experiment with various disk management schemes

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S				S								S			
CO2	S	M			S								S			
CO3	S	M	M		S		M				M	M	S			
CO4	S	M	M		S							M	S			
CO5	S	M	M		S		M				M	M	S			

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UNIT I INTRODUCTION TO OPERATING SYSTEMS

Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case study on UNIX and WINDOWS Operating System

UNIT II PROCESS SCHEDULING

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching **Thread:** Definition, Various states, Benefits of threads, Types of threads, Concept of multi threads,

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non preemptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.

UNIT III PROCESS SYNCHRONIZATION AND DEADLOCK

Operations on Processes , Cooperating Processes , Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer's Problem, Dining Philosopher Problem etc.

Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

UNIT IV MEMORY MANAGEMENT

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging.

Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).

UNIT V FILE AND SECONDARY STORAGE MANAGEMENT

I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/O Software **Disk Management:** Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.

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LIST OF EXPERIMENTS:

1. Windows and UNIX Commands
2. Simulation of System calls
3. Implementation of CPU Scheduling algorithms
4. Simulation of IPC in UNIX
5. Implementation of deadlock avoidance algorithms
6, Implementation of Page replacement algorithms
7. Implementation of memory management functions
8. Implementation of disk scheduling algorithms

TEXT BOOKS :

1.Operating System Concepts Essentials, 9th Edition by Avi Silberschatz, Peter Galvin,Greg Gagne, Wiley Asia Student Edition,2012

2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India,2007

REFERENCE BOOKS

1. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
2. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley.
3. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India
4. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly   and Associates

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CSE18R274	COMPILER DESIGN	L	T	P	Credit
		3	1	0	4

Pre-requisite: CSE18R252 / Formal Language and automata	Course Category : Program Core Course Type : Integrated Course

COURSE OBJECTIVES

- To understand the theory and practice of compiler implementation.
- To learn finite state machines and lexical scanning.
- To learn context free grammars, compiler parsing techniques, construction of abstract syntax trees, symbol tables, intermediate machine representations and actual code generation

COURSE OUTCOMES :

CO1: Understand the different phases of compilation
CO2: Apply context free grammars to parsing and compare different parsing technique
CO3: Develop skills on lexical analysis and parsing which are helpful to a broad range of computer science application areas.
CO4: Design the various code generation schemes.
CO5: Analyze optimization techniques to reduce the code size

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S	M											S			
CO2	S	M	S	M	M	L	L	L			M	M	S	L		L
CO3	S	M	S	M	M	L	L	L			M	M	S	L		L
CO4	S	M	S	M	M								S			
CO5	S	M	S	M	M	L	L	L			M	M	S	L		L

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UNIT I INTRODUCTION

Introduction to Compiler – The structure of a compiler- Compiler- Lexical Analysis – Role of the lexical analysis – Input Buffering – Specification of tokens- Recognition of tokens – Lexical analyzer generator

UNIT II LEXICAL ANALYSIS

Finite Automata – Regular Expression to an NFA - Optimization of DFA based pattern matchers- The Role of the Parser - Context-Free Grammars - Writing a Grammar -Top-Down Parsing - Recursive Descent Parsing – Predictive Parsing - Bottom-Up Parsing - Shift Reduce Parsing - Operator-Precedence Parsing

UNIT III SYNTAX ANALYSIS

Introduction to LR parsing - SLR Parser – Canonical LR Parser – LALR Parser Generators - Intermediate Languages – Declarations – Control Flow -Boolean Expressions –Switch Statements - Back patching .

UNIT IV INTERMEDIATE CODE GENERATION

Issues in the Design of a Code Generator - The Target Language - Addresses in the target code - Basic Blocks and Flow Graphs - A Simple Code Generator - DAG Representation of Basic Blocks

UNIT V CODE OPTIMIZATION AND RUN TIME ENVIRONMENTS

The Principal Sources of Optimization - Optimization of Basic Blocks - Peephole optimization- Loops in Flow Graphs –Runtime environments –Storage organizations-stack allocation of space – Access to nonlocal data on the stack

LIST OF EXPERIMENTS:

1. Implementation of Lexical Analyzer
2. Construction of Symbol Table
3. Construction of a NFA from a regular expression
4. Computation of FIRST and FOLLOW for a given grammar
5. Implementation of operator precedence parsing Algorithm
6. Implementation of shift reduce parsing Algorithm
7. Generation of a code for a given intermediate code
8. Use LEX tool to implement a lexical analyzer
9. Use YACC tool to implement a desktop calculator
10. Use YACC tool to implement a parser

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TEXT BOOK

1. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, Monica S. Lam, Compilers: Principles, Techniques, and Tools, Second Edition , 2014

REFERENCE BOOKS

1. Allen I. Holub, Compiler Design in C, Prentice Hall of India, 2003
2. Bennet J.P., Introduction to Compiler Techniques, Tata McGraw-Hill, 2nd Edition, 2003
3. Henk Alblas and Albert Nymeyer,, Practice and Principles of Compiler Building with C, PHI, 2001.

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PROFESSIOANL ELECTIVE COURSES

CSE18R352	NETWORK AND INFORMATION SECURITY	L	T	P	Credit
		3	0	1	3.5
Pre-requisite: CSE18R371 / Computer Networks	**Course Category :** Professional Elective **Course Type** : Theory with Practical Component				

COURSE OBJECTIVES :

1. To enable students to understand the Information security's role, threats, elements of cryptography, protocols, architectures and technologies for secure systems and services.

COURSE OUTCOMES :

CO1 : Examine the security architecture, services and mechanisms
CO2 : Apply the knowledge of number theory in public key cryptography
CO3 : Analyze the various data integrity algorithms
CO4 : Interpret the various internet and network security mechanisms
CO5 : Evaluate various system security mechanisms.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												S	M		M
CO2	S	S		S	S	M	L						S	M		M
CO3	S	S	S	S	S	M	L				S	M	S	M		M
CO4	S	S	S	S	S	M	L				S	M	S	M		M
CO5	S	S	S	S	S	M	L				S	M	S	M		M

UNIT I INTRODUCTION

An Overview of Computer Security - OSI Security Architecture - Security Services - Security Mechanisms - Security Attacks - Classical Encryption Techniques - Block Ciphers and Data Encryption Standard - Advanced Encryption Standard

UNIT II   PUBLIC KEY CRYPTOSYSTEMS

Number Theory- Block Cipher Operation - Public Key Cryptography and RSA -Other Public Key Cryptosystems - Diffie Hellman Key Exchange - Elgamal Cryptosystems - Elliptic Curve Cryptography

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UNIT III DATA INTEGRITY ALGORITHMS

Cryptographic Hash Function - Hash Function based on Cipher Block Chaining-Secure Hash Algorithms -SHA3 - Message Authentication Code – HMAC - DAA and CMAC - Authenticated encryption - Digital signature

UNIT IV   NETWORK AND INTERNET SECURITY

Transport Level security - Secure Socket Layer - Transport Layer Security – HTTPS - Secure Shell - E-mail Security - Pretty Good Privacy - S/MIME - Domain Keys Identified Mail - IP Security

UNIT V SYSTEM SECURITY

Intruders - Malicious software – Viruses – Worms - Distributed denial of service Attacks - Firewalls

LIST OF EXPERIMENTS

1. Implementation of Ceaser cipher
2. Implementation of hill cipher
3. Implementation of play fair cipher
4. Implementation of DES algorithm
5. Implementation of RSA algorithm
6. Implementation of Diffie hellman key exchange algorithm
7. Implementation of AES algorithm
8. implementation of firewall techniques
9. Implementation of email security
10. Implementation of IP security

TEXT BOOK:

1. William Stallings, "Cryptography and Network Security Principles and Practice" Seventh Edition, PHI, 2017.

REFERENCES BOOKS:

1. Behrouz A. Ferouzan, "Cryptography & Network Security", Tata Mc Graw
   2nd Edition, 2010.
2. **Charles Pfleeger, "Security in Computing", 5th Edition, Prentice Hall of India, 2015**

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CSE18R353	ADHOC AND SENSOR NETWORKS	L	T	P	Credit
		3	0	1	3.5
Pre-requisite: CSE18R371 / Computer Networks	Course Category : Professional Elective Course Type : Theory with Practical				

COURSE OBJECTIVES :

1. To facilitate the students to understand need for Infrastructure less networks and their importance in the future directions for wireless communications.

2. To provide a broad coverage of challenges and security issues related to the design and management of wireless sensor networks.

COURSE OUTCOMES :

CO1 : Elaborate the design issues in ad hoc and sensor networks.
CO2 : Explore and analyze the performance of different routing protocols.
CO3 : Compare the different types of Transport layer and secure protocols.
CO4 : Analyze the QoS issues in ad hoc networks.
CO5 : Evaluate the energy efficiency of various protocols in wireless sensor networks

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M	L		L
CO2	S	S		S	S	M	L						M	L		L
CO3	S	S	S	S	S	M	L				S	M	M	L		L
CO4	S	S	S	S	S	M	L				S	M	M	L		L
CO5	S	S	S	S	S	M	L				S	M	M	L		L

UNIT I INTRODUCTION & MAC PROTOCOLS

Ad Hoc Wireless Networks Issues - MAC protocols for ad hoc Wireless Networks: Issues - Classification of MAC Protocols - Contention Based protocols - Contention-Based Protocols with Reservation Mechanisms - Contention-Based MAC Protocols with scheduling Mechanisms.

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UNIT II ROUTING PROTOCOLS

Classifications - Table Driven - On-Demand - Hybrid and Hierarchical Routing Protocols - Routing Protocols with efficient Flooding mechanism - Power aware Routing Protocols - Operation of Multicast Routing Protocols - Energy efficient Multicasting and Multicasting with QoS guarantees.

UNIT III TRANSPORT LAYER AND SECURITY PROTOCOLS

Introduction - Issues - Design Goals - Classification of Transport Layer Solutions - TCP over Ad Hoc Wireless Networks - Other Transport Layer Protocols - Security in Ad Hoc Wireless Networks - Secure Routing in Ad Hoc wireless Networks.

UNIT IV QOS

Introduction - Issues and Challenges - Classifications of QoS Solutions - MAC Layer Solutions - Network Layer Solutions - QoS Frameworks for Ad Hoc Wireless Networks

UNIT V ENERGY MANAGEMENT

Introduction - Need for Energy Management - Classification of Energy Management Schemes - Battery Management Schemes - Transmission Power Management Schemes - System Power Management Schemes

List of Experiments:

1. Simulate Ad hoc network using AODV
2. Simulate Ad hoc network using DSDV
3. Simulate Ad hoc network using DSR protocol.
4. Simulate a MPLS network using LDP protocol.
5. Simulate a MPLS network for differentiated Services

TEXT BOOK:

- Siva Ram Murthy C, Manoj B.S., Ad Hoc Wireless Networks: Architectures and Protocols, Prentice Hall.

REFERENCE BOOKS:

1. Chai-Keong Toh, Ad Hoc Mobile Wireless Networks, PHI, 2002.
2. Charles Perkins, Ad Hoc Networking, Addison Wesley, 2001.
3. Mohammed Liyas, Handbook of Ad Hoc Wireless Networks, CRC Press, 2003.
4.

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ECE18R461	WIRELESS COMMUNICATION FOR COMPUTER ENGINEERS	L	T	P	Credit
		3	0	1	3.5
Pre-requisite: CSE18R371 / Computer Networks	**Course Category :** Professional Elective **Course Type :** Theory with Practical				

COURSE OBJECTIVES :

- To get an understanding of mobile radio communication principles, types and to study the recent trends adopted in cellular and wireless systems and standards.

COURSE OUTCOME(S):

At the end of the course, the student will be able to:

CO1: Explain different transmission techniques and modulation schemes for wireless communication

CO2: Summarise various technology trends for next generation cellular wireless networks

CO3: Identify the components of GSM, GPRS and Bluetooth software model for mobile computing

CO4: Describe protocol architecture of WLAN technology, WAP and WML file systems.

CO5: Illustrate routing algorithms and different transmission control techniques in transport layer of mobile networks

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S													L		L
CO2	S	S	S	S	S									L		L
CO3	S	S	S	S	S						L	L	M			
CO4	S	S	S	S	S						L	L	M			
CO5	S					S	M				L	L	M	L		L

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UNIT I BASICS OF WIRELESS TRANSMISSION

Wireless transmission, Frequencies for radio transmission, Signals, Antennas, Signal propagation. Multiplexing. Modulation schemes, Advanced FSK, Advanced PSK, Multicarrier modulation. Spread spectrum – Direct sequence, Frequency hopping, SDMA, FDMA, TDMA, CDMA.

UNIT II CELLULAR ARCHITECTURE

Evolution of Mobile Communication, trends in Cellular radio and personal communications, Cellular Concept, frequency reuse, channel assignment, hand off interference and system capacity- trunking and grade of service.

UNIT III WIRELESS SYSTEMS

GSM - Mobile services, System Architecture, protocol. Data services – GPRS. DECT, UMTS, IMT2000, Mobile AD HOC Networks - AD HOC Routing Protocols – DSDV - DSR and AODV Routing Techniques - Quality of service in Mobile Ad hoc Networks

UNIT IV WIRELESS LAN

IEEE 802.11 - System Architecture and Protocol Architecture of IEEE 802.11 – Physical and MAC layer – MAC management, HIPERLAN, Bluetooth

UNIT V MOBILE NETWORK LAYER

Mobile internet-mobile network layer-mobile IP-dynamic host configuration protocol-ad hoc networks mobile transport layer-implications of TCP on mobility-indirect TCP-snooping TCP- mobile TCP transmission-selective retransmission, Transaction oriented TCP-support for mobility-file systems-WAP - WML -wireless telephony applications

LIST OF EXPERIMENTS :

1. Hardware Experiments - Study of ZigBee / Wi-Fi / Bluetooth / GSM Trainer Kit
2. Simulation Experiments - Simulation of a simple wireless network (OMNET++ with INET or ns-3 or OPNET or GNS3 or equivalent)

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TEXT BOOK(S):

1. Upena Dalal, "WirelessCommunication", Oxford University Press, 2008
2. Jochen Schiller, "Mobile Communications", Pearson Education, 2nd Edition,2008

REFERENCE(S):

1. Theodore S. Rappaport, "Wireless Communications: Principles and Practice", Pearson, 2nd Edition, 2012
2. Raymond Steele, "Mobile Radio Communications", Wiley/IEEE Press, New York, 2010
3. W. C. Y. Lee, "Wireless and Cellular Telecommunications", McGraw Hill, 3RD Edition ,2003
4. W. C. Y. Lee, "Mobile Cellular Telecommunications Systems", McGraw Hill, 1990
5. T. G Palanivelu, R. Nakkeeran, "Wireless and Mobile Communication", PHI, 2009
6. Aditya. K. Jegannatham, "Principles of Modern Wireless Communication Systems", McGraw Hill, 2016
7. Andrea Goldsmith, "Wireless Communication", Cambridge University Press, India, 2009, ISBN: 9780521704168

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CSE18R354	GRAPH THEORY AND ITS APPLICATIONS	L	T	P	Credit
		3	1	0	4
Pre-requisite: Nil	**Course Category :** Professional Elective **Course Type** : Theory				

COURSE OBJECTIVES :

1. To introduce students with the fundamental concepts in graph theory, with a sense of some its modern applications.

2. To make students to use graphs as a powerful modeling tool to apply the abstract concepts of graph theory in modeling and solving non-trivial problems in the field of computer science.

COURSE OUTCOMES :

CO1: Interpret the basic concepts of graphs, directed graphs, and weighted graphs and able to present a graph by matrices.
CO2: Apply the properties of trees and able to find a minimal spanning tree for a given weighted graph.
CO3: Construct Eulerian and Hamiltonian graphs.
CO4: Build mathematical model for an application using graph theory.
CO5: Demonstrate understanding of the basic techniques and strategies of applying graph theory to solve advanced data structures and other real world problems on a computer networks.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												S	L		
CO2	S	S	S	S	S						M	M	S	L		
CO3	S	S	S	S	S						M	M	S	L		
CO4	S	S	S	S	S						M	M	S	L		
CO5	S	S	S	S	S						M	M	S	L		

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UNIT – I BASIC CONCEPTS IN GRAPH THEORY

Graphs - directed and undirected, sub graphs, vertex induced sub graphs, graph models, degree of a vertex, degree sequence, handshaking lemma, complement of a graph, self complementary graphs, walk, trial, path, connectivity, connectedness, distance, eccentricity, radius, diameter, vertex and edge cuts, vertex partition, independent set, clique. Common classes of graphs – regular, complete Petersen, cycle, path, tree, k-partite, planar, hypercube, mesh - Isomorphic graphs. Representation of graphs – adjacency list, incidence list, adjacency matrix and incidence matrix, Digraph – orientation, strongly, weekly and unilaterally connected digraphs, directed acyclic graph.

UNIT II GRAPH ALGORITHMS

Search algorithms – depth first search and breadth first search, spanning tree algorithm – Kruskal's and Prim's shortest path algorithm – Dijkstra's and Floyd-Warshall. Characterization of Euler graphs, necessary sufficient conditions for the existence of Hamiltonian cycles, Eulerian graphs – Chinese postman problem and its solution – Hamiltonian graphs – travelling salesman problem – nearest neighbour algorithm- Adjacency matrix and incidence matrix of graphs - Trees, Spanning trees, Matrix tree theorem.

UNIT III GRAPH COLORINGS AND MATCHINGS

Chromatic number – Chromatic partitioning – Chromatic polynomial – Matching – Covering – Four color problem, Vertex colorings, Map – colorings, Edge colorings – Applications - Berge's Theorem, Halls theorem, Tuttes Perfect matching theorem – k-matchings (reduction to perfect matching problem), job – assignments problem.

UNIT IV PERMUTATIONS & COMBINATIONS

Fundamental principles of counting – Permutations and combinations – Binomial theorem – combinations with repetition – Combinatorial numbers – Principle of inclusion and exclusion – Derangements – Arrangements with forbidden positions.

UNIT V NETWORK FLOWS AND APPLICATIONS

Flows and cuts in Networks – augmenting path algorithm, Maximum – flow problem, min-cut and max-cut algorithms, flows and connectivity – Applications.

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TEXT BOOKS:

1. Narsingh Deo, "Graph Theory with Applications to Engineering and Computer Science", PHI Publisher, 2014.
2. Yellen J and Gross J, "Graph Theory and its Applications", Chapman & Hall, Boca Raton, 2006
3. Grimaldi R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", Addison Wesley, 1994.

REFERENCE BOOKS:

1. Clark J. and Holton D.A, "A First Look at Graph Theory", Allied Publishers, 1995.
2. Mott J.L., Kandel A. and Baker T.P. "Discrete Mathematics for Computer Scientists and Mathematicians" , Prentice Hall of India, 1996.
3. Liu C.L., "Elements of Discrete Mathematics", Mc Graw Hill, 1985.
4. Rosen K.H., "Discrete Mathematics and Its Applications", Mc Graw Hill, 2007.
5. D.B.West, "Introduction to Graph Theory", Prentice Hall of India, New Delhi, 2004.
6. J.A.Bondy and U.S.R Murty, "Graph Theory", Springer, New York, 2008.
7. Santanu Saha Ray, "Graph Theory with Algorithms and its Applications: In Applied Science and Technology" Springer, 2013.
8. Jean-Claude Fournier, "Graphs Theory and Applications: With Exercises and Problems" John Wiley & Sons.
9. Mamta Mittal, " Graph Theory and Application", Anmol Publications Pvt. Ltd, 2011.

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CSE18R355	VIRTUALIZATION	L	T	P	Credit
		3	0	1	3.5
Pre-requisite: CSE18R371 / Computer Networks	**Course Category :** Professional Elective **Course Type** : Theory with P:ractical				

COURSE OBJECTIVES :

- To make the students realize the need and benefits of virtualization and automation by introducing various types, architectures and implementation of virtualization.

COURSE OUTCOMES :

CO1 : Justify the need and benefits of virtualization over the conventional methods.
CO2 : Analyze various virtualization approaches
CO3 : Elaborate the concept and working mechanism of virtual machines.
CO4 : Examine the data management of complex virtual environments using VM ware technology.
CO5 : Compare performance factors of virtualized systems, principal issues in troubleshooting virtual environments, evaluation of small scale virtual environment developed in the lab.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S												M			
CO3	S												M			
CO4	S	S	S	S	S	M	L				S	M	M	L		L
CO5	S	S	S	S	S	M	L				S	M	M	L		L

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UNIT I   INTRODUCTION

Virtualization Overview - Benefits – Need Of Virtualization – Limitations – Traditional Vs Contemporary Virtualization – Pitfalls of Virtualization – Hypervisors –Virtualization Considerations for Cloud Providers.

UNIT II TYPES OF VIRTUALIZATION

Types of Hardware Virtualization: Full Virtualization – Para Virtualization – Desktop Virtualization – Server Virtualization – Data Virtualization – OS Level Virtualization – Application Level Virtualization – Comparing Virtualization Approaches – Managing Heterogeneous Virtualization Environment – Customized and Modifying Virtualization – Advanced Virtualization – Case Studies.

UNIT III   VIRTUAL MACHINE

Understanding Virtual Machines – Taxonomy of Virtual Machines – Life Cycle – Process and System Level Virtual Machines – Emulation – Binary Translation Techniques – Managing Storage for Virtual Machine – Applications of Virtual Machines

UNIT IV IMPLEMENTATION

Building and Managing Virtual Machine – Xen – Hypervisor And Its Architecture – VMware VSphere – Kernel Virtual Machine (KVM) – Microsoft Hyper-V - Virtual Box

UNIT V AUTOMATION AND MANAGEMENT

Cloud Management Reference Architecture – Data Center Challenges And Solutions – Goals Of Automating Virtualization Management – Automating The Data Center – Benefits Of Data Center Automation – Virtualization For Automatic Service Provision – Virtualization Management – Evaluating Virtualization Management Solutions – Tools For Automation Puppet.

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LIST OF EXPERIMENTS :

1. Virtual Machine Creation.
2. Installation of vCenter.
3. Working with automation tools: Puppet, chef
4. Working with Microsoft Hyper-V

REFERENCE BOOKS:

1. Rajkumar Buyya, James Broberg, Andrzej Goscinski, "Cloud Computing principles and Pradigms", John Wiley & Sons, 2011.
2. James E.Smith, Ravi Nair, "Virtual Machines" , Elsevier, 2005.
3. Mathew Portney, "Virtualization Essentials", John Wiley & Sons, 2012.
4. Time Cerfing, Jeff Buller, Check Enstall, Richard Ruiz, "Mastering Microsoft Virtualization", Wiley Publications, 2010.
5. Ventkata Josyula, Malcolm Orr, Greg Page, "Cloud Computing: Automating the Virtualized Data Center", Cisco Press, 2012.
6. William Von Hagen, "Professional Xen Virtualization", Wiley Publications, 2008.
7. Cody Bunch, "Automating vSphere with VMware vCenter Orchestrator: Technology Hand-on", Pearson Education, 2012.

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CSE18R452	CLOUD COMPUTING TECHNIQUES	L	T	P	Credit
		3	0	1	3.5

Pre-requisite: CSE18R371 /	**Course Category :** Program Core
Computer Networks	**Course Type :** Theory with Practical

COURSE OBJECTIVES :

- To provide students with the comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, architecture and applications by introducing and researching state-of-the-art in Cloud Computing fundamental issues, technologies, applications and implementations.

COURSE OUTCOMES :

CO1 : Elaborate the layers and types of Cloud Computing
CO2 : Choose and use various software services from cloud
CO3 : Compare various models in cloud infrastructure
CO4 : Build applications using Mapreduce and GridBatch
CO5 : Experiment with resource allocation concept

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												S	M		M
CO2	S												S	M		M
CO3	S	S	S	S	S	M	L				S	M	S	M		M
CO4	S	S	S	S	S	M	L				S	M	S	M		M
CO5	S	S	S	S	S	M	L				S	M	S	M		M

UNIT I   INTRODUCTION TO CLOUD COMPUTING LANDSCAPE

Introduction - Cloud Systems Classifications - SPI Cloud Classification: Cloud Software Systems - Cloud Platform Systems - Cloud Infrastructure Systems – UCSB -IBM Cloud Ontology: Applications (SaaS) - Cloud Software Environment (PaaS) -Cloud Software Infrastructure - Software Kernel Layer - Cloud Hardware /Firmware - Jackson's Expansion on the UCSB - IBM Ontology - Hoff's Cloud Model

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UNIT II HARNESSING CLOUDS AND SOFTWARE SERVICES FOR SCIENCE

Science Gateways—Background and Motivation - Clouds and Software Services - Science Clouds, Public and Private - Cloud Computing for Science - Architecture of an SaaS Science Gateway - Dynamic Provisioning of Large-Scale Scientific Datasets

UNIT III   ENTERPRISE KNOWLEDGE CLOUDS
Introduction - Enterprise Knowledge Management: Architecture and Technologies - Enterprise Knowledge - Cloud Computing: IT as a Service - Cloud Computing Model Application Methodology - Cloud Computing in Development/Test - Cloud-Based High Performance Computing Clusters - Use Cases of Cloud Computing -Case Studies: Cloud as Infrastructure for an Internet Data Center, Cloud Computing for Software Parks, An Enterprise with Multiple Data Centers, Cloud Computing Supporting SaaS.

UNIT –IV   LARGE-SCALE DATAPROCESSING
Introduction – MapReduce - Programming Model - Implementation Sketch - Failure Handling – Optimizations – GridBatch - DFS Extension - GridBatch Operators - Sample Application: Computing Median - Traditional Enterprise Approach - Algorithm for Finding Medians - MapReduce Approach - GridBatch Approach -Comparing MapReduce and GridBatch Approaches - MapReduce Implementation on a Cloud OS - HigherLevel Programming Languages

UNIT V   HIGH-PERFORMANCE PARALLEL COMPUTING WITH CLOUD AND CLOUD TECHNOLOGIES AND RELIABLE CLOUD SERVICE
Introduction - Modeling the Service Load of a Cloud Computing System: Measuring the Workload - Framework for Requesting and Allocation Resources - Modeling the Availability and Reliability of a Cloud Computing Service - Modeling the Reliability of a Cloud Computing Service - High-Performance Parallel Computing with Cloud and Cloud Technologies - Cloud Technologies - Programming Models - Data Analyses Applications-Evaluations: Case studies - Kmeans and Matrix Multiplication - Alu Sequence Analysis - Performance of MPI on Clouds.

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LIST OF EXPERIMENTS

1. 1.Installation of Oracle Virtual box and creating virtual machine
2. Creating datacenter in Cloudsim
3. Installation of Map reduce.
4. Installation of Grid Batch
5. Program to find medians using Map reduce and Grid batch
6. Find procedure to install storage controller and interact with it.
7. Find procedure to set up the one node Hadoop cluster.
8. Mount the one node Hadoop cluster using FUSE.
9. Write a word count program to demonstrate the use of Map and Reduce tasks

TEXT BOOK:

1. Syed A. Ahson , Mohammad Ilyas, "Cloud Computing and Software Services Theory and Techniques", CRC Press, first edition,2011

REFERENCES :

1. Gautam Shroff, "Enterprise Cloud Computing: Technology, Architecture, Applications", Cambridge University Press, first edition, 2010

2. Shrief Sakr,Mohamed Gaber, "Large Scale and Big data processing and management", CRC press, first edition, 2014

3. Marijana Despotovi Zrakic, "Handbook of Research on High Performance and Cloud Computing in Scientific research and education", Information Science Reference-IGI Global, first edition, 2014.

4. San Murugesan, Irena Bojanova, "Encyclopedia of Cloud Computing", Wiley publication, Second edition, 2016

5. Borko Furht, Armando Escalante, "Handbook of Cloud Computing", Springer 2010

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CSE18R453	APPLIED CRYPTOGRAPHY THEORY AND ITS APPLICATIONS	L	T	P	Credit
		3	1	0	4

Pre-requisite: Nil	Course Category : Professional Elective
	Course Type : Theory

COURSE OBJECTIVES :

1. To understand basic principles of secure communication, know principles and problems of basic cryptosystems for encryption, digital signing and authentication.
2. To make the students to know methods to create core cryptographic protocols primitives, practically use simple cryptosystems; know how the real protocols enabling secure communication over internet, various tools and techniques to protect as well as attack a computer network**.**

COURSE OUTCOMES :

CO1: Analyze and model the mathematical foundations to modern cryptographic techniques.
CO2: Critically evaluate modern symmetric and asymmetric cryptographic techniques and attacks.
CO3: Employ modern cryptographic techniques to enhance overall system security.
CO4: Evaluate modern cryptographic techniques, such as Digital Signatures and Hashing.
CO5: Examine how cryptography is deployed in practice, with an emphasis on its application in network security.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												S	M		M
CO2	S	S		S	S	M	L						S	M		M
CO3	S	S	S	S	S	M	L				S	M	S	M		M
CO4	S	S	S	S	S	M	L				S	M	S	M		M
CO5	S	S	S	S	S	M	L				S	M	S	M		M

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UNIT I OVERVIEW

Overview of cryptography - Probability theory, Information theory, Complexity theory, Number theory, Abstract algebra, Finite fields

UNIT II NUMBER THEORY

Number - Theoretic Problems – Public Key Parameter - Pseudorandom Bits and Sequences.

UNIT III ATTACKS

Attacks - Services - Mechanisms - Conventional Encryption - Classical and Modern Techniques – Encryption - Algorithms - Confidentiality.

UNIT IV CIPHER TECHNIQUES

Stream Ciphers – Block Ciphers (including AES) –Public key Encryption – Hash Function and Data Integrity – Identification and Entity Authentication – Digital Signature – Key Establishment Protocols

UNIT V APPLICATIONS

Authentication,   Applications - Electronic Mail Security - IP Security - Web Security.

TEXT BOOKS:

1. Alfred Menezes J, Paul van Oorschot C and Scott Vanstone A, Hand Book of Applied Cryptography.
2. William Stallings, Cryptography and Network Security, Pearson Education India, 7th Edition,2017

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CSE18R454	CYBER SECURITY AND FORENSICS	L	T	P	Credit
		3	0	1	3.5
Pre-requisite : Nil	**Course Category :** Professional Elective				
	Course Type : Theory with Practical				

COURSE OBJECTIVES :

1. To facilitate students to understand about Cybercrimes, Ethical Hacking, cyber security, forensics and cyber laws.
2. To introduce forensics tools and make students to analyze and validate the digital evidences.

COURSE OUTCOMES :

CO1: Explain the role of digital forensics in the field of information assurance and cyber security and recognize the opportunities to benefit from and support the goals of those fields.

CO2: Adhere to the ethical standards of the profession and apply those standards to all aspects of the study and practice of digital forensics.

CO3: Employ fundamental computer theory in the context of computer forensics practices.

CO4: Using the scientific process, apply the principles of effective digital forensics investigation techniques.

CO5: Interpret and appropriately apply the laws and procedures associated with identifying, acquiring, examining and presenting digital evidence.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S	S		S	S	M	L						M			
CO3	S	S	S	S	S	M	L				S	M	M	L		
CO4	S	S	S	S	S	M	L				S	M	M	L		
CO5	S	S	S	S	S	M	L				S	M	M	L		

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UNIT-I INTRODUCTION TO CYBER SECURITY

Threats to security – Internet Fraud – Infrastructure attacks – Malicious hackers – Foundations of Information Assurance – Defense-in-depth strategy – Overview of RFC2196 - Common Criteria Model – Password Management – Incident Handling – Information warfare and operations.

UNIT-II SECURITY FOUNDATIONS

Access control: Purpose – Entities – Concepts – Criteria – Models – Users – Administration models – Mechanisms. Physical and environmental security controls – Applications development security – Techniques to enforce application security – Security Architecture – Operations Security – Host based intrusion detection – Network based detection efforts.

UNIT III INTRODUCTION TO COMPUTER FORENSICS

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud - Types of CF techniques - Incident and incident response methodology - Forensic duplication and investigation - Preparation for IR: Creating response tool kit and IR team. - Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition.

UNIT IV EVIDENCE COLLECTION AND FORENSICS TOOLS

Processing Crime and Incident Scenes – Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/ Hardware Tools.

UNIT V ANALYSIS AND VALIDATION

Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics

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LIST OF EXPERIMENTS:

1. Implementation for Intrusion detection
2. Logging (the best way to track down a hacker is to keep vast records of activity on a network with the help of an intrusion detection system)
3. Correlating intrusion detection and logging

REFERENCE BOOKS:

1. JohnW.Rittinghouse, William M.Hancock "Cyber security Operations Handbook", Elsevier, 2005
2. Nelson,Phillips,Enfinger,steuart,"computer Forensics and Investigation", Cengage Learning ,India Edition ,2008
3.

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CSE18R455	MOBILE AND WIRELESS SECURITY	L	T	P	Credit
		3	0	1	3.5
Pre-requisite: CSE18R371 / Computer Networks	**Course Category :** Professional Elective **Course Type** : Theory with Practical Component				

COURSE OBJECTIVES :

1. To provide a comprehensive overview of all relevant aspects of security in mobile and wireless networks and also to introduce to students advanced research topics.
2. To provide possibilities for hands--on experience with developing security features.

COURSE OUTCOMES :

CO1 : Examine the architecture of mobile and wireless systems
CO2 : Demonstrate the various attacks in mobile and wireless systems
CO3 : Analyze the various security issues in next generation mobile networks
CO4 : Implement various attacks in mobile Ad Hoc networks
CO5 : Evaluate the techniques to overcome the various threats in mobile systems

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S												M			
CO3	S	S	S	S	S	M	L				S	M	M	L		
CO4	S	S	S	S	S	M	L				S	M	M	L		
CO5	S	S	S	S	S	M	L				S	M	M	L		

UNIT I   INTRODUCTION

Mobile system architecture – mobile cellular systems – GSM and UMTS security attacks – vulnerabilities in cellular services – cellular jamming attacks and mitigation – security in VoIP services - mobile application security

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UNIT II WIRELESS SECURITY

Overview of WLAN security – Mobile IP security – Attacks on 802.11 networks – overview of ad hoc networks – trust and reputation in ad hoc networks – secure MANET routing – node replication attacks.

UNIT III SECURITY IN NEXT GENERATION MOBILE NETWORKS

Introduction to Next Generation Mobile Networks-security overview-standardization-3GPP-IEEE 802.16-Wi max-System Architecture and long term evolution security-security in IEEE 802.16e-Wi max

UNIT IV MOBILE ADHOC NETWORK SECURITY

Security in Ad Hoc wireless networks-Network security requirements-issues and challenges-network security attacks-key management-secure routing in Ad Hoc wireless networks

UNIT V MOBILE SECURITY

Trends and popularity of mobile device malware-Mobile malware command and control architecture-Efficiency of Android malware threats-Analysis of iOS malware targeting non-jail broken devices-Mobile malware defenses

LIST OF EXPERIMENTS :

1. Simulation of attacks on IEEE 802.11
2. Simulation of 3GPP
3. Simulation of black hole attack
4. Simulation of denial of service attack
5. Simulation of rushing attack
6. Simulation of wormhole attack.
7. Creating and intrusion detection system for wireless environment

TEXT BOOKS:

1. Wolfgang Osterhage, Wireless Security, CRC Press, First Edition,2016..
2. Hakima Chaouchi, Maryline Laurent-Maknavicius, Wireless and Mobile Networks Security, Wiley, 2009.

3. Anand R Prasad,Seung woo-seo,Security in next generation mobile networks, River Publishers, Aalborg, 2011

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CSE18R246	SOFTWARE ENGINEERING	L	T	P	Credit
		3	1	0	4

Pre-requisite: NIL	Course Category: Professional Elective
	Course Type : Theory

COURSE OBJECTIVES :

1. To make the students to read and understand the professional and technical literature on software engineering.
2. To familiarize the students with software engineering concepts, principles, and essential processes of the software development and emphasize the need for developing reliable and quality software.

COURSE OUTCOMES :

CO1 : Analyze and identify an appropriate process model for a given project
CO2 : Apply the principles at various phases of software development
CO3 : Estimate the work to be done, resources required and the schedule for a software project using software project estimation models.
CO4 : Translate specifications into design, and identify the components to build the architecture for a given problem, all using an appropriate software engineering methodology
CO5 : Define a Project Management Plan and tabulate appropriate Testing Plans at different levels during the development of the software

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S	S	S	S	S						M	S	S	S		
CO2	S	S	S	S	S			S			M	S	S	S		
CO3	S	S	S	S	S		S				M	S	S	S		
CO4	S	S	S	S	S	S					M	S	S	S		
CO5	S	S	S	S	S						M	S	S	S		

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UNIT I   SOFTWARE ENGINEERING CONCEPTS

Software and Software Engineering - Project Management Concepts - Software Engineering Paradigms – Generic Process Models, Assessment and Improvement - Water Fall Life Cycle Model - Prototype Model - RAD Model - Spiral Model - Incremental Model –Requirements Engineering

UNIT II MANAGING SOFTWARE PROJECTS

Metrics : Metrics in Process and Project Domains - Software Measurement - Metrics for Software Quality - Integrating Metrics in a Software Engineering Process - Estimation , Scheduling – Risk Management – Review Techniques - Software Quality Assurance

UNIT III DESIGN CONCEPTS

Design Process - Design Principles - Design Concepts - Software Architecture – Architectural Style, Design and Mapping - User Interface Design

UNIT IV   SOFTWARE TESTING AND DEBUGGING

Testing Fundamentals and Strategies - White-box and Black-box testing - Basis Path Testing - Data Flow Testing - Testing for Special Environments - Unit Testing, - Integration Testing - Validation Testing - System Testing – Debugging - Software Maintenance – Software Configuration Management

UNIT V ADVANCED TOPICS

Computer Aided Software Engineering - Clean room software engineering – Reengineering - Reverse Engineering

TEXT BOOK:

1. Roger S. Pressman, Software Engineering: A Practitioner's Approach, seventh Edition, Mc-Graw Hill, 2014.

REFERENCE BOOKS:

1. Steve McConnell, Code Complete, Second Edition, Microsoft Press.2004
2. Ian Somerville, Software Engineering,, Addison-Wesley, Ninth edition, 2011.
3. Richard E. Fairley, Software Engineering Concepts, Second Edition McGraw- Hill, 1985.

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CSE18R351	PYTHON AND SCRIPT PROGRAMMING	L	T	P	Credit
		3	0	1	3.5
Pre-requisite: Nil	**Course Category :** Professional Elective				
	Course Type : Theory with Practical				

Course Objective:

To provide an introduction to the python and script programming paradigm, and introduce and compare a range of scripting languages used for UNIX and Web-based applications.

Course Outcomes:

CO1: Interpret the programming concepts of Python, PHP and Java script.

CO2: Develop test cases and handle refactoring.

CO3: Apply modern technologies for web application development.

CO4: Design and run scripts using Java script/ PHP / Python.

CO5: Choose appropriate scripting languages to solve real life problems.

Mapping of Course Outcomes with PO, PSO:

PO/CO	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												S			
CO2	S	S	S	S	S	S	S				M		S	M		M
CO3	S	S	S	S	S	S	S				M	M	S	M		M
CO4	S	S	S	S	S	S	S				M	M	S	M		M
CO5	S	S	S	S	S	S	S				M	M	S	M		M

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UNIT I- INTRODUCTION TO PYTHON

Introduction to Python - Data Types - Booleans - Numbers - Lists - Tuples - Sets - Dictionaries - Comprehensions- Function Declaration - Recursion - Objects - Exceptions - Unbound Variables - List Comprehensions - Dictionary Comprehensions - Set Comprehensions

UNIT II- STRINGS AND CLASSES

Strings - Unicode - Formatting - String Methods - Bytes - Encoding - Regular Expressions - Verbose - Case Studies - Closures - List of Functions - List of Patterns - File of Patterns - Defining Classes - Instantiating Classes - Instance Variables - Iterators – Itertools - Generators - Generator Expression

UNIT III- HTML AND XML

Introduction to HTML5.x - List - Tables - Frame set - URL Encode - image map - CSS - forms in HTML- XML- Attributes - Elements - SAX - DOM - XPath - Parsing XML - Searching for Nodes – JAXP - XSLT.

UNIT IV- PHP

Introduction – Decisions and Loop – Functions – Arrays – Handling HTML form with PHP

UNIT V- JAVA SCRIPT

Introduction to Java Script - Data types- Scope of   Variables - Types of Operators - Loops and Decisions- Arrays - Array Methods - String Methods - Function- Error- Error Handling - Debugging

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LIST OF EXPERIMENTS

1) Pattern matching using list, sets and dictionaries.

2) Implement programs using classes and iterators.

3) Implement programs using arrays in Python.

4) Working with files and stream objects.

5) Form design using HTML

6) Handling Form data using PHP.

7) Handing HTML form data using Javascript.

TEXT BOOKS:

1. John V. Guttag, "Introduction to Computation and Programming using

   Python"   Prentice Hall of India, 2014.

2. Robin Nixon , "Learning PHP, MySQL", ' O' riley Press, 2009

3. Jon Duckett, Jack Moore, "JavaScript & JQuery: Interactive Front-End

   Web Development", John Wiley and Sons, edition 2014

REFERENCE BOOKS:

1. Mark Lutz, "Learning Python: Powerful Object-Oriented Programming", Fifth
   Edition, O'Reilly, Shroff Publishers and Distributors, 2013.
2. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third
   Edition, Pearson Education, 2006.
3. Mark Pilgrim, "Dive into Python 3" Apress, 2009.
4. Allen Downey, Jeffrey Elkner, Chris Meyers, "How to Think Like a Computer
   Scientist - Learning with Python", Green Tea Press, 2002.

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CSE18R356	SOFTWARE TESTING	L	T	P	Credit
		3	0	1	3.5
Pre-requisite: CSE18R256/ Software Engineering	**Course Category :** Professional Elective **Course Type** : Theory with Practical				

COURSE OBJECTIVES :

1. To enable a clear understanding and knowledge of the foundations, techniques, and tools in the area of software testing and its practice in the industry.

COURSE OUTCOMES :

CO1: Apply the knowledge of software testing and engineering methods.
CO2: Design and conduct a software test process for a software testing project.
CO3: Learn the needs of software test automation, and define and develop a test tool to support test automation.
CO4: Understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.
CO5: Analyze various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1		M		S		L		S	S				M		S	
CO2	M		L				S			M	M		S		M	S
CO3	M	L	S		M	M		L				L	S			M
CO4				M			M		M			S	S	S		S
CO5	S				L	S		M		S	L	M			S	M

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UNIT I INTRODUCTION

Testing as an Engineering Activity – Role of Process in Software Quality – Testing as a Process –Basic Definitions – Software Testing Principles – The Tester's Role in a Software development Organization – Origins of Defects – Defect Classes – The Defect Repository and Test Design – Defect Examples – Developer/Tester Support for Developing a Defect Repository.

UNIT II TEST CASE DESIGN

Introduction to Testing Design Strategies – The Smarter Tester – Test Case Design Strategies – Using Black Box Approach to Test Case Design Random Testing – Requirements based testing – positive and negative testing --- Boundary Value Analysis – decision tables - Equivalence Class Partitioning state-based testing– cause-effect graphing – error guessing - compatibility testing – user documentation testing – domain testing Using White–Box Approach to Test design – Test Adequacy Criteria – static testing vs. structural testing – code functional testing - Coverage and Control Flow Graphs – Covering Code Logic – Paths – Their Role in White–box Based Test Design – code complexity testing – Evaluating Test Adequacy Criteria.

UNIT III LEVELS OF TESTING

The Need for Levels of Testing – Unit Test – Unit Test Planning –Designing the Unit Tests. The Test Harness – Running the Unit tests and Recording results – Integration tests – Designing Integration Tests – Integration Test Planning – scenario testing – defect bash elimination -System Testing – types of system testing - Acceptance testing – performance testing – Regression Testing – internationalization testing – ad-hoc testing - Alpha – Beta Tests – testing OO systems – usability and accessibility testing

UNIT IV TEST MANAGEMENT

People and organizational issues in testing – organization structures for testing teams – testing services - Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – test management – test process - Reporting Test Results – The role of three groups in Test Planning and Policy Development – Introducing the test specialist – Skills needed by a test specialist – Building a Testing Group.

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UNIT V CONTROLLING AND MONITORING

Software test automation – skills needed for automation – scope of automation – design and architecture for automation – requirements for a test tool – challenges in automation - Test metrics and measurements –project, progress and productivity metrics – Status Meetings – Reports and Control Issues – Criteria for Test Completion – SCM – Types of reviews – Developing a review program – Components of Review Plans– Reporting Review Results. – evaluating software quality – defect prevention – testing maturity model

LIST OF EXPERIMENTS

1. Study of Selenium web testing tool
2. Using Selenium IDE, Write a test suite containing minimum 4 test cases.
3. Write and test a program to login a specific web page.
4. Write and test a program to select the number of students who have scored more than 60 in any one subject
5. Write the test cases for banking application
6. Create a test plan document for Library Management System application

TEXT BOOKS:

1. Ilene Burnstein,"Practical Software Testing",6th Edition,Springer International EditionAditya P.Mathur, ―Foundations of Software Testing‖, Pearson Education,2012.
 2.   Srinivasan Desikan and Gopalaswamy Ramesh, " Software Testing – Principles and Practices", Pearson education, 2010

REFERENCE BOOKS:

1. Boris Beizer, ―Software Testing Techniques‖, Second Edition, Dreamtech, 2011
2. Elfriede Dustin, ―Effective Software Testing‖, First Edition, Pearson Education, 2008.
3. Renu Rajani, Pradeep Oak, ―Software Testing – Effective Methods, Tools and Techniques‖, Tata McGraw Hill, 2010.

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CSE18R357	AGILE METHODOLOGY	L	T	P	Credit
		3	1	0	4
Pre-requisite: Nil	**Course Category :** Professional Elective				
	Course Type : Theory				

COURSE OBJECTIVES :

To impart a thorough understanding of the principles and practices used in agile software development and to explore these techniques by solving problems of student interest.

COURSE OUTCOMES :

CO1: Understand the basic concepts of Agile Software Process.
CO2: Analyze the significance of Agile Methodology in software development.
CO3: Explore the process of Agile Methodology.
CO4: Explain Agile Practicing and Testing
CO5: Apply the concepts of Agile Methodology using SCRUM Tools.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	M		S		M				S					S		
CO2		S	L	M			S				M		S		L	
CO3	S			S	S	M		L				M				M
CO4		M	M		L		M	S		M			M		M	
CO5	S	S		L	S	S	M		S	L	S	M		S		M

UNIT I   INTRODUCTION

Software is new product development – Iterative development – Risk-Driven and Client-Driven iterative planning – Time boxed iterative development – During the iteration, No changes from external stakeholders – Evolutionary and adaptive development - Evolutionary requirements analysis – Early "Top Ten" high-level requirements and skilful analysis – Evolutionary and adaptive planning – Incremental delivery – Evolutionary delivery – The most common mistake – Specific iterative and Evolutionary methods.

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UNIT II AGILE AND ITS SIGNIFICANCE

Agile development – Classification of methods – The agile manifesto and principles – Agile project management – Embrace communication and feedback – Simple practices and project tools – Empirical Vs defined and prescriptive process – Principle-based versus Rule-Based – Sustainable discipline: The Human touch – Team as a complex adaptive system – Agile hype – Specific agile methods.

UNIT III AGILE METHODOLOGY

Method overview – Lifecycle – Work products, Roles and Practices values – Common mistakes and misunderstandings – Sample projects – Process mixtures – Adoption strategies – Fact versus fantasy – Strengths versus "Other" history.

UNIT IV AGILE PRACTICING AND TESTING

Project management – Environment – Requirements – Test – The agile alliances – The manifesto – Supporting the values – Agile testing – Nine principles and six concrete practices for testing on agile teams.

UNIT V CASE STUDY

SCRUM: Introduction – Practices - Applying scrum – Need – Scrum values - Comparison of Agile modeling with RUP – Tools in agile software development.

TEXT BOOKS:

1. Craig Larman, "Agile and Iterative Development – A Manager's Guide", Pearson Education – 2010.
2. Elisabeth Hendrickson Quality Tree Software Inc, "Agile Testing" 2010.

REFERENCE BOOKS:

1. John Hunt, "Agile Software Construction", Springer, USA, 2005.
2. Robert Martin, "Agile Software Development: Principles, Patterns, and Practices" Prentice Hall, USA, 2003.
3. Ken Schwaber and Mike Beedle, "Agile Software Development with SCRUM", Prentice Hall, USA, 2002.
4. Alistair Cockburn, "Agile Software Development: The Cooperative Game", Pearson Education, 2007.
5. Kent Beck, Cynthia Andreas, "Extreme Programming Explained: Embrace Change", Pearson Education, 2005.

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CSE18R358	FREE AND OPEN SOURCE SOFTWARE	L	T	P	Credit
		3	0	1	3.5
Pre-requisite: Nil	**Course Category :** Professional Elective				
	Course Type : Theory with Practical				

COURSE OBJECTIVES :

To provide a basic idea of Open source technology, their software development process so as to understand the role and future of open source software in the industry along with the impact of legal, economic and social issues for such software.

COURSE OUTCOMES :

CO1: Explore the fundamentals of open source and the basic concepts of LINUX.
CO2: Create a query to work with open source database.
CO3: Examine the fundamentals concepts of RUBY ON RAILS.
CO4: Build web application on IBM BLUMIX
CO5: Evaluate web services and open source tool by using case study

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	M		L		S	M				M				S		
CO2	S	M	S	M			M	L					M		L	
CO3	L			S	L	L		S	M	L				M		M
CO4		L	M	L	S	M	S		M		S	M		S		M
CO5		S			M	S	L		S	M	M	S	S		M	

UNIT I` INTRODUCTION

Introduction to open sources- Need of Open Sources- Advantages of Open Sources- Applications of Open Sources- commercial aspects of Open source movement- LINUX: Introduction- General overview- Kernel mode and user mode-Process-Advanced Concepts-Scheduling-Personalities- Cloning- Signals-Development with LINUX.

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UNIT II OPEN SOURCE DATABASE

MySQL: Introduction- Setting up account-Starting, terminating and writing your own SQL programs Record selection technology- Working with strings-Date and Time-Sorting Query Results- Generating Summary- Working with meta data- Using sequences- MySQL and Web.

UNIT III RUBY ON RAILS

RUBY ON RAILS: Introduction- The Structure and Execution of Ruby Programs-Datatypes and Objects - Expressions and Operators - Statements and Control Structures - Methods, Procs, Lambdas, and Closures - Classes and Modules – The Ruby Platform - The Ruby Environment.

UNIT IV   IBM BLUMIX

BLUMIX: Introduction-Evolution of BlueMix – how does work-infrastructure – storage – network – security –Paas on the BlueMix - DBaas on the BlueMix - Web application on BlueMix – mobile application on BlueMix - javasript and java application on BlueMix.

UNIT V   OPEN SOURCE TOOLS AND CASE STUDIES

WEB SERVER: Apache Web server – Working with Web server – Configuring and using Apache Web services – Open Source Software tools and processors – Eclipse IDE platform – Compilers – Model Driven Architecture tools.CASE STUDY: Government Policy toward Open Source (E-Governance) – Wikipedia as an Open source project.

LIST OF EXPERIMENTS :

1. Installation of software packages
2. Ruby on Rails: File uploading and send mails
3. Version Control system setup and usage
4. Working with Eclipse IDE
5. Mini Project using IBM Blumix

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TEXT BOOKS:

1. Introduction to Linux: Installation and Programming NRCFOSS Series, edited by N.B.Venkateswarlu, 2010
2. Robert Sheldon and Geoff Moes, "Beginning MySQL ", Wiley India, 2009.
3. David Flanagan, Yukihiro Matsumoto "The Ruby Programming Language" O'Reilly Media, 2010.
4. Christopher Negus," Linux Bible",Wiley Publishing Inc, Indianapolis, 2011.
5. IBM Bluemix Architecture Series: Web Application Hosting on IBM Containers, IBM Redbooks.

REFERENCE BOOKS:

1. Sreetha sankaranarayanan "Learning IBM BluMix", October 2016.
2. Adam McDaniel, "Perl and Apache: Your visual blueprint for developing dynamic Web content", Wiley Publishing Inc, Indianapolis, 2010.
3.Dave.W.Mercer, Allan Kent, Steve D Nowicki, Dan squire and Wankyu choi, "Beginning PHP 5 ", Wiley India,2010.

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CSE18R359	USER INTERFACE DESIGN	L	T	P	Credit
		3	0	1	3.5

Pre-requisite: Nil	Course Category : Professional Elective
	Course Type : Theory with Practical

COURSE OBJECTIVES :

To make students to understand the design, prototyping, and evaluation of user interfaces, the cognitive and perceptual constraints that affect interface design and applications for computing devices, often called Human-Computer Interaction (HCI).

COURSE OUTCOMES :

CO1: Explore the importance of User Interface and the basic principle of UI design.
CO2: Analyze the concepts of GUI and CSCW characteristics.
CO3: Compare the viewpoint of user, customer and designer
CO4: Develop Web interface design.
CO5: Create Mobile User Interface design.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	M		L	S			M		L				M			
CO2		S	M		S	M		M			L	M		S		L
CO3	S			M	L		S	L	M	S					M	
CO4	L	M	S	L		S				M	S	M		M		M
CO5			L		L	S	M	L	M			M	S	L	L	

UNIT I HUMAN FACTORS AND USER INTERFACE DESIGN PROCESS

The importance of User Interface – UI and Software Designer – Goals of UI design – Motivations for human factors in Design – Understanding user needs and requirements. Classes of UI design – Principles of good design – Evaluating design using the principles – Choice of color – Task oriented approach for UI - Case study.

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UNIT II OBJECT ORIENTED UI DESIGN

Design of icons – Use of metaphors – GUI style guides and toolkits – Portability – GUI design and object oriented approach – CSCW characteristics – Examples – CSCW UI – Method of specifying and designing UI for CSCW Case study

UNIT II USABILITY

The viewpoint of user, customer and designer –Usability specification – Description of stages in usability specification and evaluation.

UNIT IV WEB INTERFACE DESIGN

Designing Web Interfaces –Drag and drop, direct selection, contextual tools, overlays and virtual pages, process flow, case studies.

UNIT V   MOBILE UI

Mobile ecosystem: platforms and application frameworks: Types of mobile applications: widgets, applications, information architecture, Mobile 2.0, Mobile design – case studies

LIST OF EXPERIMENTS :

1. Design elements and principles
2. Web page design & development (scripting)
3. Designing UI for mobile applications
4. Creating prototype of UI
5. Designing interactive Web applications
6. GUI for applications
7. Artificial Intelligence in developing UI

TEXT BOOKS:

1. Bill Scott and Theresa Neil, "designing Web Interfaces", O'Reilly, USA, 2011
2. Brian Fling," Mobile Design and Development", O'Reilly, USA, 2010

REFERENCE BOOKS:

1. Alan Dix Janet Finlay, Gregory Abowd, Russell Beale, "Human - Computer Interaction", Prentice Hall, USA,2010.
2. Andrew Sears, Julie A Kacko, ''The HCI handbook'' , Lawrence Earlbaum Associates, New York, 2009.

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CSE18R456	WEB TECHNOLOGY	L	T	P	Credit
		3	0	1	3.5

Pre-requisite: Nil	Course Category : Professional Elective
	Course Type : Theory with Practical

OBJECTIVES :

1. To make students to familiar with client server architecture and able to develop a web application using java technologies.
2. To assist students to gain skills and project-based experience needed for entry into web application development careers.

COURSE OUTCOMES :

CO1: Interpret the technologies in web development
CO2: Develop programs using various scripting languages
CO3: Build an internet application
CO4: Experiment with web servers and databases
CO5: Create web applications using various web technologies

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												S			
CO2	S	S	S	S	S	M	L	M			S	M	S	M		M
CO3	S	S	S	S	S	M	L	M	L	L	S	M	S	M	L	M
CO4	S	S	S	S	S	M	L	M			S	M	S	M		M
CO5	S	S	S	S	S	M	L	M			S	M	S	M		M

UNIT I INTRODUCTION TO WEB TECHNOLOGIES

Evolution of the Internet and World Wide Web--Web Basics -Client-Side Scripting versus Server-Side Scripting-World Wide Web Consortium (W3C) -Web 2.0- Introduction to HTML5- Editing HTML5- Validation Service- Headings - Linking - Images -alt Attribute- Void Elements-Using Images as Hyperlinks - Special Characters and Horizontal Rules - Lists - Tables - Forms- Internal Linking - meta Elements - New HTML5 Form input Types- Page-Structure Elements

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UNIT II CSS AND SCRIPTING LANGUAGES

Introduction to Cascading Style Sheets- Inline Styles - Embedded Style Sheets - Conflicting Styles - Linking External Style Sheets - Positioning Elements-Backgrounds Element Dimensions -Box Model and Text Flow Media Types and Media Queries - Drop-Down Menus -User Style Sheets- JavaScript: Introduction to Scripting- Displaying a Line of Text with JavaScript in a Web Page -Modifying Your First Script -Obtaining User Input with prompt Dialogs-Dynamic Welcome Page - Adding Integers-Memory Concepts-Arithmetic -Decision Making: Equality and Relational Operators, Control Statements ,functions, arrays.

UNIT III XML AND INTERNET APPLICATION

XML -Introduction -XML Basics - Structuring Data -XML Namespaces-Document Type Definitions (DTDs)-W3C XML Schema Documents-XML Vocabularies-Ajax-Enabled Rich Internet Applications with XML and JSON-Introduction History of Ajax- "Raw" Ajax Example Using the XMLHttpRequest Object - Asynchronous Requests-Exception Handling -Callback Functions -XMLHttpRequest Object Event, Properties and Methods- Using XML and the DOM- Creating a Full-Scale Ajax-Enabled Application-Using JSON- Rich Functionality - Interacting with a Web Service on the Server- Parsing JSON Data

UNIT IV WEB SERVERS & WEB DATABASES

Introduction -HTTP Transactions-Multitier Application -architecture - Client-Side Scripting versus Server-Side Scripting Accessing Web Servers - Apache, MySQL and PHP Installation XAMPP Installation ,running ,testing procedures, Microsoft IIS Express and WebMatrix - Installing, running ,client side, PHP examples-Introduction to Relational Databases-MySQL -Microsoft Language Integrate Query - Java DB/Apache Derby

UNIT V WEB APPLICATION DEVELOPMENT

Introduction -Your First ASP.NET Application in C# and Visual basic-Building the WebTime Application-Standard Web Controls: Designing a Form Validation Controls-Session Tracking-Web Services-Case Study: Database-Driven ASP.NET Guestbook,Case Study: Password-Protected Books Database Application

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LIST OF EXPERIMENTS :

1. Using HTML5 canvas with JavaScript to draw lines, rectangles, arcs, and circles.
2. Using HTML5 canvas with JavaScript to draw gradients and shadows.
3. Write an XML file and DTD file which will display the Book information
4. Installation & Configuration of APACHE,WAMP stack
5. Procedure to use and configure PhpMyAdmin to manage mySQL databases.
6. Create a Ajax-Enabled Rich Application with PHP and mySQL
7. Usage of JavaScript function JSON.parse(text) which converts a JSON text into a JavaScript object.
8. Procedure to use JSON to read data from a web server, and display it in a web page using XMLHttp.

TEXT BOOK:

1. Paul J. Deitel, Harvey M. Deitel, Abbey Deitel, "Internet & World Wide Web How to Program, 5/e, Pearson Education Asia, 2009.

REFERENCE BOOKS:

1. Eric Ladd, Jim O' Donnel, "Java, XHTML, HTML, XML: magnum", Prentice Hall of India, QUE, 2000.
2. Rajkamal, "Web Technology", Tata McGraw-Hill, 2007, 7thedition.
3. Jon Duckett,"Web Design with HTML, CSS, JavaScript and jQuery Set" Wiley, First edition, 2014

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CSE18R457	MOBILE APPLICATION DEVELOPMENT	L	T	P	Credit
		3	0	1	3.5
Pre-requisite: : CSE18R272/ Java Programming	**Course Category :** Professional Elective				
	Course Type : Theory with Practical				

COURSE OBJECTIVES :

To make students to learn application development and develop mobile app on various mobile platform like ANDROID and IOS.

COURSE OUTCOMES :

CO1: Understand about the mobile application market and web services for various mobile devices.
CO2: Understand about the various Mobile Information Design, design Tools, Mobile Platforms and Mobile Web Option.
CO3: Design the User interface with various features of Android SDK like displaying pictures, menus etc.
CO4: Utilize the messaging, networking and location based service in Android application
CO5: Create, Debug and build the apps for the latest Windows and IOS

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												S			
CO2	S												S			M
CO3				S	S	M	L				S				M	
CO4	S	S				M	L							S		
CO5			S								S	M		L		M

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UNIT I INTRODUCTION

Preliminary Considerations – Cost of Development – Importance of Mobile Strategies in Business World – Mobile Web Presence – Mobile Applications – Marketing – Web Services for Mobile Devices – Creating Example Web Service _ Debugging Web Service.

UNIT II MOBILE USER INTERFACE DESIGN

Effective Use of Screen Real Estate – Understanding Mobile Application Users – Understanding Mobile Information Design – Understanding Mobile Platforms – Using the Tools for Mobile Interface Design – Choosing a Mobile Web Option – Adaptive Mobile Website – Dedicated mobile website – Mobile Web Applications with HTML 5

UNIT III   ANDROID APPLICATION DEVELOPMENT

Getting started with Android – Designing Your User interface using Views – Displaying Pictures and Menus with Views – Using Image views to Display pictures – Using menus with views – Data Persistence – Saving and loading user performances - Persisting data to files – Creating and using Data bases – Content Providers.

UNIT IV ANDROID MESSAGING, NETWORKING, LOCATION BASED SERVICES

SMS Messaging, Sending E-mail – Networking – Downloading Binary Data, Text Files- Accessing Web Services – Performing Asynchronous Calls – Location Based Services – Displaying Maps – Getting Location Data – Creating your own services – Communicating between a service and an activity – Binding activities to Services

UNIT V IOS, WINDOWS PHONE, PHONEGAP AND TITANIUM

IOS: Tools, iOS Project, Debugging iOS Apps, Building the derby app in iOS, Objective C Basics - **Windows Phone 7:** Tools, Windows Phone 7 Project – Building Derby App in Windows Phone 7 - **Appcelerator titanium:** tools, Developing application, Building derbyapp, connecting to market - **Phonegap:** tools, Developing application, Building Derbyapp, connecting to market.

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LIST OF EXPERIMENTS:

Android Application project:
1. Apply the view concept to design the tic-tac-toe game.
2. Create an Information System using database.
3. Create an application to perform the scientific calculation.
4. Develop the application for farmers in planting and irrigation.
5. Develop an application for smart city traveler.
6. Create an attendance application based on the Location Based Service.

IOS Project:
1. Create an application by accessing the camera feature.
2. Design the application to forecast the weather condition.

Windows Project:
1. Design a paint application
2. Design the simple word application.
3. Develop the application to track the vehicle.

Phonegap/Titanium Project:
1. Develop a simple game by using graphics and animation.
2. Create an application to alert about fire accident through SMS.
3. Develop a simple mobile quiz for GATE exam.

TEXT BOOKS:

1. Jeff McWherter and Scott Gowell, Professional Mobile Application Development, Wrox 2012.
2. Wei-Meng Lee "Beginning Android 4 Application Development" March 2012

REFERENCE BOOKS:

1. Charlie Collins, Michael Galpin and Matthias Kappler, Android in Practice, Dream Tech. 2012
2. James Dovey and Ash Furrow, Beginning Objective C, Apress, 2012
3. David Mark, Jack Nutting, Jeff LaMouche, and Fredric Olsson, Beginning iOS6 Development: Exploring the iOS SDK, Apress, 2013.

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CSE18R360	INTERNET OF THINGS	L	T	P	Credit
		3	0	1	3.5
Pre-requisite: : Nil	**Course Category :** Professional Elective **Course Type** : Theory with Practical				

COURSE OBJECTIVES:

To make the students explore the interconnection and integration of the physical world and understand the IOT Market perspective and acquire a deep knowledge on how to design and develop IOT architectures and connect the same to cloud environments.

COURSE OUTCOMES:

CO1: Understand the Functional blocks and Architecture of IoT.
CO2: Analyze the Market perspective of IoT.
CO3: Examine Devices, Gateways and Application Framework in IoT.
CO4: Analyze the services offered cloud environment and Data Analytic tools
CO5: Apply IoT in Home and Industrial Automation and Real World Design Constraints.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S												M			
CO3	S	S	S								S	M	M	L		L
CO4	S	S	S								S	M	M	L		L
CO5	S	S	S	S	S	M	L				S	M	M	L		L

UNIT I   FUNDAMENTALS OF IOT

Genesis of IoT - IoT and Digitization – IoT impact – IoT challenges - Enabling Techniques- IoT Architecture: One M2M - IoT World Forum (IoTWF) - Additional IoT Reference Models – Simplified IoT Architecture - Core IoT functional Stack – Fog, Edge and Cloud Computing in IoT- Functional Blocks of an IoT Ecosystem: Sensors, Actuators, MEMS and Smart Objects.

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UNIT II   IOT PROTOCOLS

IoT Access Technologies: Physical Layer , MAC Layer and Topology of IEEE 802.15.4, 802.15.4c, 1901.2a, 802.11ah and LoRaWAN - Network Layers : IP versions, Constrained Nodes and Constrained Networks - Optimizing IP for IoT: From 6LoWPAN to 6Lo – RPL - Application Transport Methods : Supervisory Control and Data Acquisition (SCADA) - Application Layer Protocols : CoAP and MQTT

UNIT III   IOT DESIGN AND DEVELOPMENT

Design Methodology – Embedded Computing Basics – Microcontrollers – Systems on Chips - IoT system Building Blocks - Arduino – Board Details, IDE Programming – Raspberry Pi Interfaces - Raspberry Pi with Python Programming

UNIT IV   DATA ANALYTICS FOR IOT

Data Analytics Overview and Challenges - Structured vs Unstructured Data - Data in Motion vs Data at Rest – Role of Machine Learning: Supervised Learning – Unsupervised Learning – Data Analytics Tools and Technology: NoSQL Databases – Hadoop - Apache Kafka, Apache Spark - Edge Streaming Analytics - Network Analytics – Chef - NETCONF-YANG

UNIT V CASE STUDIES / INDUSTRIAL APPLICATIONS

Home Automation: Smart Lighting – Home Intrusion Detection – Smart Cities: Smart Parking - Smart Traffic Control – Environment: Weather Monitoring System – Air Pollution Monitoring – Forest Fire Detection – Agriculture: Smart Irrigation – Manufacturing: Converged Plantwide Ethernet (CPwE) Reference Model - Power Utility Industry: Field Area Network (FAN) GridBlock

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LIST OF EXPERIMENTS

1. Home Automation Using IOT

2. IOT Gas Pipe Leakage Detector

3. IOT Electronic Door Opener

4. IOT Garbage Monitoring System

5. Smart Dustbin with IOT Indicator

6. IOT based Streetlight Controller

7. Smart Helmet

8. Alcohol Detection System Using IOT

9. IOT Based Heart Rate Monitoring System

10. Weather Monitoring Using IoT

TEXT BOOK:

1. David Hanes, Ganzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry – IoT Fundamentals: Networking Technologies, Protocols and Use cases for Internet of Things, Cisco press,2017
2. Adrain McEwen & Hakim Cassimally – Designing the Internet of Things- Wiley – 2014
3. Arshdeep Bahga, Vijay Madisetti – Internet of Things – A hands on approach, University press 2015

REFERENCE BOOK:

1. Olivier Hersent, David Boswarthick, Omar Elloumi – The Internet of Things key applications and protocols, Wiley 2012 .

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ECE18R265	SIGNALS AND SYSTEMS FOR COMPUTER ENGINEERS	L	T	P	Credit
		3	0	1	3.5

PRE - REQUISITE: Nil	**Course Category:** Professional Elective
	Course Type : Theory with Practical's

COURSE OUTCOMES :

CO1: Identify different types of continuous time and discrete time signals.
CO2: Identify different types of continuous time and discrete time systems.
CO3: Analyse signals using Z Transform and FT.
CO4: Analyse signals using DFT and FFT
CO5: Appreciate different Digital Filter structures

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S			S	S						M	L	S			
CO2	S			S	S						M	L	S			
CO3	S	S	S	S	S						M	L	S	M	L	L
CO4	S			S	S						M	L	S			
CO5	S	S	S	S	S						M	L	S	M	L	L

UNIT 1 BASICS OF SIGNALS

Basic operations on signals, continuous time and discrete time signals: step, impulse, ramp, exponential and sinusoidal functions

UNIT II BASICS OF SYSTEMS

Continuous time and discrete time systems, Properties of systems: linearity, causality, time invariance, memory, stability, invertibility. Linear time invariant systems, convolution

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UNIT III Z-TRANSFORM AND FOURIER TRANSFORM

Z-transform, region of convergence, properties of Z-transform, inverse Z-transform. Fourier transform (FT) of discrete time signals, properties of FT, relation between Z-transform and FT.

UNIT IV DFT

Discrete Fourier transform (DFT) - Properties of DFT, inverse DFT, Fast Fourier transform (FFT), Radix-2 FFT algorithms, butterfly structure

UNIT V DIGITAL FILTERS

Digital filter structures, block diagram and signal flow graph representation, Overview of IIR and FIR filters

LIST OF EXPERIMENTS (Using MATLAB or equivalent)

1. Representation and Operations: Vectors, Matrices, Complex Numbers
2. Signal generation and basic operations
3. Basic system operations
4. Fourier Transform (CTFT, DTFT)
5. Determination of z-transform and its inverse

TEXT BOOK(S):
1. Tarun Kumar Rawat, "Signals and Systems", Oxford University Press, 2010.
2. V. Krishnaveni, A. "Rajeswari, Signals and Systems", Wiley, 2012

REFERENCE(S):
1. Michael J Roberts and Govind Sharma, "Signals and Systems", McGraw Hill, 2010
2. M.N. Bandyopadhyaya,"Introduction to Signals and Systems and Digital Signal Processing", PHI, 2008

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ECE18R320	RFID AND ITS APPLICATIONS	L	T	P	Credit
		3	1	0	4
Pre-requisite: Nil	**Course Category :** Professional Elective				
	Course Type : Theory				

COURSE OBJECTIVES :

To introduce students to the principles and concepts around the emerging technology of Radio Frequency Identification (RFID) and to provide with the knowledge required for designing, developing, implementing and administering RFID-based business or industrial applications.

COURSE OUTCOMES :

After completing this course, the student will be able to:

CO1: Learn the basic components and applications of RFID systems
CO2: Analyse and characterize RFID reader architectures
CO3: Analyse various antennas and protocols used in RFID systems
CO4: Design RF ID systems with an understanding of guidelines to be followed for security and privacy

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S												M			
CO3	S										S	M	M			
CO4	S	S	S	M	M						S	M	M	L		L
CO5	S	S	S	S	S	S	M				S	M	M	L		L

UNIT 1 RFID BASICS

History and Practice of RFID, RFID Systems and Terminology, Types of RFID, Frequency Bands for RFID, Tags-Passive, Semi passive, and Active Tags. Radio Basics for UHF RFID -Signal Voltage and Power, Information, Modulation, and Multiplexing, Backscatter Radio Links, Link Budgets, Effect of Antenna Gain and Polarization on Range, Propagation in the Real World

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UNIT II READERS AND TAGS

UHF RFID Readers: Radio Architectures and Components, RFID Transmitters and RFID Receivers, Digital-Analog Conversion and Signal Processing Packaging and Power UHF RFID Tags: Power and Powerlessness, RF to DC, Getting Data, Talking Back, Tag IC Overall Design Challenges, Packaging

UNIT III RFID ANTENNAS

Reader Antennas:Antennas for Fixed Readers, Antennas for Handheld or Portable Readers, Near-field Antennas, Cables, and Connectors
Tag Antennas: Practical challenges of Tag antenna, Impedance Matching and Power Transfer, Dipoles and Derivatives, Tags and the (local) Environment, Near-field and Hybrid Tag Antennas

UNIT IV RFID PROTOCOLS

EPC global Generation 1-EPC global Class 0, EPC global Class 1 Generation 1, ISO 18000-6B (Intellitag), ISO 18000-6C (EPC global Class 1 Generation 2)

UNIT V RFID SECURITY, STANDARDS, AND APPLICATIONS

RFID Security: Confidentiality, Integrity, Availability, Threats, Cryptography, and Threat Modelling RFID Standards, Laws, Regulations, Policies, and Guidelines: EPC global, ISO/IEC Item Management, Contactless Smart Cards, Animal Identification, FCC Rules for ISM Band, Identity Standards, and Guidelines for Securing RFID Systems Real-time Demonstration of RFID Tag and Reader Working in a Laboratory

TEXT BOOK(S):
1. Daniel M. Dobkin, "The RF in RFID: UHF RFID in Practice", Elsevier/Newness, U.S./India, 2012(2nd Edition), ISBN: 9780123945839
2. Jari-Pascal Curty, Michel Declercq, Catherine Dehollain, Norbert Joehl, "Design and Optimization of Passive UHF RFID Systems", Springer, 2007, ISBN: 9780387352749

REFERENCE(S):
1. Tom Igoe, "Getting Started with RFID: MAKE-OBJECTS", O'Reilly/Make: makezine.com, 2012, ISBN: 9781449324186
2. Amin Rida, Li Yang, Manos M. Tentzeris, "RFID-Enabled Sensor Design and Applications", Artech House, 2010, ISBN: 9781607839811

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ECE18R368	DIGITAL SIGNAL PROCESSING FOR COMPUTER ENGINEERS	L	T	P	C
		3	0	1	3.5
Pre-requisite: ECE18R265	Course Category: Professional Elective Course Type: Theory with Practical				

COURSE OUTCOME(S):

After completing this course, the student will be able to:

CO1: Analyze and process signals in the digital domain

CO2: Design IIR Filters to suit specific requirements for specific applications

CO3: Design FIR Filters to suit specific requirements for specific applications

CO4: Compute statistical analysis and inference of quantisation on random signals

CO5: Explain the architecture of TMS320C54XX digital signal processors

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S												M			
CO3	S										S	M	M			
CO4	S	S	S	M	M						S	M	M	L		L
CO5	S	S	S	S	S	S	M				S	M	M	L		L

UNIT I SIGNALS, SYSTEMS

Definition of Signal, System, Signals, Systems Classification, Electronic noise and its types, Colours of noise, Signal Operations, Basic Signals, Continuous Time and Discrete Time Signals, Two Dimensional Signals: Images, Signal comparisons and transformations: correlation, orthogonal signals and orthogonality, cross correlation, auto correlation

UNIT II DSP BASICS

Digital Signal Processing System ––advantages and applications of DSP, FFT algorithms, Radix–2 FFT algorithms, decimation in time, decimation in Frequency algorithms –Applications of FFT algorithms

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UNIT III IIR FILTERS

Design of Butterworth filters - Chebyshev Type I and Type II filters - IIR filter design using bilinear transformation - impulse invariant transformation - frequency transformation in analog and digital domain

UNIT IV FIR FILTERS

EPC global Generation 1-EPC global Class 0, EPC global Class 1 Generation 1, ISO 18000-6B (Intellitag), ISO 18000-6C (EPC global Class 1 Generation 2)

UNIT V TMS320C54XX PROCESSOR

Number representations, fixed point and floating-point numbers, Quantisation and its error - DSP architecture, Fixed and Floating-point architecture principles - TMS320C54XX Processor: Features, Architecture, Interrupts, addressing modes, Instruction set

LIST OF EXPERIMENTS :

DSP Processor Implementation (Any 3)
1.   Study of architecture of Digital Signal Processor
2.   MAC operation using various addressing modes
3.   Implementation of difference equations
4.   Linear Convolution
5.   Circular Convolution

 MATLAB / SciLab / Equivalent Software package (Any 3)
6.   Study of Mathematical processing software
7.   Representation and Operations
8.   Linear and Circular Convolutions
9.   DFT
10.   FIR filter design / IIR filter design

TEXT BOOK(S):

1. John G. Proakis, Dimitris G Manolakis, "Digital Signal Processing: Principles, Algorithms, and Applications", Pearson, 2009(4th Edition), ISBN: 9788131710005
2. Udayashankara V., "Modern Digital Signal Processing: Includes Signals and Systems Matlab Programs, DSP Architecture with Assembly and C Programs", PHI, 2013(3rd Edition), ISBN: 9788120351677

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REFERENCE(S):

1. S Salivahanan, "Digital Signal Processing", McGraw Hill, 2014(3rd Edition), ISBN: 9789332902831

2. Tarun Kumar Rawat, "Digital Signal Processing", Oxford University Press, 2014(1st Edition), ISBN: 9780198081937

3. Sanjit K Mitra, "Digital Signal Processing: A Computer-Based Approach", McGraw Hill, 2013(4th Edition), ISBN: 9781259098581

4. B. Venkataramani and M Bhaskar, "Digital Signal Processors", McGraw Hill, 2010(2nd Edition), ISBN: 9780070702561

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ECE18R369	DIGITAL VLSI DESIGN	L	T	P	Credit
		3	0	1	3.5

Pre-requisite : ECE18221	Course Category : Professional Elective
	Course Type : Theory with Practical

COURSE OBJECTIVES :

To make students to learn the fundamentals of VLSI design and understand the IC Manufacturing Process and also to familiarize them with VLSI circuits design.

COURSE OUTCOMES :

CO1: Explain the characteristics of CMOS transistors and their circuit level of models

CO2: Explain the chip technology scaling process

CO3: Design models of CMOS circuit that realize specified function

CO4: Identify the interactions between process parameters device structures, circuit performance and system design

CO5: Design, conduct experiments on circuits using CMOS Technology and interpret the results to analyse its parameters

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S												M			
CO3	S	S	M	M	M								M			
CO4	S	S	M	M	M								M			

UNIT I MOS TRANSISTOR PRINCIPLE
CMOS chip design options, MOS transistors, CMOS Logic, CMOS inverter, DC characteristics, Logic gates, implementing simple Boolean functions using CMOS

UNIT II CMOS LAYOUT AND FABRICATION
CMOS Fabrication process (overview only), Layout design rules, gate layouts, stick diagrams

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UNIT III DELAY AND POWER

Delay estimation- Transient response, RC delay model, Linear delay model, CMOS gate transistor sizing, Logical effort and transistor sizing, Timing analysis delay models, Power Dissipation Dynamic power, Static power, Energy-delay optimization, Low power architectures

UNIT IV DIGITAL CMOS DESIGN

Pseudo-nMOS Logic, CMOS Transmission Gate, Dynamic CMOS Logic, Domino CMOS Logic, Pass Transistor Logic, Complementary Pass Transistor Logic,

UNIT V DIGITAL VLSI SYSTEMS

Datapath systems: Adder, Multiplier; Array sub-systems: SRAM, DRAM, Flash Memory, Read Only Memory

LIST OF EXPERIMENTS:

1. Design and Simulation of nMOS inverter, CMOS inverter and obtaining its transfer characteristics
2. Layout design of Digital logic circuits
3. Design of various CMOS logics
4. Design of simple circuit using CMOS

TEXT BOOK(S):

1. Debaprasad Das, "VLSI Design", Oxford University Press, India, 2016(2nd Edition), ISBN: 9780198094869
2. Singh Ajay Kumar, "Digital VLSI Design", PHI, India, 2011 - ISBN: 97881-20341876

REFERENCE(S):

1. Neil H.E. Weste, David Harris, Ayan Banerjee, "CMOS VLSI Design: A Circuits and Systems Perspective", Pearson, India– 2015(4th Edition), ISBN: 9789332542884
2. A. Albert Raj, Latha. T, "VLSI Design", PHI, India, 2008, ISBN: 9788120334311
3. Pucknell Douglas A., Eshraghian Kamran, "Basic VLSI Design", PHI, India, 3rd Edition, ISBN: 9788120309869
4. Neil H. E. Weste, Kamran Eshraghian, "Principles of CMOS VLSI Design: A Systems Perspective", Pearson, India, 2010(2nd Edition), ISBN: 9788131719428
5. Sung-Mo (Steve) Kang, Yusuf Leblebici and Chul Woo Kim, "CMOS Digital Integrated Circuits Analysis and Design", McGraw Hill, India, 2016(4th Edition), ISBN: 9789352602148

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CSE18R361	EMBEDDED SYSTEMS AND ITS APPLICATIONS	L	T	P	Credit
		3	0	1	3.5

Pre-requisite : Nil	
	Course Category : Professional Elective
	Course Type : Theory with Practical

COURSE OBJECTIVES :

1. To enable students to gain holistic approach in the design of embedded hardware, network and software system and to provide practical insight in to in to embedded system design through experiments using LPC 2148 microcontroller.

COURSE OUTCOMES :

CO1: Examine the Building Blocks of Embedded System.
CO2: Explore the functions of Embedded Networking devices.
CO3: Analyze Various Embedded Development Strategies
CO4: Elucidate the Basic concept of Real time operating system
CO5: Apply the knowledge of embedded programming to application development.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S												M			
CO3	S	S	S								S	M	M			
CO4	S	S	S								S	M	M			
CO5	S	S	S	S	S	M	L				S	M	M	L		L

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS Introduction to Embedded Systems – The build process for embedded systems- Structural units in Embedded processor , selection of processor & memory devices- DMA – Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock, In circuit emulator, Target Hardware Debugging.

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UNIT II EMBEDDED NETWORKING

Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus Communication Protocols – RS232 standard – RS422 – RS485 – CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) –need for device drivers

UNIT III EMBEDDED FIRMWARE DEVELOPMENT ENVIRONMENT Embedded Product Development Life Cycle- objectives, different phases of EDLC, Modelling of EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model, Sequential Program Model, concurrent Model, object oriented Model.

UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN

Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task communication shared memory, message passing-, Inter process Communication – synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance, comparison of Real time Operating systems: Vx Works, чC/OS-II, RT Linux.

UNIT V MICROCONTROLLER PROGRAMMING AND EMBEDDED SYSTEM APPLICATION DEVELOPMENT

Programming in high-level language and assembly languages, basic data types, operators, constructs, data structures, compiler directives -Case Study of Washing Machine- Automotive Application- Smart card System Application,.

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LIST OF EXPERIMENTS:

1. Study of Embedded ARM Compilers-Keil
2. Introduction To Code Composer Studio
3. Serial Communication Using The LPC2148 Uart
4. Basic Input And Output Using The LPC 2148 Uart
5. Lcd Dispay Using The LPC2148 Experimenter Board
6. Hexadecimal Calculator Using The LPC 2148 Experimenter Board
7. Interrupts Using The LPC 2148 Experimenter Board
8. Analog To Digital Conversion Using The LPC 2148 Experimenter Board

TEXT BOOKS:

1. Rajkamal, 'Embedded System-Architecture, Programming, Design', Mc Graw Hill, 2013.
2. Peckol, "Embedded system Design", John Wiley & Sons,2010
3. Lyla B Das," Embedded Systems-An Integrated Approach", Pearson, 2013

REFERENCE BOOKS:

1. Shibu. K.V, "Introduction to Embedded Systems", Tata Mcgraw Hill,2009.
2. Elicia White," Making Embedded Systems", O' Reilly Series,SPD,2011.
3. Tammy Noergaard, "Embedded Systems Architecture", Elsevier, 2006.
4. Han-Way Huang, "Embedded system Design Using C8051", Cengage Learning,2009.
5. Rajib Mall "Real-Time systems Theory and Practice" Pearson Education, 2007.

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CSE18R362	LOGIC AND FUNCTIONAL PROGRAMMING	L	T	P	Credit
		3	0	1	3.5

Pre-requisite : CSE18R171	Course Category : Professional Elective Course Type : Theory with Practical

COURSE OBJECTIVE

- To further the state of the art on the theoretical and practical aspects of developing

- Declarative programming tools in logic programming for IOT data analysis. Introduce basics of functional programming and constraint logic programming .

- Introduction into formal concepts used as a theoretical basis for both paradigms, basic knowledge and practical experience.

COURSE OUTCOMES :

- On completion of the course the student should be able to Understanding of the theory and practice of functional and logic programming For IOT.

- The ability to write functional and logic programs for nodes in IOT.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S												M			
CO3	S	S	S								S	M	M	L		L
CO4	S	S	S								S	M	M	L		L
CO5	S	S	S	S	S	M	L				S	M	M	L		L

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UNIT I PROPOSITION LOGIC

Introduction of logic and Functional Paradigm, Propositional Concepts, Semantic Table , Problem Solving with Semantic Table.

UNIT II : NATURAL DEDUCTION AND AXIOMATIC PROPOSITIONAL LOGIC:

Rules of Natural Deduction, Sequent Calculus, Axiomatic Systems, Meta theorems, Important Properties of AL, Resolution, Resolving Arguments

UNIT III : INTRODUCTION TO PREDICATE LOGIC

Objects, Predicates and Quantifiers, Functions, First Order Language, Quantifiers, Scope and Binding, Substitution, An Axiomatic System for First Order Predicate Logic, Soundness and Completeness, Axiomatic Semantic and Programming

UNIT IV : SEMANTIC TABLEAUX & RESOLUTION IN PREDICATE LOGIC:

Semantic Tableaux, Instantiation Rules, Problem-solving in Predicate Logic, Normal forms, Her brand Universes and H-interpretation, Resolution, Unification, Resolution as a computing Tool, Nondeterministic Programming, Incomplete Data Structure, Second Order Programming in Prolog, Logic Grammars: Definite Clause Grammar, A Grammar Interpreter.

UNIT V : LAZY AND EAGER EVALUATION STRATEGIES:

Evaluation Strategies, Lazy Evaluation: Evaluation Order and strictness of function,Programming with lazy evaluation, Interactive functional program, Delay of unnecessary Computation, Infinite Data Structure, Eager Evaluation and Reasoning 9 Unit 6: Recent trends in logical and functional programming, predicate logics and various evaluation strategies.

TEXT BOOKS:

1. John Kelly, "The Essence of Logic", Prentice-Hall India,2009

2. Saroj Kaushik, "Logic and Prolog Programming", New Age International ltd,2011

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CSE18R363	IOT APPLICATIONS AND COMMUNICATION PROTOCOLS	L	T	P	Credit
		3	0	1	3.5

Pre-requisite : CSE18R371	
	Course Category : Professional Elective
	Course Type : Theory with Practical s

COURSE OBJECTIVE

Basic introduction of all the elements of IoT-Mechanical, Electronics/sensor platform, Wireless and wireline protocols, Mobile to Electronics integration, Mobile to enterprise integration Open source/commercial electronics platform for IoT-Raspberry Pi, Arduino , ArmMbedLPC Open source /commercial enterprise cloud platform for IoT-Ayla, iO Bridge, Libellium, Axeda, Cisco fog cloud

COURSE OUTCOMES :

On completion of the course the student should be able to To understand merging technological options, platforms and case studies of IoT- implementation in home & city automation Determine the Market perspective of IoT

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S												M			
CO3	S	S	S								S	M	M	L		L
CO4	S	S	S								S	M	M	L		L
CO5	S	S	S	S	S	M	L				S	M	M	L		L

UNIT 1: BASIC FUNCTION AND ARCHITECTURE OF A SENSOR

sensor body, sensor mechanism, sensor calibration, sensor maintenance, cost and pricing structure, legacy and modern sensor network. Development of sensor electronics IoT vs legacy, and open source vs traditional PCB design style Development of sensor communication protocols, Protocols: Modbus, relay, Zigbee, Zwave, X10,Bluetooth, ANT, etc. Business driver for sensor deployment — FDA/EPA

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regulation, fraud/tempering detection, supervision, quality control and process management Different kind of calibration Techniques: manual, automation, infield, primary and secondary calibration — and their implication in IoT Powering options for sensors: battery, solar, Witricity, Mobile and PoE

UNIT II: ZIGBEE AND ZWAVE

advantage of low power mesh networking. Long distance Zigbee. Introduction to different Zigbee chips. Bluetooth/BLE: Low power vs high power, speed of detection, class of BLE. Introduction of Bluetooth vendors & their review. Wireless protocols such as Piconet and packet structure for BLE and Zigbee Other long distance RF communication link. LOS vs NLOS links, Capacity and throughput calculation Application issues in wireless protocols:power consumption, reliability, PER, QoS, LOS

UNIT III: PCB VS FPGA

ASIC design Prototyping electronics vs Production electronics ,Basic introduction of multi-layer PCB design and its workflow Electronics reliability-basic concept of FIT and early mortality rate Environmental and reliability testing-basic concepts Basic Open source platforms: Arduino, Raspberry Pi, Beaglebone Unit 4: Introduction to Mobile app platform for IoT: Protocol stack of Mobile app for IoT, Mobile to server integration, iBeacon in IoS, Window Azure, Linkafy Mobile platform for IoT, Axeda, Xively

UNIT IV: DATABASE IMPLEMENTATION FOR IOT :

Cloud based IoT platforms, SQL vs NoSQL, Open sourced vs. Licensed Database, Available M2M cloud platform, AxedaXively, Omega NovoTech, Ayla Libellium, CISCO M2M platform, AT &T M2M platform, Google M2M platform ,IOT-locks, Energy optimization in home

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REFERENCES:
1. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications and Protocols, Wiley-Blackwell,2010

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		L	T	P	Credit
CSE18R364	**MOBILE APPLICATIONS AND SERVICES**	**3**	**1**	**0**	**4**

Pre-requisite : CSE18R271	**Course Category :** Professional Elective **Course Type :** Theory

COURSE OBJECTIVE

This course presents the three main mobile platforms and their ecosystems, namely Android, iOS, and PhoneGap/WebOS. It explores emerging technologies and tools used to design and implement feature-rich mobile applications for smart phones and tablets It also take into account both the technical constraints relative to storage capacity, processing capacity, display screen, communication interfaces, and the user interface, context and profile

COURSE OUTCOMES :

CO1 : Understand the environment of android application framework and tools.

CO2 : apply various user interface design and work with content provider

CO3 : Identify the target platform and users to define the network communication
    model to and to create notifications

CO4 : Examine the best practices, LBS and peer to peer architecture

CO5 : Analyse and perform the security transaction using the Communication
    protocols for IOT nodes

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2		M							M		S	S				
CO3		S						L				S		L	S	
CO4				S										L		
CO5					S			L				S				L

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UNIT I: INTRODUCTION:

Introduction to Mobile Computing, Introduction to Android Development Environment, Factors in Developing Mobile Applications, Mobile Software Engineering, Frameworks and Tools, Generic UI Development Android User

UNIT II : MORE ON UIS:

VUIs and Mobile Apps, Text-to-Speech Techniques, Designing the Right UI, Multichannel and Multimodal Uis, . Storing and Retrieving Data, Synchronization and Replication of Mobile Data, Getting the Model Right, Android Storing and Retrieving Data, Working with a Content Provider

UNIT III : COMMUNICATIONS VIA NETWORK AND THE WEB:

State Machine, Correct Communications Model, Android Networking and Web, Telephony Deciding Scope of an App, Wireless Connectivity and Mobile Apps, Android Telephony Notifications and Alarms: Performance, Performance and Memory Management, Android Notifications and Alarms, Graphics, Performance and Multithreading, Graphics and UI Performance, Android Graphics

UNIT IV : PUTTING IT ALL TOGETHER :

Packaging and Deploying, Performance Best Practices, Android Field Service App, Location Mobility and Location Based Services Android Multimedia: Mobile Agents and Peer-to-Peer Architecture, Android Multimedia

UNIT V: PLATFORMS AND ADDITIONAL ISSUES :

Development Process, Architecture, Design, Technology Selection, Mobile App Development Hurdles, Testing, Security and Hacking , Active Transactions, More on Security, Hacking Android 8 Unit 6: Recent trends in Communication protocols for IOT nodes, mobile computing techniques in IOT, agents based communications in IOT

REFERENCES:

1. Wei-Meng Lee, Beginning Android™ 4 Application Development, 2012 by John Wiley & Sons.
2. Charlie Collins, Michael Galpin and Matthias Kappler, Android in Practice, Dream Tech. 2012

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CSE18R458	SOFTWARE TECHNOLOGY FOR PERVASIVE COMPUTING	L	T	P	Credit
		3	1	0	4

Pre-requisite : Nil	Course Category : Professional Elective
	Course Type : Theory

COURSE OBJECTIVES :

1. To provide awareness that combines current networking technologies with wireless computing, Internet capability to create an environment for pervasive computing using real time applications.
2. To train the students to develop small applications using J2ME for pervasive environments.

COURSE OUTCOMES :

CO1: Explore the conceptual fundamentals involved in all elements and aspects of pervasive Computing.
CO2: Apply the design process of WAP & WML
CO3: Distinguish the hardware, software / services aspects involved
CO4: Design and Develop J2ME user interface and Applications.
CO5: Compare the protocols, languages, models and technologies involved.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S												M			
CO3	S	S	S								S	M	M	L		L
CO4	S	S	S								S	M	M	L		L
CO5	S	S	S	S	S	M	L				S	M	M	L		L

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UNIT I INTRODUCTION TO PERVASIVE COMPUTING

Past Present and Future -The Pervasive Computing Market - m-Business -conclusions and Challenges – The Future Application Examples : Retail - Airtel Check-in and Booking - Sales Force Automation – Healthcare Tracking - Car Information Systems – email access via voice and WAP. Hardware - Human - Machine Interfaces - Biometrics - Operating Systems - Java for Pervasive Device.

UNIT II   WAP & WML

Pervasive Computing and web based Applications - XML and its role in Pervasive Computing - Wireless Application Protocol (WAP) Architecture and Security – Introduction to Wireless Mark-Up language (WML).

UNIT III   PDA IN PERVASIVE COMPUTING

PDA in Pervasive Computing – Introduction - PDA software Components, Standards, emerging trends - PDA Device characteristics - PDA Based Access Architecture.

UNIT IV J2ME USER INTERFACE

J2ME User Interface – Commands, Items and Event Processing – Exception Handling – High – Level Display – Screens – Low Level Display – Canvas – User Interactions – graphics – Clipping Regions – Animations.

UNIT V ISSUES IN PERVASIVE COMPUTING

User Interface Issues in Pervasive Computing, Architecture - Smart Card- based Authentication Mechanisms - Wearable computing Architecture.

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TEXT BOOKS:

1. Jochen Burkhardt, Horst Henn, Stefan Hepper, Thomas Schaec & Klaus Rindtorff, "Pervasive Computing Technology and Architecture of Mobile Internet Applications", Addision Wesley, Reading, 2006.
2. Uwe Ha nsman, LothatMerk, Martin S Nicklous & Thomas Stober, "Principles of Mobile Computing", Second Edition, Springer- Verlag, New Delhi, 2003.

REFERENCE BOOKS:

1. Rahul Banerjee, "Internetworking Technologies: An Engineering Perspective", Prentice-Hall of India, New Delhi, 2003. (ISBN 81-203-2185-5)
2. Burkhardt, Henn, Hepper, Rintdorff, Schaeck. "Pervasive Computing", Addison Wesley, 2002.
3. James Keogh, "J2ME: The Complete Reference", Tata McGraw Hill, 2003.
4. Tommi Mikkonen, "Programming mobile devices – An Introduction for practitioners", Wiley, 2007.

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CSE18R365	ARTIFICIAL INTELLIGENCE	L	T	P	Credit
		3	1	0	4
Pre-requisite : Nil	**Course Category :** Professional Elective				
	Course Type : Theory				

COURSE OBJECTIVES :

1. To introduce the basic principles in artificial intelligence research by covering simple representation schemes, problem solving paradigms, constraint propagation and search strategies.
2. To explore the students with the areas of AI application such as knowledge representation, natural Language processing, expert systems, vision and robotics.

COURSE OUTCOME (CO):

CO1: Explain the foundations and history of Artificial Intelligence, as well as the science of agent design.

CO2: Illustrate the use of problem-solving techniques, such as the various search methods, games, and constraint satisfaction problems.

CO3: Demonstrate AI's use of knowledge representation, through logic agents and first-order logic to address AI problems.

CO4: Design simple software to experiment with various AI learning concepts and analyze results.

CO5: Build self-learning and research skills to be able to tackle a topic of interest on his/her own or as part of a team.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	L	S	L											M		S
CO2		S	S			L							S			M
CO3	L	S	M		S								S	S	M	S
CO4		S	S	L			S					L	M	S		M
CO5		M	S	S	M							L	S	S		S

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UNIT-I   INTRODUCTION

Intelligent Agents – Agents and environments - Good behavior - The nature of environments- Structure of agents- Problem Solving - Problem solving agents- Example problems- Searching for solutions- Uniformed search strategies- Avoiding repeated states

UNIT-II   SEARCHING TECHNIQUES

Informed search strategies- Heuristic function- Local search algorithms and optimistic problems- Local search in continuous spaces- Online search agents and unknown environments- Constraint satisfaction problems (CSP)- Backtracking search and Local search for CSP – Structure of problems- Adversarial Search – Games- Optimal decisions in games – Alpha – Beta Pruning-

UNIT-III   KNOWLEDGE REPRESENTATION

First order logic – Representation revisited- Syntax and semantics for first order logic-Using first order logic-Knowledge engineering in first order logic- Inference in First order logic – prepositional versus first order logic- Unification and lifting- Forward chaining – backward chaining- Resolution

UNIT-IV KNOWLEDGE IN LEARNING

Learning from observations - Forms of learning - Inductive learning-Learning decision trees - Ensemble learning- Knowledge in learning – Logical formulation of learning – Explanation based learning – Learning using relevant information – Inductive logic programming- Statistical learning methods- Learning with complete data- Learning with hidden variable - EM algorithm

UNIT-V ROBOT INTELLIGENCE

Introduction – Robot Hardware – Robotic Perception – Planning to Move – Planning Uncertain Movements – Moving – Robotic Software Architectures - Application Domains – Case Study

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TEXT BOOKS

1. Artificial Intelligence – A Modern Approach, Stuart Russell, Peter Norvig, 3rd Edition, Pearson Education, 2015.

REFERENCE BOOKS

1. Artificial Intelligence, Elaine Rich and Kevin Knight, 2nd Edition, Tata McGraw-Hill, 2003.
2. Artificial Intelligence-Structures and Strategies for Complex Problem Solving, George F. Luger, Pearson Education / PHI, 2002.
3. Artificial Intelligence, Neeta Deshpande, Nanda Yadav, Technical Publications, Pune, 2008.

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CSE18R366	GAME THEORY	L	T	P	Credit
		3	0	1	3.5
Pre-requisite : NIL	**Course Category :** Professional Elective				
	Course Type : Theory with Practical				

COURSE OBJECTIVES :

1. To provide an introduction to mathematical framework required for game theory which makes possible the analysis of the decision making process of interdependent subjects.

2. To make students to identify strategic situations and represent them as games and solve simple games using various techniques

COURSE OUTCOMES :

CO1: Model competitive real world phenomena using concepts from game theory.
CO2: Discuss the theory which underlies games.
CO3: Review and critically assess literature which deals with game theory and related materials.
CO4: Elucidate the potential or proven relevance of game theory and its impact in many fields of human endeavor which involve conflict of interest between two or more participants.
CO5: Communicate game-theoretic ideas and concepts to non-specialist audiences in a language which is accessible and comprehensible.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												S	M		L
CO2	S	S	S	S	S								S			
CO3	S	M	M	M	M								S			
CO4	S												S			
CO5	S	S	S	S	S	S	S	M	M	M	M	M	S		M	

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UNIT I   INTRODUCTION

Game theory: theory of rational choice - interactions of decision makers - Nash Equilibrium: Theory - Strategic games - examples - Best response functions - Dominated actions - Symmetric games and symmetric equillibria. - Cournot's model - Bertrand's model - Electoral competition - Mixed strategy Equilibrium.

UNIT II   IMPERFECT INFORMATION IN GAMES

Baysian Games - Extensive Games with Imperfect Information: Motivational examples - Cournot's duopoly game with imperfect information - Extensive Games with Imperfect Information: Strategies - Nash equilibrium - Beliefs and sequential equilibrium - Signaling games.

UNIT III   VARIANTS AND EXTENSIONS

Strictly Competitive Games and Maxminimization - Rationalizability - Evolutionary Equilibrium - Case study: The Prisoner's Dilemma - Bargaining as an extensive game.

UNIT III ANALYZING BEHAVIOR IN STATIC AND DYNAMIC SETTINGS

Dominance and Best Response - Rationalizability and Iterated Dominance - Location, Partnership, and Social Unrest - Strictly Competitive Games and Security Strategies - Contract, Law, and Enforcement in Static Settings - Analyzing Behavior In Dynamic Settings: Details of the Extensive Form - Sequential Rationality and Solution Concepts - Topics in Industrial Organization - Parlor Games - Games with Joint Decisions; Negotiation Equilibrium - Unverifiable Investment, Hold Up, Options, And Ownership - Repeated Games and Reputation – Collusion.

UNIT –V   INFORMATION

Random Events and Incomplete Information - Risk and Incentives in Contracting - Lemons, Auctions, and Information Aggregation - Perfect Bayesian Equilibrium - Job-Market Signaling and Reputation

LIST OF EXPERIMENTS

1. Study of tools used for game designing
2. To calculate payoffs, strict dominance, weak dominance using equilibrium.
3. To calculate the elimination of strictly dominated strategies and weakly dominated strategies.
4. To Implement the Zero Sum games in the mixed strategies.
5. To implement the Assurance game/Stag Hunt in the following situation. Two hunters can either jointly hunt a stag (an adult deer and rather large meal) or individually hunt a rabbit (tasty, but substantially less filling). Hunting stags is quite challenging and requires mutual cooperation. If either hunts a stag alone, the chance of success is minimal. Hunting stags is most beneficial for society but requires a lot of trust among its members.
6. To implement the game of Chicken (Chicken game) in the equilibrium is preferred by each player.
7. To implement the dead lock gaming in the following strategy (dominant and equilibrium strategies).
8. To Implement the Prisoner's Dilemma game.
9. To implement the Parlor Games.

TEXT BOOKS:

1. Martin J. Osborne, An introduction to game theory, Oxford University Press, 2014.
2. Joel Watson, Strategy: An Introduction to Game Theory, Third edition, W. W. Norton & Company, 2013.

REFERENCE BOOKS:

1. Ian Millington and John Funge, Artificial Intelligence for Games, Second Edition - ISBN: 0123747317
2. Mailath, George J., and Larry Samuelson. Repeated Games and Reputations. New York, NY: Oxford University Press, 2006.
3. Leyton-Brown, K., Shoham, Y., Essentials of Game Theory: A Concise, Multidisciplinary Introduction, Morgan & Claypool Publishers. 2008.
4. Steven Tadelis, Game Theory An Introduction, Princeton University Press, 2013.
5. William Spaniel, Game Theory 101: The Complete Text book, 2011.
6. William Spaniel, Game Theory 101: Bargaining, 2014.
7. Presh Talwalka, The Joy of Game Theory: An Introduction to Strategic Thinking, 2014.
8. Roger A McCain Game Theory: A Nontechnical Introduction to the Analysis of Strategy: 3rd Edition, World Scientific Publishing Co. Pte. Ltd, 2014.

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CSE18R367	VIRTUAL REALITY	L	T	P	Credit
		3	0	1	3.5
Pre-requisite : NIL	**Course Category :** Professional Elective **Course Type** : Theory with Practical				

COURSE OBJECTIVES :

1. To understand the fundamentals of virtual reality

2. To understand geometric modeling and Virtual environment

3. To study about Virtual Hardware and Software

4. To develop Virtual Reality applications

COURSE OUTCOMES :

CO1: Understand the basic concept and framework of virtual reality
CO2: Elucidate the concept of principles and multidisciplinary features of virtual reality
CO3: Compare the different technology for user interaction and perception in virtual reality
CO4: Analyze how to managing large scale VR environment in real time.
CO5: Apply VR system framework and development tools.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	Pos												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												S		M	
CO2	S	S	S	S	L								M			
CO3	S	M	M	M	M								M		L	
CO4	S												S			L
CO5	S	S	S	L	S	S	S						M		L	

UNIT I - INTRODUCTION TO VIRTUAL REALITY

Virtual Reality & Virtual Environment : Introduction – Computer graphics – Real time computer graphics –Flight Simulation – Virtual environments –requirement – benefits of virtual reality- Historical development of VR : Introduction – Scientific Landmark - 3D Computer Graphics :Introduction – The Virtual world space – positioning the virtual observer – the perspective projection – human vision – stereo perspective projection – 3D clipping – Colour theory – Simple 3D modeling 176 CS-Engg&Tech-SRM-2013 –

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Illumination models – Reflection models – Shading algorithms- Radiosity – Hidden Surface Removal – Realism-Stereographic image.

UNIT II - GEOMETRIC MODELLING

Geometric Modeling: Introduction – From 2D to 3D – 3D space curves – 3D boundary representation - Geometrical Transformations: Introduction – Frames of reference – Modeling transformations – Instances –Picking – Flying – Scaling the VE – Collision detection - A Generic VR system: Introduction – The virtual environment – the Computer environment – VR Technology – Model of interaction – VR Systems.

UNIT III - VIRTUAL ENVIRONMENT

Animating the Virtual Environment: Introduction – The dynamics of numbers – Linear and Non-linear interpolation - The animation of objects – linear and nonlinear translation - shape & object – free from deformation – particle system- Physical Simulation : Introduction – Objects falling in a gravitational field – Rotating wheels – Elastic collisions – projectiles – simple pendulum – springs – Flight dynamics of an aircraft.

UNIT IV-VR HARDWARES & SOFTWARES

Human factors : Introduction – the eye - the ear- the somatic senses - VR Hardware : Introduction – sensor hardware – Head-coupled displays –Acoustic hardware – Integrated VR systems-VR Software: Introduction –Modeling virtual world –Physical simulation- VR toolkits – Introduction to VRML.

UNIT V - VR APPLICATION

Virtual Reality Applications: Introduction – Engineering – Entertainment – Science – Training – The Future: Introduction – Virtual environments – modes of interaction.

TEXT BOOK
1. John Vince, "Virtual Reality Systems ", Pearson Education Asia, 2007.

REFERENCES
1. Adams, "Visualizations of Virtual Reality", Tata McGraw Hill, 2000.
2. Grigore C. Burdea, Philippe Coiffet , "Virtual Reality Technology", Wiley Interscience, 2nd Edition, 2006.
3. William R. Sherman, Alan B. Craig, "Understanding Virtual Reality: Interface, Application, and Design", Morgan Kaufmann, 2008.

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CSE18R368	COMPUTER GRAPHICS & MULTIMEDIA SYSTEMS	L	T	P	Credit
		3	0	1	3.5
Pre-requisite : CSE18R171	**Course Category :** Professional Elective **Course Type** : Theory with Practical				

COURSE OBJECTIVES :

To introduce the concept and various algorithms in computer graphics and various multimedia formats, compression techniques and to implement know algorithms in graphics and also short animations.

COURSE OUTCOMES :

CO1: Understand the concepts of display devices and Line drawing algorithms
CO2: Apply different types of clipping algorithms and two dimensional transformations.
CO3: Use the concepts of 3D display methods, transformation and viewing in computer Graphics
CO4: Analyze the different types of compression techniques and different types of data file format used in multimedia systems.
CO5: Acquire the Multimedia Authoring Systems and Hypermedia message components & standards.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2			S	S	S											
CO3	S	M	M											S		
CO4	S							S					M		S	
CO5	S	S	S				S				M	M	M			L

UNIT I INTRODUCTION
Overview of graphics systems-display devices-Raster Scan and Random Scan Systems-Graphics hardware and software. Line Drawing algorithms- DDA- Bresenham.- Circle-Ellipse Drawing algorithm- Area fills algorithms- Attributes of output primitives.

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UNIT II TWO-DIMENSITIONAL CONCEPTS

Two-dimensional geometric transformation: Translation- rotation- scaling- shearing-reflection. - Two-dimensional Viewing- window to viewport mapping- Clipping- point clipping- line clipping- Cohen-Sutherland- Liang Barsky- Nicholl-Lee-Nicholl Line clipping algorithms- Polygon Clipping-Sutherland- Hodgeman polygon clipping-Curve clipping- Text clipping- Exterior Clipping.

UNIT III   THREE-DIMENSIONAL CONCEPTS

Three-dimensional display methods- Three-dimensional object representations – polygon surfaces- Cure surfaces- spine representations- Bezier curves and surfaces- B-spline curves and surfaces- Beta splines- Rational spline – Octree - BSP Trees-Fractal Geometry methods: Procedures,Classification,Geometric Construction of deterministic and statistically self-similar fractals - Three-dimensional geometric and modeling transformations - Three dimensional viewing and clipping.

UNIT IV COMPRESSION AND DATA, FILE FORMAT

Types of Compression – Binary Image Compression schemes – Color , Gray scale and still video image compression – Video Compression – Audio Compression – Fractal Compression - Rich Text Format – TIFF File Format – RIFF – MIDI File Format – JPEG DIB File Format – AVI indeo File Format –MPEG Standards.

UNIT V   MULTIMEDIA AUTHORING AND USER INTERFACE

Multimedia Authoring Systems – Hypermedia applications and Design considerations – User Interface Design – Mobile Messaging – Hyper Media Message Components – Hyperlinking and Embedding – Creating Hypermedia Messages – Integrated Multimedia Message Standards – Integrated Document Management .

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LIST OF EXPERIMENTS   **15 Hours**

1.   Implementation of Line drawing algorithms (DDA, Bresenham's algorithm).
2.   Implementation of Midpoint Circle drawing algorithm.
3.   Implementation of Area fill algorithms
4.   Implementation of 2D Transformations such as Translation, Rotation, Scaling,
5.   Reflection and Shearing.
6.   Implementation of Cohen-Sutherland 2D clipping and window-view port mapping.
7.   Implementation of 3D Transformations such as Translation, Rotation and Scaling.
8.   Implementation of Color models.
9.   Implementation of following animations in C language.
        a.   Simulation of bouncing ball
        b.   Animation of Car
        c.   Simulation of dancing doll.
10.   To visualize the projection of 3D images

TEXT BOOKS:

1. Donald D. Hearn, M. Pauline Baker and Warren Carithers, "Computer Graphics with OpenGL", Fourth Edition, Pearson Education, 2011.
2. Ze-Nian Li and Mark S.Drew, "Fundamentals of Multimedia", First Edition, Pearson Education, 2014.

REFERENCE BOOKS:

1. F.S.Hill, "Computer Graphics using OPENGL", Second edition, Pearson Education, 2003.
2. Prabhat K Andleigh, Kiran Thakrar, "Multimedia systems design", First Edition, PHI, 2007.

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CSE18R369	COMPUTATIONAL INTELLIGENCE	L	T	P	Credit
		4	0	1	4
Pre-requisite : Nil	**Course Category :** Major Elective **Course Type** : Theory with Practical Component				

COURSE OBJECTIVES :

1. To understand the fundamental theory and concepts of neural networks, neuro-modeling, several neural network paradigms and its applications.
2. To understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic control and other machine intelligence applications of fuzzy logic.
3. To understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems

COURSE OUTCOMES :

CO1: Examine the role of Soft computing techniques and their applications.
CO2: Implement the concepts of fuzzy sets and fuzzy logic .
CO3: Analyze the various Neural Network Architectures.
CO4: Apply genetic algorithm to engineering Optimization problem
CO5: Analyze Neural Network, Fuzzy logic and Genetic Algorithm in Hybrid Intelligent Systems techiques.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S	S	S	S	S								M	L		L
CO3	S	M	M	M	M						M	M	M	L		L
CO4	S	M	M	S	S						M	M	M	L		L
CO5	S	S	S	S	S						M	M	M	L		L

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UNIT I INTRODUCTION
Conventional Artificial Intelligent system-symbolic processing-expert systems-pitfalls-Hard Vs Soft computing techniques-Constituents of soft computing-Special features-Hybrid system

UNIT II FUZZY SETS AND LOGIC

Fuzzy sets-Operation on fuzzy sets-fuzzy relation-Fuzzy rules and fuzzy reasoning-Fuzzy Inference systems-Defuzzification-Fuzzy Logic Control-Fuzzy clustering-Fuzzy Decision Making-Applications of Fuzzy logic.

UNIT III   ARTIFICIAL NEURAL NETWORKS

Overview of Biological neuro system-Mathematical Model of Neurons-Learning rules-Learning paradigms-Supervised, unsupervised and reinforcement learning-Perceptron networks-Training rules-multilayer perception –back propagation algorithms-associative memories-Hop field networks-Boltzmann machine-Self Organising Map-Adaptive Resonance theory

UNIT IV EVOLUTIONARY COMPUTATION

Robustness of traditional optimization and search techniques-The goals of optimization-Introduction to evolutionary programming-Evolutionary strategy-Comparison –Genetic Algorithm- binary and real representation schemes, selection methods, crossover and mutation operators for binary and real coding - constraint handling methods –Applications.

UNIT V   HYBRID INTELLIGENT SYSTEMS

Adaptive Neuro Fuzzy Inference Systems(ANFIS)-Architecture-Hybrid Learning Algorithm-Parameter Identification-Rule Based Structure identification-Input Selection-Input Space partition-Neuro fuzzy control-Genetic algorithm for fuzzy system design-Neural network training using GA.

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LIST OF PRACTICAL COMPONENTS:

1. Implementation of simple program using MATLAB
    - Find out the factorial of a given number
    - Find the Fibonacci series of a given number
    - Find out the sum and average of the given number
    - Implementation of matrix operation
2. Implementation of Fuzzy Arithmetic operation.

3. Implementation of Fuzzy Operations.

4. Implementation of Defuzzification

5. Implementation of Fuzzy Inference System.

6. Implementation of Perceptron Network

7. Implementation of BPN

8. Build A Hopfield Network

TEXT BOOKS:

1. J.S.R.Jang,C.T.Sun and E.Mizutani,"Neuro Fuzzy and Soft Computing",PHI Learning private Limited,2010.
2. S.N.Sivanandam and S.N.Deepa, Principles of Soft computing, Wiley India Edition, 2nd Edition, 2013.

REFERENCE BOOKS:

1. Timothy J.Ross,"Fuzzy Logic with Engineering Applications",McGraw-Hill,2004.
2. Goldberg,Genetic Algorithm in search,Optimization and Machine learning,Addison Wesley,1998.

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CSE18R459	COMPUTER VISION AND DIGITAL IMAGING		L	T	P	Credit
			3	1	0	4
Pre-requisite : NIL	Course Category : Professional Elective					
	Course Type : Theory					

COURSE OBJECTIVES :

To introduce the students to computer vision algorithms, methods and concepts which will enable the student to implement computer vision systems with emphasis on applications and problem solving

COURSE OUTCOMES :

CO1: Explore the fundamentals of imaging ,video processing and computer vision
CO2: Analyze different types of image enhancement techniques
CO3: Compare the different types of clustering and classification used in image and video processing
CO4: Distinguish various types of movements used in image and video based applications
CO5: Apply various vision algorithms to solve real time applications

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S	S	S	S	S								M			L
CO3	S	M	M	M	M								M			L
CO4	S												M			L
CO5	S	S	S	S	S	S	S				M	M	M			L

UNIT I INTRODUCTION

Fundamentals of Image Formation Transformation- Orthogonal, Euclidean, Affine, Projective - Multi-camera views Perspective, Binocular Stereopsis- Camera and Epipolar Geometry- Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework- Auto-calibration.

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UNIT II IMAGE ENHANCEMENT

Edges - Canny, LOG, DOG- Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT.

UNIT III PATTERN ANAYLSIS

K-Means- K-Medoids - Mixture of Gaussians - Discriminant Function- Supervised- Un-supervised- Semi-supervised- Classifiers- Bayes- KNN - ANN models- Dimensionality Reduction- PCA, LDA, ICA- Non-parametric methods.

UNIT IV MOTION ANAYLSIS

Background Subtraction and Modeling - Optical Flow- KLT- Spatio-Temporal Analysis-Dynamic Stereo- Motion parameter estimation.

UNIT V REAL TIME APPLICATIONS

 CBIR- CBVR- Activity Recognition- computational photography- Biometrics- stitching and document processing- Modern trends - super-resolution- GPU- Augmented Reality- cognitive models- fusion and SR&CS.

REFERENCE BOOKS:

1. SE Umbaugh, Digital Image Processing and Analysis: Human and Computer Vision Application with CVIPtools, 2nd Edition, , CRC Press, 2011
2. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.
3. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2003
4. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004

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CSE18R460	NATURAL LANGUAGE PROCESSING	L	T	P	Credit
		3	0	1	3.5
Pre-requisite : Nil	**Course Category :** Professional Elective				
	Course Type : Theory with Practical				

COURSE OBJECTIVES :

To provide students an introduction to computational linguistics, from morphology (word formation) and syntax (sentence structure) to semantics (meaning), and natural language processing applications such as parsing, machine translation, generation and dialog system

COURSE OUTCOMES :

CO1: Examine the speech and language processing
CO2: Determine the language syntax Grammars equivalence and normal forms.
CO3: Recognize Syntax-Driven semantic analysis
CO4: Identify natural language generation.
CO5: Build Language similarities and differences for Usability and system development.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S	S	S	S	S								M	L		L
CO3	S	M	M	M	M								M	L		L
CO4	S	M	M										M	L		L
CO5	S	S	S	S	S	S	S				M	M	M	L		L

UNIT I INTRODUCTION

Introduction: Knowledge in speech and language processing – Ambiguity – Models and Algorithms – Language, Thought and Understanding. Regular Expressions and automata: Regular expressions – Finite-State automata. Morphology and Finite-State Transducers: Survey of English morphology – Finite-State Morphological parsing – Combining FST lexicon and rules – Lexicon-Free FSTs: The porter stammer – Human morphological processing

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UNIT II SYNTAX

Constituency – Context-Free rules and trees – Sentence-level constructions – The noun phrase – Coordination – Agreement – The verb phase and sub categorization – Auxiliaries – Spoken language syntax – Grammars equivalence and normal form – Finite-State and Context-Free grammars – Grammars and human processing. Parsing with Context-Free Grammars - Parsing as search – A basic Top-Down parser – Problems with the basic Top-Down parser – The early algorithm – Finite-State parsing methods

UNIT III   SEMANTIC

Syntax-Driven semantic analysis – Attachments for a fragment of English – Integrating semantic analysis into the early parser – Idioms and compositionality – Robust semantic analysis. Lexical semantics: relational among lexemes and their senses – WordNet: A database of lexical relations – The Internal structure of words – Creativity and the lexicon.

UNIT IV NATURAL LANGUAGE GENERATION

Introduction to language generation – Architecture for generation – Surface realization – Discourse planning – Other issues

UNIT V MACHINE TRANSLATION

Language similarities and differences – The transfer metaphor – The interlingua idea: Using meaning – Direct translation – Using statistical techniques – Usability and system development.

LIST OF EXPERIMENTS:

1. Stanford's Core NLP Suite - Part of Speech Tagging, Grammar Parsing
2. Natural Language Toolkit- Tokenizing, Parsing, Identifying the Names
3. Apache Lucene and Solr - Text ranging from advanced string manipulation utilities to powerful and flexible tokenization libraries
4. Apache OpenNLP – Tokenization, Part of speech tagging, Parsing, Named entity recognition
5. GATE and Apache UIMA - Building a complex NLP application

TEXT BOOK:

1. Daniel Jurafsky and James Martin H., Speech and Language Processing, Pearson Education,Singapore Pvt. Ltd., 2009.

REFERENCE BOOK:

1. Steven Bird Ewan kelwin and Edward Looper, Natural Language Processing with python, Pearson Education, 2003.

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INT18R353	DATA WAREHOUSING AND MINING	L	T	P	Credit
		3	1	0	4
Pre-requisite : INT18R371	**Course Category :** Professional Elective				
	Course Type : Theory				

COURSE OBJECTIVES :

1. To know the concepts and techniques of data mining and data warehousing
2. To understand the systems for data warehousing and/or data mining

COURSE OUTCOMES :

CO1 : Understand the Data Warehouses and implementation of architectures
CO2 : Understand data pre-processing, language, architectures, concept description
CO3 : Learn how to use Association Rule Mining
CO4 : Understand Classification And Clustering
CO5 : Understand the how to apply Data mining in Recent Trends.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	L	S	M		S	S							S	M		
CO2	L	S											S			
CO3	L	S	M		S							L	S	M		L
CO4	L	S											S			
CO5	L	S				S	S					M	S	M		L

UNIT I INTRODUCTION TO DATA WAREHOUSING

Introduction - Data Warehouse - Multidimensional Data Model - Data Warehouse Architecture – Implementation - Further Development - Data Warehousing to Data Mining. Practical: Data Model

UNIT II   DATA PREPROCESSING, LANGUAGE, ARCHITECTURES, CONCEPT DESCRIPTION
Why Pre processing - Cleaning, Integration – Transformation – Reduction – Discretization - Concept Hierarchy Generation, Data Mining Primitives, Query Language, Graphical User Interfaces – Architectures - Concept Description - Data

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Generalization - Characterizations - Class Comparisons - Descriptive Statistical Measures. Practical: Query Language

UNIT III ASSOCIATION RULES

Association Rule Mining - Single-Dimensional Boolean Association Rules from Transactional Databases - Multi-Level Association Rules from Transaction Databases. Practical: Association Rules

UNIT IV CLASSIFICATION AND CLUSTERING

Classification and Prediction – Issues - Decision Tree Induction - Bayesian Classification - Association Rule Based - Other Classification Methods – Prediction - Classifier Accuracy - Cluster Analysis - Types of data - Categorization of methods - Partitioning methods - Outlier Analysis. Practical: Categorization of methods

UNIT V RECENT TRENDS

Multidimensional Analysis and Descriptive Mining of Complex Data Objects -Spatial Databases - Multimedia Databases - Time Series and Sequence Data - Text Databases – relationless databases- World Wide Web -Applications and Trends in Data Mining. Practical: Spatial Databases - Multimedia Databases

TEXT BOOK

1.   J. Han, M. Kamber, "Data Mining: Concepts and Techniques", Harcourt India Morgan Kauffman, 2011.

REFERENCE BOOKS:

1.   Margaret H.Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education 2006.
2.   Sam Anahory, Dennis Murry, "Data Warehousing in the real world", Pearson Education 2009.
3. David Hand, Heikki Manila, Padhraic Symth, "Principles of Data Mining", PHI 2004.

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CSE18R370	BIG DATA ANALYTICS	L	T	P	Credit
		3	1	0	4

Pre-requisite : NIL	Course Category : Professional Elective
	Course Type : Theory

COURSE OBJECTIVES

1. Prepare the students to understand and gain the basic knowledge about big data and its evolution.
2. Gain knowledge about various frameworks & techniques to handle big data like Hive, Sharding, NoSQL Databases, S3, Hadoop Distributed file systems, Hbase, Impala and so on.
3. Familiarise the students with R programming concepts to perform data analytic tasks.

COURSE OUTCOMES

CO1: Understand the key issues on big data, characteristics, data sources and the associated applications in intelligent business and scientific computing.

CO2: Understand the frameworks of Hadoop and Map reduce and apply them to solve complex problems.

CO3: Understand and apply the concepts of R programming to perform data analytics.

CO4: Apply various machine learning algorithms to solve data analytic problems and render the results using visualization tools.

CO5: Analyze the uses of schema-free databases such as NoSQL and create efficient algorithms to analyze statistical datasets.

MAPPING of CO to PO and PSO

	Pos												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S			M		M	M				M		M	M		
CO2	M	M		S								L	S	M		
CO3				S	S								S	M		
CO4				M		S	S	M		M	M					
CO5	M	M	M	M			S									

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UNIT I   Introduction to Big Data

Analytics – Nuances of big data – Value – Issues – Features of Big Data - Security, Compliance, auditing and protection - Big data characteristics - Volume, Veracity, Velocity, Variety – Big data applications – Main phases for Big data life cycle – Hadoop – Hadoop Ecosystem.

UNIT II   Hadoop Processing

Hadoop Processing: MapReduce Framework, Anatomy of File Write and Read, Rack Awareness., MapReduce Use Cases, Traditional way Vs MapReduce way, Why MapReduce, Hadoop 2.x MapReduce Architecture, Hadoop 2.x MapReduce Components, Key-value stores Matrix multiplication, Word count, PageRank

UNIT III   R Programming

Introduction – Loops and control structures – Functional Programming: Map, Reduce, Search, Filter, Compose, Partial Application, Side Effects, Recursion – Debugging and Profiling – Object Oriented Programming: Principles, S3, S4, Reference classes, Reuse of existing data structures

UNIT IV   Predictive Analytics and Visualization

Predictive Analytics – Supervised – Unsupervised learning – Neural networks – Mining Frequent itemsets - Market based model – Apriori Algorithm – Dimensionality Reduction – Principle Component Analysis – Clustering Techniques – Hierarchical – K-Means – Clustering high dimensiona data –Visualizations – Data visualization tools – d3.js – Gephi

UNIT V   NoSQL and Real Time Data Analytics

NoSQL – Characteristics of NoSQL – Types of NoSQL Data Models – Distribution Models – CAP Theorem – Sharding - Analyzing big data with twitter, facebook – Analyzing statistical data for predictive analytics – Agricultural data, Cricket data, and Weather forecasting – Big data for Ecommerce

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TEXT BOOKS

1. Judith Hurwitz, Alan Nugent, Fern Halper, Marcia Kaufman, "Big Data for Dummies", Wiley Brand, 2013.
2. Roger D. Peng – R Programming for Data Science, Lean Pub, Lulu, 2019.

REFERENCE BOOKS

1. Bart Baesens, ―Analytics in a Big Data World‖, The Essential Guide to Data Science and its Applications, Wiley, First edition,2014.
2. Anand Rajaraman, Jeffrey D. Ullman, "Mining of Massive Datasets", Cambridge University Press New York, 2011.
3. Paul C. Zikopoulos, Chris Eaton, ―Understanding Big Data‖, McGraw-Hill, 2012 (eBook from IBM)

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CSE18R451	MACHINE LEARNING TECHNIQUES	L	T	P	Credit
		3	1	0	4

Pre-requisite: Nil	Course Category : Professional Elective
	Course Type : Theory

COURSE OBJECTIVES :

1. To provide students with an in-depth introduction to two main areas of Machine Learning namely supervised and unsupervised and also to cover some of the main models and algorithms for regression, classification, clustering linear and logistic regression, regularization, MLE, probabilistic (Bayesian) inference, SVMs and kernel methods.

COURSE OUTCOMES :

CO1 : Examine the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.
CO2 : Elaborate strengths and weaknesses of various machine learning approaches.
CO3 : Derive mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.
CO4 : Propose and implement various machine learning algorithms in a range of real-world applications.
CO5 : Interpret and handle large data sets

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												S	M		M
CO2	S												S	M		M
CO3	S	S	S	S	S	M	L				S	M	S	M		M
CO4	S	S	S	S	S	M	L				S	M	S	M		M
CO5	S	S	S	S	S	M	L				S	M	S	M		M

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UNIT I FOUNDATIONS OF LEARNING

Components of Learning – Learning Models – Geometric Models – Probabilistic Models – Logic Models – Grouping and Grading – Learning versus Design – Types of Learning – Supervised – Unsupervised Learning – Reinforcement – Theory Of Learning – Feasibility of Learning – Error and Noise – Training versus Testing – Theory of Generalization – Generalization Bound – Approximation – Generalization Tradeoff – Bias and Variance – Learning Curve

UNIT II LINEAR MODELS

Linear Classification – Univariate Linear Regression – Multivariate Linear Regression – Regularized Regression – Logistic Regression – Perceptrons – Multilayer Neural Networks – Learning Neural Networks Structures – Support Vector Machines – Soft Margin SVM – Going beyond Linearity – Generalization and Overfitting – Regularization – Validation

UNIT III DISTANCE-BASED MODELS

Nearest Neighbor Models – K-Means – Clustering around Medians – Silhouttes – Hierarchical Clustering – K-D Trees – Locality Sensitive Hashing – Non-Parametric Regression – Ensemble Learning – Bagging and Random Forests – Boosting – Meta Learning

UNIT IV TREE AND RULE MODELS

Decision Trees – Learning Decision Trees – Ranking and Probability Estimation Trees – Regression Trees – Clustering Trees – Learning Ordered Rule Lists – Learning Unordered Rule Lists – Descriptive Rule Learning – Association Rule Mining – First-Order Rule Learning

UNIT V REINFORCEMENT LEARNING

Passive Reinforcement Learning – Direct Utility Estimation – Adaptive Dynamic Programming – Temporal-Difference Learning – Active Reinforcement Learning – Exploration – Learning an Action-Utility Function – Generalization in Reinforcement Learning – Policy Search – Applications In Game Playing – Applications In Robot Control

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REFERENCE BOOKS:

1. Y. S. Abu-Mostafa, M. Magdon-Ismail, and H.-T. Lin, "Learning from Data", AMLBook Publishers, 2012.
2. P. Flach, "Machine Learning: The art and science of algorithms that make sense of data", Cambridge University Press, 2012.
3. K. P. Murphy, "Machine Learning: A probabilistic perspective", MIT Press, 2012.
4. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2007.
5. D. Barber, "Bayesian Reasoning and Machine Learning", Cambridge University Press, 2012.
6. M. Mohri, A. Rostamizadeh, and A. Talwalkar, "Foundations of Machine Learning", MIT Press, 2012.
7. T. M. Mitchell, "Machine Learning", McGraw Hill, 1997.

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CSE18R461	BIO INSPIRED INTELLIGENCE TECHNIQUES	L	T	P	Credit
		3	0	1	3.5
Pre-requisite : NIL	Course Category : Professional Elective				
	Course Type : Theory with Practical				

COURSE OBJECTIVES :

To introduce students various schemes for classification, search, learn and optimization based on bio-inspired mechanisms

COURSE OUTCOMES :

CO1: Explore the benefits and limitations of bio-inspired approaches.
CO2: Extract basic principles from intelligent systems in nature that can be applied to engineering.
CO3: Critically analyze the use of cellular systems
CO4: Differentiate the different models of immune systems
CO5: Apply bio-inspired AI to engineer solutions for real world applications.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S	S	S	S	S								M	L		L
CO3	S	M	M	M	M								M	L		L
CO4	S												M			
CO5	S	S	S	S	S	S	S				M	M	M	L		L

UNIT I EVOLUTIONARY SYSTEMS

Evolutionary Systems – Artificial Evolution - Genetic Representations - Evolutionary Measures - Types of Evolutionary Algorithms - Schema Theory - Evolutionary Computation- Representation- Selection- Reproduction - Genetic Algorithms - Canonical Genetic Algorithm – Crossover- Mutation - Control Parameters – Applications - Genetic Programming - Tree-Based Representation – Building Block

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Genetic Programming –Applications. Evolutionary Programming – Basics –Operators – Strategy Parameters -Evolutionary Programming Implementations

UNIT II   NEURAL AND FUZZY SYSTEMS

Neural Networks - Biological Nervous Systems - Artificial Neural Learning - Architecture. Unsupervised Learning - Self-Organizing Feature Maps. Supervised Learning – Types- Learning Rules. Radial Basis Function Networks. Reinforcement Learning – Model Free - Neural Networks and Reinforcement Learning. Fuzzy Systems- Fuzzy Sets – Logic and Reasoning – Controllers- Rough Sets.

UNIT III CELLULAR AND DEVELOPMENT SYSTEMS

Cellular Systems - The Basic Ingredients - Cellular Automata -Modeling - Classic Cellular Automata – Other Cellular Systems – Computation - Artificial Life - Complex Systems - Analysis and Synthesis of Cellular Systems. Developmental Systems - Potential Advantages of a Developmental Representation -Rewriting Systems - Synthesis of Developmental Systems - Evolution and Development – Defining Artificial Evolutionary Developmental Systems -Evolutionary Rewriting Systems – Developmental Programs and Processes

UNIT IV IMMUNE SYSTEMS AND COLLECTIVE SYSTEMS

Natural Immune systems - Classical View -Working -Constituents of Biological Immune Systems - Immunity Types - Learning the Antigen Structure - The Network Theory - The Danger Theory –Artificial Immune Systems - Algorithms - Classical View Models - Clonal Selection Theory Models – Network Theory Models - Danger Theory Models - Applications and Other AIS models Applications- Biological Self-Organization - Particle Swarm Optimization - Basics - Social Network Structures – Variations - Basic PSO Parameters - Optimization - Applications. Ant Colony Optimization – Cemetery Organization and Brood Care - Division of Labor –Applications

UNIT V BEHAVIORAL SYSTEMS

Behavioral Systems - Behavior in Cognitive Science - Behavior in Artificial Intelligence – Behavioral Systems – Behavior Based Robots –Evolution - Co-evolution - Learning and Self Reproduction of Behavioral Systems. Cultural Algorithms - Culture and Artificial Culture - Cultural Algorithm – Belief Space – Fuzzy Cultural Algorithms – Applications. Co-evolution – Types - Competitive and Cooperative Co-evolution.

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LIST OF EXPERIMENTS :

1. Implementation of Simple Evolutionary Algorithms

2. Implementation of Supervised Learning Algorithms

3. Applying ACO/PSO/AIS algorithms to computing problems like network routing, TSP opr any innovative computing problem.

REFERENCE BOOKS:

1. Claudio Mattiussi, Dario Floreano "Bio-Inspired Artificial Intelligence: Theories, Methods,   and Technologies" (Intelligent Robotics and Autonomous Agents series), MIT Press, 2008
2. Andries P. Engelbrecht, "Computational Intelligence: An Introduction", 2nd Edition , Wiley; 2007
3. Russell C. Eberhart, Yuhui Shi Computational Intelligence: Concepts to Implementations, Morgan Kaufmann; 1 edition 2007.

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CSE18R462	DATA VISUALIZATION	L	T	P	Credit
		3	0	1	3.5
Pre-requisite NIL	**Course Category :** Professional Elective				
	Course Type : Theory with Practical				

COURSE OBJECTIVES :

1. To introduce students to the field of data visualization, basic visualization design and evaluation principles, and learn how to acquire, parse, and analyze large datasets.
2. To make them to learn techniques for visualizing multivariate, temporal, text-based, geospatial, hierarchical, and network/graph-based data.

COURSE OUTCOMES :

CO1: Explore the importance of Visualization and be familiar with the process of visualization
CO2: Implement the Visualization Techniques for various kinds of data
CO3: Choose the effective visualization techniques for the real world data set
CO4: Interpret the various problems in designing a effective visualization system
CO5: Develop a modern and integrated visualization Systems

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S	S	S	S	S								M	L		L
CO3	S	M	M	M	M								M	L		L
CO4	S												M			
CO5	S	S	S	S	S	S	S				M	M	M	L		L

UNIT I VALUE OF VISUALIZATION

What is Visualization-The Visualization Process – Cognition-The Scatterplot-The Role of the User-Types of Data-Data Pre-processing-What Is Perception-Principles of Perception-perceptual processing.

`

UNIT II VISUALIZATION TECHNIQUES FOR SPATIAL DATA AND GEOSPATIAL DATA

Various Dimensions of Data-Dynamic Data -Combining Techniques-Visualizing Spatial Data-Visualization of Point Data- Visualization of Area Data -Visualization of Line Data-Issues in Geospatial data visualization-space traversal-cognitive cost

UNIT III VISUALIZATION TECHNIQUES FOR MULTIVARIATE DATA

Point Based Techniques-Line Based Techniques-Region Based Techniques Visualization Techniques for Trees,Graphs,and Networks: Displaying Hierarchical Structures-Displaying arbitrary Graph/Networks- Text and Document Visulaization: Levels of Text Representation-The vector Space model-Single Document Visualization

UNIT IV INTERACTION TECHNIQUES

Screen Space- Object Space- Data Space- Attribute Space- Data Structure Space-Visualization Structure Space- Animating Transformations- Interaction Control-Designing Effective Visualizations- Steps in Designing Visualizations- Problems in Designing Effective Visualizations- Visualization Systems

UNIT V VISUALIZATION TECHNIQUES

User Tasks- User Characteristics- Data Characteristics- Visualization Characteristics-Structures for Evaluating Visualizations- Benchmarking Procedures- An Example of Visualization Benchmarking-Visualization Systems: Systems Based on Data Type-Systems Based on Analysis Type- Text Analysis and Visualization

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LIST OF EXPERIMENTS :

1. Perform Data Pre-processing for a given data set and implement the strategies for dealing with missed data
2. Design an experiment to identify which is better for visualizing a linear pattern in a large data set: a simple point plot, or a point plot where the points are circular, rectangular, colour, or vibrating.
3. In flow simulation, one often computes a number of different attributes at each time slice and location. Design at least three distinct ways you could map temperature, pressure, and velocity in a three-dimensional flow field. For each, discuss the accuracy/resolution at which the viewer could attain the data values
4. Plot a data set called Quakes (given in R project) and interpret the results of the visualization. Where are the two clear planes of seismic activity?
5. Implement a technique that will effectively display data sets with large numbers of dimensions/variables.
6. Implement a tag cloud for a document of your choice.
7. Select any one visualization tool and examine the types of interaction it supports. List the interaction operators and operands, as well as the parameters of the interaction that the user can control.
8. Implement a technique using which you will order the dimensions of a Census Data prior to visualization
9. Design a set of experiments for evaluating one characteristic of volume visualization techniques
10. Implement 2D flow visualization techniques

TEXT BOOK:

1. Matthew O. Ward, Georges Grinstein, Daniel Keim, Interactive Data Visualization: Foundations, Techniques, and Applications, Second Edition,CRC Press 2015

REFERENCE BOOKS:

1. Colin Ware, Morgan Kaufmann, Visual Thinking for Design,2008
2. Interactive Data Visualization for the Web by By Scott Murray O'Reilly Media, Inc, 2013,
3. The Visual Display of Quantitative Information (2nd Edition). E. Tufte. Graphics Press, 2001.
4. . E. Tufte , Envisioning Information. Graphics Press, 1990.

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CSE18R463	ANALYTICS TOOLS	L	T	P	Credit
		3	1	0	4
Pre-requisite : Nil	**Course Category :** Professional Elective **Course Type** : Theory				

COURSE OBJECTIVES :

To familiarize students with various tools used for data analytics by making them to install, configure and working with sample data sets.

COURSE OUTCOMES :

CO1: Examine the importance of hadoop framework and hadoop ecosystem
CO2: Learn and apply the Hadoop tools for analytical applications
CO3 :Explore the structured tools like Hive and create applications using Hive
CO4: Apply the R Tool for Statistical Analytics and Use it For Clustering and
Classification algorithms.
CO5: Familiar with the Spark framework and the spark shell programming

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	Pos												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S															
CO2		S			S								M	L		L
CO3		M	M	M										L		
CO4	S			S	S						M	M		L		L
CO5	S			S	S								M			

UNIT I APACHE HADOOP

Introduction-Architecture-Modules of Hadoop- Hadoop Installation-HDFS-YARN-Mapreduce

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UNIT II HBASE, PIG & SQOOP

Introduction-Data Model-Read-Write-MemStore-Installation-RDBMS vs HBase-Commands –Introduction-Usage of PIG- Installation-Data Types- User defined functions-Introduction- Installation-Import-Export-Integration

UNIT III APACHE HIVE

Introduction- Installation-Data types-DDL Commands-DML Commands-User defined Functions-Sort by and Order By Commands-Joins

UNIT IV   R TOOL

Introduction-Features-Environment setup-Command prompt-Data types-variables-Operators-decision making-loops-Functions-Strings-vectors-Arrays-Files.

UNIT V   APACHE SPARK

Introduction-Architecture-Components-Resilient Distributed Datasets-Iterative Operations- Installation-Spark Shell-Programming with RDD

REFERENCE BOOKS:

1. Tom White, "HADOOP: The definitive Guide" , O Reilly 2012.
2. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
3. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
4. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
5. Alan Gates, "Programming Pig", O'Reilley, 2011.
6. Holden Karau, Andy Konwinski, Patrick Wendell, Matei Zaharia, **"**Learning Spark Lightning-Fast Big Data Analysis "O'Reilley, 2015
7. Vignesh Prajapati, "Big Data Analytics with R and Hadoop", Packet Publishing 2013.

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CSE18R464	WEB ANALYTICS AND DEVELOPMENT	L	T	P	Credit
		3	0	1	3.5

Pre-requisite : Nil	Course Category : Professional Elective
	Course Type : Theory with Practical

COURSE OBJECTIVE

 The course explores use of social network analysis to understand growing connectivity and complexity in the world ranging from small groups

MAPPING OF COURSE OUTCOMES WITH PO, PSO

	Pos												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1													S			
CO2	S		M		M						M			M		
CO3			M				L					S			M	
CO4			L				S					S			S	
CO5				S				S	S		S					S

UNITI: INTRODUCTION

Social network and Web data and methods, Graph and Matrices, Basic measures for individuals and networks, Information Visualization

UNIT II: WEB ANALYTICS TOOLS:

Click Stream Analysis, A/B testing, Online Surveys

UNIT III: WEB SEARCH AND RETRIEVAL:

Search Engine Optimization, Web Crawling and indexing, Ranking Algorithms, Web traffic models

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UNIT IV : MAKING CONNECTION:

Link Analysis, Random Graphs and Network evolution, Social Connects: Affiliation and identity

UNIT V: CONNECTION

Connection Search, Collapse, Robustness Social involvements and diffusion of innovation

REFERENCES:

1. Hansen, Derek, Ben Sheiderman, Marc Smith.. Analyzing Social Media Networks with NodeXL: Insights from a Connected World. Morgan Kaufmann, 304,2011

2. Avinash Kaushik. Web Analytics 2.0: The Art of Online Accountability,2009.

3. Easley, D. & Kleinberg, J. Networks, Crowds, and Markets: Reasoning About a Highly Connected World. New York: Cambridge University Press, 2010

4.Wasserman, S. & Faust, K. (1994). Social network analysis: Methods and applications. New York: Cambridge University Press. Monge, P. R. & Contractor, N. S. Theories of communication networks. New York: Oxford University Press, 2003.

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<table>
<tr><td rowspan="2">CSE18R465</td><td rowspan="2">DATA STORAGE TECHNOLOGIES AND NETWORKS</td><td>L</td><td>T</td><td>P</td><td>Credit</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite : CSE18R371</td><td colspan="4">Course Category : Professional Elective
Course Type   : Theory</td></tr>
</table>

COURSE OBJECTIVE

to provide learners with a basic understanding of Enterprise Data Storage and Management Technologies

MAPPING OF COURSE OUTCOMES WITH PO, PSO

	POs												PSOs			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1													S			
CO2	S		M		M						M			M		
CO3			M				L					S			M	
CO4			L				S					S			S	
CO5				S				S	S		S					S

UNIT I STORAGE MEDIA AND TECHNOLOGIES

Magnetic, Optical and Semiconductor Media, Techniques for read/write Operations, Issues and Limitations.

UNIT II USAGE AND ACCESS

Positioning in the Memory Hierarchy, Hardware and Software Design for Access, Performance issues.

UNIT III LARGE STORAGES

Hard Disks, Networked Attached Storage, Scalability issues

UNIT IV STORAGE ARCHITECTURE

Storage Partitioning, Storage System Design, Caching, Legacy Systems.

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UNIT V STORAGE AREA NETWORKS

Hardware and Software Components, Storage Clusters/Grids. Storage QoS–Performance, Reliability, and Security issues. recent Trends related to Copy data management, Erasure coding, and Softwaredefined storage appliances.

REFERENCES:

1. The Complete Guide to Data Storage Technologies for Network-centric ComputingPaperback– Import, Mar 1998 by Computer Technology Research Corporation

2. Data Storage Networking: Real World Skills for the CompTIA Storage by Nigel Poulton

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LEVEL I

CSE18R302	FUNDAMENTALS OF NETWORKING	L	T	P	C
		3	0	0	3

COURSE OUTCOME:

CO1:   Understand the basic concepts of networking
CO2:   Understand the networking Hardware components
CO3:   Understand various types of transmission medias & topologies.
CO4:   Identify the networks type of medium and topological techniques to construct a network.
CO5:   Apply the applications of network in real time situations.

UNIT I INTRODUCTION

Introduction to Networks and Networking - Protocol and Standards - Categories of Networks - Uses and Benefits of Network - Transmission Media - Network Components.

UNIT II TYPES OF TOPOLOGIES

Simple Physical Topologies – Bus – Star - Ring and Mesh Topologies - Hybrid Physical Topologies – Enterprise - Wide Topologies - Wan Topologies - Logical Topologies - Reference Model- OSI and TCP/IP

UNIT III ERROR DETECTION TECHNIQUES

Error Detection and Correction - Connecting Devices in Data Link Layers - Switching techniques - Ethernet - CSMA/CD - Switched Ethernet - Gigabit Ethernet - Ethernet frame types - IEEE 802.3 -Token ring - FDDI

UNIT IV NETWORK PROTOCOLS

The Network Layer – Design Issues – Internal Organization of Network Layer - Logical Addressing - Internet Protocols - IPV4 and IPV6 - Address Mapping - Error Reporting and Multicasting – Delivery- Forwarding And Routing

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UNIT V NETWORK LAYERS

Process to Process Delivery: UDP- TCP - SCTP – Congestion Control and Quality of Service - Session Layer - Presentation Layer and Application Layer - DNS services - DHCP Services - Remote Logging - E-mail - File Transfer - www - http – Multimedia.

TEXT BOOKS

1. Forouzan b. A, " Data communications and Networking", 4th Edition, Tata Mcgraw-Hill Publications, 2006.
2. Tamara dean, "Network+ guide to networks", 7th Edition,2015

REFERENCES.

1. Tanenbaum A. S., "Computer Networks ", 4th Edition, Pearson Education,2007
2. James f. Kurose, "Computer Networking- a top-down approach featuring the internet" , 5th Edition, Person Education, 2015
3. Comer D," Computer Networks And Internet", 2nd Edition, Pearson Education,2001

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CSE18R303	OOPS USING C++	T	L	P	C
		3	1		3

COURSE OUTCOMES :

CO1: Understand the basic concepts of OOPS and syntax in C++

CO2: Create C++ programs using classes, constructors

CO3: Create C++ programs for function overloading, operator overloading

CO4: Identify the inheritance type for given problem and create programs using virtual function concepts

CO5: Analyze the need for generic programming and fault tolerant programming using templates and exception handling

UNIT I INTRODUCTION

Introduction to OOP – Basic Concepts of OOP – Applications of OOP- Introduction to C++ - Introduction to C++ - C++ Input and Output – Declarations in C++ - Namespaces - Function Prototypes – Inline Functions – Default Arguments – Unary Scope Resolution Operator

UNIT II CLASSES, CONSTRUCTORS AND FRIEND CLASS

Introduction – Comparing class with Structure – Class Scope – Accessing Members of a class – Constructor – Destructor – Passing and Returning Objects From Functions- Friend Class – Friend function

UNIT III OVERLOADING & INHERITANCE

Operator Overloading – Fundamentals – Restrictions – Overloading stream – Insertion and Stream Extraction Operators – Overloading Unary & Binary Operators – Inheritance – Introduction – Types - Protected Members –Public - Protocols and Private Inheritance – Direct Base Classes and Indirect Base Classes

UNIT IV VIRTUAL FUNCTIONS, STREAMS AND FILES

Introduction –Virtual Functions –Polymorphism – C++ Stream I/O: Streams – Stream Input – Stream Output – Unformatted I/O – Stream Manipulators – Stream Format States – Stream Error – States. Files: File Operations, File Pointers, Error Handling during File Operations.

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UNIT V TEMPLATES & EXCEPTION HANDLING

Templates – Function Templates – Class Templates –Exception Handling - When Exception Handling, Basic of C++ Exception, Catching an Exception, Re throwing an Exception, Exception Specifications.

TEXT BOOK

1. E.Balagurusamy, "Object-Oriented Programming Using C++ ", Mcgraw Hill Education, 6th Edition, 2013.

REFERENCE BOOKS

1. D.S.Malik, "C++ Programming Language", CENGAGE Learning, 2009.
2. Bjarne Struoustrup, "The C++ Programming Language ", Addison Wesley, 2000.
3. John R.Hubbard, "Programming with C++", Schaums Outline Series, TMH 2003.
4. Deitel H.M., and Deitel P.J., "How to program C++", PHI 2003.

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CSE18R304	OOPS USING JAVA	T	L	P	C
		3	1	0	3

COURSE OUTCOMES :

CO1: Understand the basic concepts of Object Oriented paradigm

CO2:   Apply the programming concepts of JAVA to problem solutions.

CO3:   Design error free code to real world problems.

CO4:   Develop re-useable code for application development.

CO5:   Implement user friendly applications.

UNIT I: OBJECT ORIENTED BASICS

Need for Oop Paradigm - A Way of Viewing World – Agents, Responsibility- Messages, Methods - Classes and Instances- Class Hierarchies (Inheritance) - Method Binding, Overriding and Exceptions- Summary of Oop Concepts, Coping With Complexity - Abstraction Mechanisms.

UNIT II: JAVA BASICS

History of Java- Java Buzzwords - Data Types – Variables - Scope and Life Time Of Variables - Arrays - Operators- Expressions - Control Statements - Type Conversion and Casting - Simple Java Program - Concepts of Classes – Objects – Constructors – Methods - Access Control- This Keyword - Garbage Collection - Overloading Methods and Constructors - Parameter Passing- Recursion - Nested and Inner Classes- Exploring String Class.

UNIT III: INHERITANCE,PACKAGES AND INTERFACE

Forms of Inheritance- Class Hierarchy- Benefits of Inheritance - Member Access Rules - Super Uses - Using Final With Inheritance - Polymorphism- Method Overriding - Abstract Classes - Defining - Creating And Accessing A Package - Understanding CLASSPATH - Importing Packages - Interfaces

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UNIT IV: EXCEPTION HANDLING

Concepts of Exception Handling - Benefits of Exception Handling - Exception Hierarchy - Usage of Try - Catch - Throw - Throws and Finally - Built In Exceptions - Creating Own Exception Sub Classes

UNIT V:APPLETS

Applets: Fundamentals - Differences Between Applets and Applications- Type Of Applet - Applet Architecture - Creating Applets - Passing Parameters to Applet – Frames: Working with Frame Windows - Creating Frame Windows In an Applet – AWT Components: Lable - Buttons - Checkbox - Checkbox Group - List - Text Field – Layout Management: Menubars & Menu

TEXT BOOKS:

1. Forouzan b. A, " Data Communications and Networking", 4th Edition, Tata Mcgraw-Hill Publications, 2006.
2. Tamara dean, "Network+ Guide to Networks", 6th Edition, 2004

REFERENCES.

1. Tanenbaum A. S., "Computer Networks", 4th Edition, Pearson Education,2008
2. James F. Kurose, "Computer Networking- A Top-Down Approach Featuring The Internet" , 2nd Edition, Person Education,
3. Comer D., "Computer Networks And Internet", 2nd   Edition, Pearson Education", 7th Editon, TMH,.
4. T. Budd, "Understanding OOP With Java", Updated Edition,, Pearson Education.

REFERENCE BOOKS:

1. J.Nino and F.A. Hosch, "An Introduction To Programming And OO Design Using Java", John Wiley & Sons,2008
2. T. Budd , "An Introduction To OOP", Third Edition, Pearson Education,2002
3. Y. Daniel Liang, "Introduction To Java Programming", Pearson Education,2008
4. R.A. Johnson, "An Introduction To Java Programming and Object Oriented Application Development" ,Thomson, 2007

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CSE18R305	INTRODUCTION TO DATA ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OUTCOMES : :

CO1: Understand the need for business analytics and phases of data analytics

CO2: Apply appropriate modulating and analytical methods to analyze data

CO3: Create statistical models and represent the predicted results

CO4: Implement machine learning algorithms to process data

CO5: Analyze and visualize the results of necessary datasets using 'R' tool

UNIT – I DATA ANALYTICS LIFE CYCLE

Introduction to Big Data Business Analytics - State of The Practice In Analytics Role of Data Scientists - Key Roles for Successful Analytic Project - Main Phases of Life Cycle - Developing Core Deliverables For Stakeholders.

UNIT II – MODELING METHODS

Choosing and Evaluating Models – Mapping Problems to Machine Learning - Evaluating Clustering Models - Validating Models – Cluster Analysis – K-Means Algorithm - Naïve Bayes – Memorization Methods – Linear and Logistic Regression – Unsupervised Methods.

UNIT III – STATISTICS AND REGRESSION

Sampling Techniques - Data Classification - Tabulation - Frequency And Graphic Reporesentation - Measures of Central Value - Arithmetic Mean - Geometric Mean - Harmonic Mean - Mode - Median - Quartiles - Deciles - Percentile - Measures of Variation – Range - IQR - Quartile Deviation - Mean Deviation - Standard Deviation - Coefficient Variance - Skewness - Moments & Kurtosis - Descriptive Statistics - Inferential Statistics - Regression & ANOVA

UNIT IV – MACHINE LEARNING TECHNIQUES

Introduction and Concepts - Supervised Learning with Regression and Classification Techniques - Supervised Learning with Regression and Classification Techniques - Unsupervised Learning and Challenges for Big Data Analytics.

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UNIT V - INTRODUCTION TO R

Reading and Getting Data Into R – Ordered and Unordered Factors – Arrays and Matrices – Lists and Data Frames – Reading Data From Files – Probability Distributions – Statistical Models In R - Manipulating Objects – Data Distribution.

REFERENCE BOOKS:

1. Nina Zumel, John Mount, "Practical Data Science With R", Manning Publications, 2014.
2. Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman, "Mining Of Massive Datasets", Cambridge University Press, 2014.
3. Mark Gardener, "Beginning R - The Statistical Programming Language", John Wiley & Sons, Inc., 2012.
4. W. N. Venables, D. M. Smith And The R Core Team, " An Introduction To R", 2013.
5. Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta, "Practical Data Science Cookbook", Packt Publishing Ltd., 2014.
6. Chris Eaton, Dirk Deroos, Tom Deutsch Et Al., "Understanding Big Data", Mcgrawhill, 2012.
7. Alberto Cordoba, "Understanding The Predictive Analytics Lifecycle", Wiley, 2014.
8. Eric Siegel, Thomas H. Davenport, "Predictive Analytics: The Power To Predict Who Will Click, Buy, Lie, Or Die", Wiley, 2013.
9. James R Evans, "Business Analytics – Methods, Models And Decisions", Pearson 2013.
10. R. N. Prasad, Seema Acharya, "Fundamentals Of Business Analytics", Wiley, 2015.
11. S M Ross, "Introduction To Probability And Statistics For Engineers And Scientists", Academic Foundation, 2011.

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CSE18R306	INTRODUCTION TO SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OUTCOMES :

CO1: Identify and build an appropriate process model for a given project

CO2: Analyze the principles at various phases of software development

CO3: Translate specifications into design, and identify the components to build the architecture for a given problem.

CO4: Define a appropriate Testing Plans at different levels during the development of the software

CO5: Understand the software project estimation models and estimate the work to be done, resources required and the schedule for a software project

UNIT I INTRODUCTION

Software and Software Engineering - Project Management Concepts - Software Engineering Paradigms – Generic Process Models, - Water Fall Life Cycle Model - Prototype Model - RAD Model - Spiral Model - Incremental Model

UNIT II SOFTWARE PROJECTS

Process and Project Domains – Feasibility Study- Understanding Requirements- Estimation , Scheduling – Risk Management – Review Techniques - Software Quality Assurance

UNIT III DESIGN CONCEPTS

Design Process - Design Principles - Design Concepts - Software Architecture – Architectural Style- User Interface Design

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UNIT IV SOFTWARE TESTING

Testing Fundamentals and Strategies - White-box and Black box Testing - Testing for Special Environments - Unit Testing, - Integration Testing - Validation Testing - System Testing – Debugging - Software Maintenance

UNIT V CASE TOOLS

Computer Aided Software Engineering - Clean Room Software Engineering – Reengineering - Reverse Engineering

EXTBOOK

1. Ian Somerville, Software Engineering,, Addison-Wesley, 8th edition, 2006.

REFERENCE BOOKS

1. Roger S. Pressman," Software Engineering: A Practitioner's Approach", Mc-Graw Hill, Seventh Edition, 2010.
2. Steve McConnell, "Code Complete", Second Edition, Microsoft Press,2006
3. Richard E. Fairley, "Software Engineering Concepts", McGraw- Hill, 1985.

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		L	P	T	C
CSE18R307	**FUNDAMENTALS OPERATING SYSTEMS**	3	0	0	3

COURSE OUTCOMES :

CO1: Understand the Structure and functions of Operating Systems
CO2: Understand the principles of scheduling and design various scheduling
    algorithms

CO3: Analyze the various memory management schemes.
CO4: Apply the principles of Disk scheduling and file systems
CO5: Understand the administrative tasks of Linux servers

UNIT I OPERATING SYSTEMS OVERVIEW

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 PROCESS MANAGEMENT

Processes - Process Concept - Process Scheduling - Operations on Processes - Interprocess Communication; Threads- Overview - Multicore Programming - Multithreading Models; Windows 7 - Thread And SMP Management. Process Synchronization - Critical Section Problem - Mutex Locks - Semophores - Monitors; CPU Scheduling And Deadlocks.

UNIT III STORAGE MANAGEMENT

Main Memory-Contiguous Memory Allocation - Segmentation - Paging - 32 and 64 Bit Architecture Examples; Virtual Memory- Demand Paging - Page Replacement - Allocation - Thrashing; Allocating Kernel Memory - OS Examples.

UNIT IV I/O SYSTEMS

Mass Storage Structure- Overview - Disk Scheduling and Management; File System Storage-File Concepts - Directory and Disk Structure - Sharing and Protection; File System Implementation- File System Structure - Directory Structure - Allocation Methods - Free Space Management - I/O Systems.

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UNIT V CASE STUDY

Linux System- Basic Concepts; System Administration-Requirements for Linux System Administrator - Setting up a LINUX Multifunction Server - Domain Name System - Setting up Local Network Services; Virtualization- Basic Concepts - Setting up Xen - Vmware on Linux Host and Adding Guest OS.

TEXT BOOK:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9 th Edition, John Wiley and Sons Inc., 2012.

REFERENCES:

1. William Stallings, "Operating Systems – Internals and Design Principles", 7 th Edition, Prentice Hall, 2011.
2. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Addison Wesley, 2001.
3. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education", 1996.
4. D M Dhamdhere, "Operating Systems: A Concept-Based Approach", Second Edition, Tata McGraw-Hill Education, 2007.

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CSE18R308	ETHICAL HACKING	L	T	P	C
		3	1	0	4

COURSE OUTCOMES : :

CO1: Understand the need of Ethical Hacking

CO2: Demonstrate the social engineering attacks

CO3: Implement the various attacks and vulnerabilities

CO4: Design the tools and techniques to prevent hacking

CO5: Analyze the various malwares

UNIT I INTRODUCTION

Ethics Of Ethical Hacking: Why you need to Understand Your Enemy's Tactics?, Recognizing The Gray Areas in Security – Vulnerability Assessment – Penetration Testing. Ethical Hacking and the Legal System: Understanding Individual Cyberlaws – 18 USC Section 1029, 1030, 2510 – Digital Millennium Copyright Act (DMCA) – Cyber Security Enhancement Act 2002. Proper and Ethical Disclosure: CERT's Current Process – Full Disclosure Policy – Organization for Internet Safety

UNIT II SOCIAL ENGINEERING ATTACKS

Social Engineering Attacks: How A Social Engineering Attack Works? – Conducting A Social Engineering Attack – Common Attacks used in Penetration Testing – Defending Against Social Engineering Attacks. Physical Penetration Attacks: Why A Physical Penetration is important – Conducting a Physical Penetration – Common Ways into A Building. Insider Attacks: Why Simulating an Insider Attack is Important – Conducting an Insider Attack – Defending against Insider Attack.

UNIT III CONTENT-TYPE ATTACKS

Understanding and Detecting Content-Type Attacks: How do Content-Type Attacks work? - Which File Formats are Being Exploited Today? - Tools to Detect Malicious PDF Files – Tools to test your Protections against Content-Type Attacks – How to protect your Environment from Content-Type Attacks. Web Application Security Vulnerabilities: Overview of Top Web Application Security Vulnerabilities – SQL Injection Vulnerabilities – Cross-Site Scripting Vulnerabilities. VoIP Attacks .

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UNIT IV PASSIVE ANALYSIS

Passive Analysis: Ethical Reverse Engineering – Why Bother with Reverse Engineering? – Source Code Analysis. Advanced Reverse Engineering: Overview of Software Development Process – Instrumentation Tools – Fuzzing – Instrumented Fuzzying Tools and Techniques. Finding New Browser Based Vulnerabilities. Mitigation Alternatives

UNIT V MALWARE ANALYSIS

Collecting Malware and Initial Analysis: Malware – Latest Trends in Honeynet Technology – Catching Malware – Initial Analysis of Malware. Hacking Malware: Trends in Malware – De-Obfuscating Malware – Reverse Engineering Malware.

TEXT BOOKS:

1. Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, Terron Williams, "Gray Hat Hacking The Ethical Hackers Handbook", 3rd Edition, 2011.

REFERENCES:

- Sharma Pankaj, "Hacking", APH Publishing, 2005.
- Rajat Khare, "Network Security and Ethical Hacking", Luniver Press, 2006.

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CSE18R309	INTRODUCTION TO PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OUTCOMES :

CO1: Develop basic programs using fundamental structures.

CO2: Create programs using various collection data types.

CO3:   Apply appropriate Python control flow structure.

CO4: Implement user defined python functions.

CO5: Understand the objected oriented concepts of Python.

UNIT I INTRODUCTION

Python Object Types – Numeric Type Basics – Numeric Literals –Built In Numeric Tools – Python Expression Operators – Numbers In Action – Other Numeric Types – String Literals – Strings in Action – String Methods – String Formatting Expressions – String Formatting Method Calls – General Type Categories

UNIT II LISTS AND DICTIONARIES

Lists in Action – Basic List Operations – List Iteration and Comprehensions – Indexing, Slicing and Matrixes – Changing List in Place – Dictionaries – Dictionaries in Action – Basic Dictionary Operations – Changing Dictionaries in Place – Dictionary Methods – A Language Table – Dictionary Usage Notes – Other Ways to Make Dictionary – Tuples – Files – Python Type Hierarchies

UNIT III STATEMENT AND SYNTAX

Introducing Python Statements- A Tale of Two Ifs – Assignment Statements – Expression Statements – Print Operations – If Statements – Python Syntax Rules – While Loops – For Loops – Loop Coding Techniques – Iterators – List Comprehension

UNIT IV FUNCTIONS

Coding Functions- Scope Basics – Scope Rules – Global Statement – Scopes and Nested Functions – Nonlocal Statement – Argument Passing Basics – Special Argument Matching Modes – Function Design Concepts- Recursive Functions – Function Objects – Anonymous Functions – Mapping Functions

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UNIT V CLASSES AND OOP

Class Coding Basics – Class Statement – Methods – Inheritance – Attribute Tree Construction – Specializing Inherited Methods – Class Interface Techniques – Abstract Super Classes - Namespaces –Simple Names – Attribute Names – Namespace Dictionaries – Operator Overloading – Designing With Classes

TEXT BOOK

1. Mark Lutz , "Learning Python" , Fifth Edition, O,Reilly, 2013

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		L	T	P	C
CSE18R310	**PC HARDWARE AND TROUBLE SHOOTING**	3	0	0	3

COURSE OUTCOMES :

CO1: Understand the basic organization of Computers

CO2: Understand the working mechanisms of peripheral devices

CO3: Understand the PF hardware overview

CO4: Apply system configuration setting for PC assembling and integration

CO5:Analyze computer troubles and apply troubleshooting techniques

UNIT I INTRODUCTION

Introduction – Computer Organization – Number Systems and Codes – ALU – CU – Instruction Fetch – Interrupts – I/O Techniques – Device Controllers – Error Detection Techniques – Microprocessor – Personal Computer Concepts – Advanced System Concepts – Microcomputer Concepts – OS – Multitasking and Multiprogramming – Virtual Memory – Cache Memory – Modern   PC

UNIT II PERIPHERAL DEVICES
Introduction – Keyboard – CRT Display Monitor – Printer – Magnetic Storage Devices –FDD – HDD – Special Types of Disk Drives – Mouse and Trackball – Modem – Fax-Modem – CD ROM   Drive   –   Scanner   –   Digital   Camera   –   DVD   –   Special   Peripherals.

UNITIII PC HARDWARE OVERVIEW

Introduction – Hardware BIOS DOS Interaction – The PC family – PC hardware – Inside the System Box – Motherboard Logic – Memory Space – Peripheral Interfaces - and Controllers – Keyboard   Interface   –   CRT   Display   interface   –   FDC   –   HDC.

UNIT IV INSTALLATION AND PREVENTIVE MAINTENANCE

Introduction – System Configuration – Pre Installation Planning – Installation Practice – Routine Checks – PC Assembling and Integration – BIOS Setup – Engineering Versions and Compatibility – Preventive   Maintenance – DOS – Virus – Data   Recovery.

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UNIT V TROUBLESHOOTING

Introduction – Computer Faults – Nature of Faults – Types of Faults – Diagnostic Programs And Tools – Microprocessor and Firmware – Programmable LSI's – Bus Faults – Faults Elimination Process – Systematic Troubleshooting – Symptoms Observation – Fault Diagnosis – Fault Rectification – Troubleshooting Levels –

FDD,HDD,CD ROM problems.

TEXT BOOK

1. B. Govindarajalu, "IBM PC Clones Hardware, Troubleshooting and
Maintenance", 2rd Edition, TMH, 2002. [

REFERENCES:

1. Peter Abel, Niyaz Nizamuddin, "IMB PC Assembly Language and Programming",Pearson Education, 2007
2. Scott Mueller, "Repairing PC's", PHI, 1992

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CSE18R311	DATA AND WORD PROCESSING	L	T	P	C
		3	0	0	3

COURSE OUTCOMES : :

CO1: Develop documents using word software by applying all document functions and
    Styles
CO2: Create reports with charts using spreadsheets software
CO3: Create and maintain a simple database
CO4: Create presentations with esthetic sense
CO5: Understand basic mechanisms for using internet and world wide web

UNIT I INTRODUCTION TO MS OFFICE

Introduction To MS Office - MS Word And Open Office – Writer: MS Word - Working With Documents -Opening & Saving Files, Editing Text Documents, To Different Formats, Importing & Exporting Documents, Sending Files To Others, Formatting Documents - Setting Font Styles, Font Selection- Style, Size, Colour Etc, Setting Page Style -, Web Page. Creating Tables- Table Settings, Borders, Alignments, Insertion, Deletion, Merging, Splitting, Sorting, And Formula, Drawing - Inserting Cliparts, Pictures/Files Etc., Tools – Word Completion, Spell Checks, Mail Merge, Templates, Using Wizards, Tracking Changes, Security, Digital Signature**.** Printing Documents – Shortcut Keys.

UNIT II INTRODUCTION TO MS EXCEL

Introduction To MS Office – MS Excel and Open Office – Calc: MS Excel: Spread Sheet & Its Applications, Opening Spreadsheet, Menus - Main Menu, Formula Editing, Formatting, Toolbars, using Icons. Entering & Deleting Data-, Filling Continuous Rows, Columns, Highlighting Values, Find, Search & Replace, Inserting Data, Insert Cells, Column, Rows & Sheets, Symbols, Data From External Files, Frames, Clipart, Pictures, Files etc, Inserting Functions, Working With Sheets – Sorting, Filtering, Validation, Consolidation, and Subtotal. Creating Charts - Drawing. Printing. Using Tools – Error Checking, Spell Checks, Formula Auditing, Creating & Using Templates, Pivot Tables, Tracking Changes, Security, Customization.

UNIT III INTRODUCTION TO MS ACCESS

Introduction to MS Office-MS Access and Open Office-Base: MS Access: Introduction, Planning a Database, Starting Access, Access Screen, Creating a New Database, Creating Tables, Working

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with Forms, Creating Queries, Finding Information in Databases, Creating Reports, Types of Reports, Printing & Print Preview – Importing Data From other Databases Viz. MS Excel Etc.

UNIT IV INTRODUCTION TO MS POWER POINT

Introduction to MS Office-MS Power Point and Open Office-Impress: MS Power Point: Introduction to Presentation – Opening New Presentation, Different Presentation Templates, Setting Backgrounds, Selecting Presentation Layouts. Creating a Presentation - Setting Presentation Style, Adding Text to The Presentation. Formatting a Presentation - Adding Style, Colour, Gradient Fills, Arranging Objects, Adding Header & Footer, Slide Background, Slide Layout. Adding Graphics to The Presentation- Inserting Pictures, Movies, Tables etc Into Presentation, Drawing Pictures Using Draw. Adding Effects to The Presentation- Setting Animation & Transition Effect. Printing Handouts, Generating Standalone Presentation Viewer.

UNIT V INTERNET AND WEB BROWSERS

 Internet and Web Browsers: Definition & History of Internet - Uses of Internet - Definition of Web Addressing-URL-Different Types of Internet Connections; Dial Up Connection, Broad Band (ISDN, DSL, Cable), Wireless (Wi-Fi, Wimax, Satellite, Mobile) Naming Convention, Browsers and Its Types, Internet Browsing, Searching - Search Engines - Portals - Social Networking Sites- Blogs - Viewing a Webpage, Downloading and Uploading the Website; Creating an Email-ID, E-Mail Reading, Saving, Printing, Forwarding and Deleting The Mails, Checking the Mails, Viewing and Running File Attachments, Addressing With Cc and Bcc.

TEXT BOOKS

1. Jan Marrelli ,"A Guide to Microsoft Office 2013," 1st Edition, EMC / Paradigm publications, 2013

   2. David Beskeen," Microsoft Office 2013 Illustrated Introductory", Cengage Learning,
   1st Edition , **2013**

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		L	T	P	C
CSE18R312	**FUNDAMENTALS TO COMPUTER ARCHITECTURE**	3	0	0	3

COURSE OUTCOME

CO1 : Understand the functional units of a computers, bus structures and addressing modes

CO2 : Understand the knowledge of algorithms to solve arithmetic problems.

CO3 : Understand about single bus, multiple bus organization and pipelining concepts

CO4 : Analyze RAM, ROM, Cache memory and virtual memory concepts

CO5 : Understand the various I/O Interface

UNIT I BASIC STRUCTURE OF COMPUTERS

Describe about Computer and It's Requirement, Functional Units - Basic Operational Concepts - Bus Structures - Software Performance – Memory Locations And Addresses – Memory Operations – Instruction and Instruction Sequencing – Addressing Modes – Assembly Language .

UNIT II ARITHMETIC UNIT

Addition and Subtraction of Signed Numbers – Design of Fast Adders – Multiplication of Positive Numbers - Signed operand Multiplication and Fast Multiplication – Integer Division – Floating Point Numbers and Operations.

UNIT III BASIC PROCESSING UNI T

Fundamental Concepts – Execution of a Complete Instruction – Multiple Bus Organization – Hardwired Control – Micro Programmed Control - Pipelining – Basic Concepts – Data Hazards – Instruction Hazards.

UNIT IV MEMORY SYSTEM

Basic Concepts – Semiconductor RAMS - ROMs – Speed - Size and Cost – Cache Memories -Performance Consideration – Virtual Memory - Memory Management Requirements – Secondary Storage.

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UNIT V I/O ORGANISATION

Accessing I∕O devices – Interrupts – Direct Memory Access – Buses – Interface Circuits – Standard I/O Interfaces (PCI, SCSI, USB).

TEXT BOOK

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky,‖ Computer Organization‖,McGraw-Hill, 5th Edition, 2008

REFERENCE BOOKS

1. William Stallings, ―Computer Organization and Architecture – Designing forPerformance‖,Pearson Education, 8th Edition, 2009.

2. David A.Patterson and John L.Hennessy,‖ Computer Organization and Design: The hardware software interface‖, Morgan Kaufmann, 3rd Edition, , 2007.

3. John P.Hayes, ―Computer Architecture and Organization‖, McGraw Hill, 3^{rd}Edition, 1998.

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CSE18R313	BIO INSPIRED ALGORITHM	L	T	P	C
		3	0	0	3

COURSE OUTCOMES :

CO1:Explain how biological systems exploit natural processes.

CO2:Visualize how complex and functional high-level phenomena can emerge from low-level interactions.

CO3:Compare and select the most appropriate method from: neural, deep learning, fuzzy, evolutionary or hybrid method for any application / data set.

CO4:Design and implement simple bio-inspired algorithms.

CO5:Conduct experiments to investigate empirically bio-inspired systems.

UNIT I – INTRODUCTION

From Nature to Nature Computing - Philosophy- Three Branches - A Brief Overview - Conceptualization: Natural Phenomena, Models and Metaphores- General Concepts-Individuals, Entities and agents - Parallelism and Distributivity- Interactivity- Adaptation-Feedback-Self-Organization-Complexity, Emergence and Reductionism- Bottom-up Vs Top-Down- Determination, Chaos and Fractals.

UNIT II - COMPUTING INSPIRED BY NATURE

Evolutionary Computing : Problem solving - Hill Climbing and Simulated Annealing-Evolutionary Biology- Darwin's Dangerous Idea- Genetics Principles- Classical Example-Standard Evolutionary Algorithm - Genetic Algorithms- Reproduction-Crossover -Mutation-Applications - Evolution Strategies- Evolutionary Programming- Genetic Programming

UNIT III - SWARM INTELLIGENCE

Introduction - Ant Colonies- Ant Foraging Behaviour - Ant Colony Optimization- SACO and scope of ACO algorithms- Clustering Dead bodies and Larval Sorting-Ant Colony Algorithm (ACA) - Swarm Robotics- Foraging for food - Clustering of objects - Collective Prey retrieval-Scope of Swarm Robotics- Social Adaptation of Knowledge- Particle Swarm- Particle Swarm Optimization (PSO)

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UNIT IV - IMMUNOCOMPUTING

Introduction- Immune System- Physiology and Main Components – Pattern Recognition And Binding- Adaptive Immune Respomse- Self/Nonself Discrimination - Immune Network Theory- Danger Theory- Artificial Immune Systems- Representation- Evaluation Interaction- Immune Algorithms- Bone Marrow Models- Negative Selection Algorithms- Binary and Real Valued Negative Selection Algorithms- Clonal Selection and Affinity Maturation- Forest's Algorithm- CLONALG - Artificial Immune Networks- Continuous and Discrete Immune Networks.

UNIT V - COMPUTING WITH NEW NATURAL MATERIALS

DNA Computing: Motivation- DNA Molecule- Manipulating DNA - Filtering Models- Adleman's Experiment- Lipton's Solution To SAT Problem- Test Tube Programming Language- Formal Models- Sticker Systems- Splicing Systems- Insertion/Deletion Systems - PAM Model- Universal DNA Computers- Scope Of DNA Computing- From Classical To DNA Computing - Quantum Computing: Motivation- Basic Concepts From Quatum Theory – From Classical To Quantum Mechanics- Wave- Particle Duality- Uncertainty Principle- Principles From Quantum Mechanics: DIRAC Notation- Quantum Superposition- Tensor Products- Entanglement- Evolution-Measurement- No-Cloning Theorem- Quatum Information: Bits And Qubits - Multiple Bits And Qubits- Gates – Quantum Circuits- Quatum Parallelism- Quantum Algorithms

TEXT BOOK:

1. Leandro Nunes de Castro, "Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007

REFERENCE BOOKS:

1. Floreano D. and Mattiussi C., "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", MIT Press, Cambridge, MA, 2008.
2. Albert Y.Zomaya, "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006.

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CSE18R401	**BIOPYTHON**	L	T	P	C
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PREREQUISITE: CSE18R309

COURSE OUTCOMES :.

CO1:Understand the programming concepts in Python

CO2:Implement sequence algorithms.

CO3:Analyze large data sets using arrays and files.

CO4:Develope database applications using SQL.

UNIT I INTRODUCTION TO PYTHON

Programming Principles – Basic Data Types – Program Flow – Simple Data Types – Collection Data Types – Importing Modules – Controlling Command Execution - Conditional Execution - Loops - Error Exceptions - Function Basics - Input Arguments - Variable Scope - Files - Computer Files - Reading Files - File Reading Examples - Writing Files

UNIT II OBJECT ORIENTED PYTHON

 Creating Classes - Data Models - Implementing A Data Model - Refined Implementation - Using Python For Mathematics - Linear Algebra - Numpy Package - Linear Algebra Examples

UNIT III SEQUENCE ALGORITHMS

Biological Sequences: Bio-Molecules For Non-Biologists - Using Biological Sequences In Computing - Simple Sub-Sequence Properties - Obtaining Sequences With Biopython - Pair wise Sequence Alignments: Sequence Alignment - Calculating An Alignment Score - Optimising Pair wise Alignment - Quick Database Searches - Multiple-Sequence Alignments: Multiple Alignments - Alignment Consensus And Profiles - Generating Simple Multiple Alignments In Python - Interfacing Multiple-Alignment Programs -

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Sequence Variation And Evolution: A Basic Introduction To Sequence Variation - Similarity Measures - Phylogenetic Trees.

UNIT IV WORKING WITH ARRAY DATA

Multiplexed Experiments - Reading Array Data - The 'Microarray' Class - Array Analysis - High-Throughput Sequence Analyses: High-Throughput Sequencing - Mapping Sequences To A Genome - Using The Htseq Library

UNIT V WORKING WITH IMAGES AND DATABASES

Images: Biological Images - Basic Image Operations - Adjustments And Filters - Feature Detection - Databases: A Brief Introduction To Relational Databases - Basic SQL - Designing A Molecular Structure Database – Probability: The Basics Of Probability Theory - Restriction Enzyme Example - Random Variables - Markov Chains – Statistics: Statistical Analyses - Simple Statistical Parameters - Statistical Tests - Correlation And Covariance -Clustering And Discrimination: Separating And Grouping Data - Clustering Methods - Data Discrimination.

TEXT BOOK:

1. Stevens T. J., Boucher W,"Python Programming for Biology: Bioinformatics and Beyond", Cambridge University Press,2015

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CSE18R402	INTERNET SECURITY AND COMPUTER FORENSICS	L	T	P	C
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PREREQUISITE: CSE18R302 / Fundamentals of Networking

COURSE OUTCOMES :

CO1: Understand the Computer Forensics and incident response.

CO2: Realize the Computer Investigation and collection of Evidence for Forensics

CO3: Analyze and validate the computer forensics data and Tools

CO4: Identify the various email Security and Firewalls

CO5: Understand the Indian Laws and Acts and to apply for the computer forensics

UNIT - I INTRODUCTION TO COMPUTER FORENSICS

Computer Forensics- Understanding Computer Forensics, Introduction To Traditional Computer Crime, Traditional Problems Associated With Computer Crime, Identity Theft & Identity Fraud. Types Of CF Techniques – Incident And Incident Response Methodology – Forensic Duplication And Investigation. Preparation For IR: Creating Response Tool Kit And IR Team. – Forensics Technology And Systems.

UNIT -II INVESTIGATION

Understanding Computer Investigation, Introduction To Investigation Tools, Ediscovery, Evidence Collection, Evidence Preservation - Preparing For Computer Investigations-Systematic Approach-Procedures For Investigations-Conducting An Investigation-Physical Requirement, Data Acquisition.

UNIT-III ANALYSIS AND VALIDATION

Computer Forensics Analysis And Validation- Determining What Data To Collect And Analyze- Validating Forensic Data- Addressing Data-Hiding Techniques- Performing Remote Acquisitions- Computer Forensic Tools- Forensic Software Tools- Hardware Tools- Validating And Testing Forensics Software- Recovering Files.

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UNIT - IV E-MAIL SECURITY & FIREWALLS

E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands On Case Studies. Encryption and Decryption Methods, Search and Seizure Of Computers, Recovering Deleted Evidences, Password Cracking, Internet Firewalls For Trusted System: Roles of Firewalls – Firewall Related Terminology- Types of Firewalls – Firewall Designs – SET For E-Commerce Transactions.

UNIT -V LAWS AND ACTS

Laws and Ethics, Evidence Controls, Evidence Handling Procedures, Basics of Indian Evidence ACT IPC and Crpc , Electronic Communication Privacy ACT, Legal Policies.

TEXT BOOKS:

1. Amelia Philips and Christopher Steuart, Bill Nelson, "Guide to Computer Forensics and Investigations", Fourth Edition, Cengage learning.2007
2. Nelson Phillips and Enfinger Steuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.
3. Kevin Mandia, Chris Prosise, Matt Pepe, "Incident Response and Computer Forensics ", Tata McGraw -Hill, New Delhi, 2006

REFERENCE BOOKS:

1. Robert M Slade," Software Forensics", Tata McGraw - Hill, New Delhi, 2005.

2. Bernadette H Schell, Clemens Martin, "Cybercrime", ABC – CLIO Inc, California, 2004.

3. "Understanding Forensics in IT ", NIIT Ltd, 2005.

4. John R.Vacca, "Computer Forensics", Cengage Learning, 2005.

5. Marjie T.Britz, "Computer Forensics and Cyber Crime": An Introduction", 3rd Edition, Prentice Hall, 2013.

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CSE18R403	INTRODUCTION TO CLOUD COMPUTING	L	T	P	C
		3	0	0	3

PREREQUISITE: CSE18R302 / Fundamentals of Networking

COURSE OUTCOMES :

CO1: Understand the layers and types of Cloud Computing

CO2: Understand the IaaS, PaaS and SaaS

CO3: Analyze various scheduling techniques for virtual machines in cloud

infrastructure

CO4: Implement private/public/hybrid Cloud infrastructure

CO5: Implement policy management system for Cloud Computing

CO6: Design of data security techniques in the Cloud Computing

UNIT I   FOUNDATIONS

Introduction to Cloud Computing - Definition - Characteristics - Components - Cloud Provider - SAAS - PAAS - IAAS And Others - Organizational Scenarios of Clouds - Administering & Monitoring Cloud Services - Benefits and Limitations - Deploy Application Over Cloud - Comparison among SAAS - PAAS - IAAS Cloud Computing Platforms: Infrastructure As Service: Amazon EC2 - Platform As Service: Google App Engine - Microsoft Azure - Utility Computing - Elastic Computing

UNIT II   INFRASTRUCTURE AS A SERVICE (IaaS)

Introduction to Cloud Technologies - Study of Hypervisors - Compare SOAP and REST Webservices - AJAX and Mashups-Web Services: SOAP and REST - SOAP Versus - REST - AJAX: Asynchronous 'Rich' Interfaces - Mashups: User Interface Services Virtualization Technology: Virtual Machine Technology - Virtualization Applications in Enterprises - Pitfalls of Virtualization   Multitenant Software: Multi-Entity Support -

Multi-Schema Approach - Multi-Tenance Using Cloud Data Stores - Data Access Control for Enterprise Applications

UNIT III   PLATFORM AND SOFTWARE AS A SERVICE

Data in the Cloud: Relational Databases - Cloud File Systems: GFS And HDFS - Bigtable - Hbase and Dynamo. Map-Reduce And Extensions: Parallel Computing - The Map-Reduce Model - Parallel Efficiency of Map-Reduce - Relational Operations Using Map-Reduce - Enterprise Batch Processing Using Map-Reduce - Introduction to Cloud Development - Example/Application of Mapreduce - Features and Comparisons among GFS - HDFS Etc - Map-Reduce Model

UNIT IV   MONITORING AND MANAGEMENT

Cloud Security Fundamentals - Vulnerability Assessment Tool for Cloud - Privacy and Security in Cloud - Cloud Computing Security Architecture: Architectural Considerations- General Issues - Trusted Cloud Computing - Secure Execution Environments And Communications - Micro-Architectures; Identity Management and Access Control-Identity Management - Access Control - Autonomic Security Cloud Computing Security Challenges: Virtualization Security Management- Virtual Threats - VM Security Recommendations - VM-Specific Security Techniques - Secure Execution Environments and Communications In Cloud.

UNIT V   GOVERNANCE AND SECURITY

Issues in Cloud Computing - Implementing Real Time Application over Cloud Platform Issues in Intercloud Environments - QOS Issues in Cloud - Dependability - Data Migration - Streaming in Cloud. Quality Of Service (Qos) Monitoring in A Cloud Computing Environment. Cloud Middleware. Mobile Cloud Computing. Inter Cloud Issues. A Grid Of Clouds - Sky Computing - Load Balancing - Resource Optimization - Resource Dynamic Reconfiguration - Monitoring in Cloud

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TEXT BOOKS

1. Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper, "Cloud Computing for Dummies ", Wiley India Edition, 2012.
2. Gautam Shroff ,"Enterprise Cloud Computing" Cambridge,
3. Ronald Krutz and Russell Dean Vines ,"Cloud Security", Wiley-India

REFERENCE BOOKS

1. Scott Granneman ,"Google Apps",Pearson Pub;lications,2008
2. Tim Malhar, S.Kumaraswammy, S.Latif ,"Cloud Security & Privacy" Auerbach Publications, 2007
3. Antohy T Velte ,"Cloud Computing : A Practical Approach", McGraw Hill,2009
4. Barrie Sosinsky ,"Cloud Computing Bible", John Wiley & Sons, 2011

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CSE18R404	PROGRAMMING IN C# AND .NET	L	T	P	C
		3	0	0	3

PRE-REQUISITES : CSE18R303/ OOPS using C++/

CSE18R304/ OOPS using Java

COURSE OUTCOMES :

CO1:Understand the programming concepts of C#
CO2:Apply the object oriented concepts of C# for application development.
CO3:Create distributed data driven applications using the .NET framework and C#.
CO4:Develop web-based distributed applications using C#, SQL Server and ADO.NET
CO5:Design and develop Web based applications on .NET with CLR.

UNIT – I INTRODUCTION TO C#

Introducing C# - Understanding .NET - Overview Of C# - Literals - Program Structure And Simple Input And Output Operations – Operators And Expressions – Statements – Arrays And Structures - String - String Builder - Enumerations - Boxing And Unboxing.

UNIT – II OBJECT ORIENTED ASPECTS OF C#

Class, Objects, Constructors And Its Types, Inheritance - Namespace – Polymorphism – Interface And Overloading – Multiple Inheritance – Property – Indexes – Delegates – Publish/Subscribe Design Patterns-Operator Overloading-Method Overloading, Delegates, Events, Errors And Exception, Threading.

UNIT – III UNIT III APPLICATION DEVELOPMENT ON .NET

Building Windows Application - Creating Our Own Window Forms With Events And Controls - Menu Creation - Inheriting Window Forms - SDI And MDI Application - Dialog Box (Modal And Modeless) - Accessing Data With ADO.NET - Dataset - Typed Dataset - Data Adapter - Updating Database Using Stored Procedures - SQL Server With ADO.NET - Handling Exceptions - Validating Controls - Windows Application Configuration.

UNIT - IV WEB BASED APPLICATION DEVELOPMENT ON .NET

Working With XML and .NET – Techniques For Reading and Writing XML Data - Using Xpath and Search XML - ADO.NET Architecture – ADO.NET Connected And Disconnected Models – XML And ADO.NET – Creating Virtual Directory and Web Application, Session Management

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Techniques, Web. Config, Web Services, Passing Datasets, Returning Datasets From Web Services, Handling Transaction, Handling Exceptions, Returning Exceptions From SQL Server.

UNIT – V CLR AND .NET FRAMEWORK

Application Domains – Remoting – Leasing and Sponsorship - .NET Coding Design Guidelines –Assemblies – Security in .NET, Versioning, Attributes, Reflection, Viewing Meta Data, Type Discovery, Reflection On Type, Marshalling, Application Development.

TEXT BOOKS:

5. Herbert Schildt, "The Complete Reference: C# 4.0", Tata Mc Graw Hill, 2012.
6. Christian Nagel , "Professional C# 2012 with .NET 4.5", Wiley India, 2012.
7. S. Thamarai Selvi and R. Murugesan "A Textbook on C# ", Pearson Education,2003.
8. Stephen C. Perry "Core C# and .NET", Pearson Education,2006.

REFERENCES:

- Andrew Troelsen , "Pro C# 2010 and the .NET 4 Platform", Fifth edition, A Press, 2010.
- Ian Griffiths, Matthew Adams, Jesse Liberty, "Programming C# 4.0", Sixth Edition, O'Reilly, 2010.

- Jesse Liberty, "Programming C#", Second Edition, O'Reilly Press, 2002.
- Robinson et al, "Professional C#", Fifth Edition, Wrox Press, 2002.
- Herbert Schildt, "The Complete Reference: C#", Tata McGraw Hill, 2004.

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CSE18R405	ANDROID PROGRAMMING	L	T	P	C
		3	0	0	3

PRE-REQUISITES : CSE18R304/ OOPS using Java

COURSE OUTCOME

CO1: Study the basics of android application development environment

CO2: Know the basics about the android User Interface

CO3: Utilize the views concept in designing the activities of android User Interface.

CO4: Explains how to customize activities and intents and manage data that helps you work with APIs, the Android SDK.

CO5: Understand on how to package and publish your applications to the Android Market

 UNIT 1: INTRODUCTION ANDROID PROGRAMMING

Features of Android, Architecture of Android, Android Devices in the Market, Android SDK, Installing the Android SDK Tools, Configuring the Android SDK Manager, Eclipse, Android Development Tools (ADT), Creating Android Virtual Devices (AVDs), Creating Your First Android Application, Anatomy of an Android Application.

UNIT II: ANDROID USER INTERFACE
Understanding the Components of a Screen, Views and ViewGroups, LinearLayout, AbsoluteLayout, TableLayout, RelativeLayout, FrameLayout, ScrollView, Adapting to Display Orientation, Anchoring Views, Resizing and Repositioning, Managing Changes to Screen Orientation, Persisting State Information during Changes in Configuration, Detecting Orientation Change, Controlling the Orientation of the Activity.

UNIT III: DESIGNING YOUR USER INTERFACE WITH VIEWS
Using Basic Views, TextView View, Button, ImageButton, EditText, CheckBox, ToggleButton, RadioButton, and RadioGroup Views, ProgressBar View, , Using Picker Views, Using List Views to Display Long Lists, Using the Spinner View, Using Image Views to Display Pictures, Gallery and ImageView Views, ImageSwitcher, GridView, Using Menus with Views

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UNITIV: DATA PERSISTENCE

Saving and Loading User Preferences, Accessing Preferences Using an Activity, Programmatically Retrieving and Modifying the Preferences Values, Persisting Data to Files, Creating and Using Databases, Creating the DBAdapter Helper Class, Using the Database Programmatically , Pre-Creating the Database.

UNIT V: DEVELOPING ANDROID SERVICES AND PUBLISHING ANDROID APPLICATIONS

Creating Your Own Services, Performing Long-Running Tasks in a Service, Executing Asynchronous Tasks on Separate Threads Using Intent Service, Establishing Communication between a Service and an Activity, Binding Activities to Services, Preparing for Publishing, Publishing on the Android Market

TEXT BOOK:

1. Wei-Meng Lee, "Beginning Android 4 Application Development" March 2012

REFERENCES

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox 2012.
2. Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", Dream Tech. 2012
3. James Dovey and Ash Furrow, "Beginning Objective C", Apress, 2012
4. David Mark, Jack Nutting, Jeff LaMouche, and Fredric Olsson, "Beginning iOS6 Development: Exploring the iOS SDK", Apress, 2013

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CSE18R406	INTRODUCTION TO IOT	L	T	P	C
		3			3

PRE-REQUISITES : CSE18R302/ Fundamentals of Networking

COURSE OUTCOMES :

CO1:Understand   the basic concepts ,architecture and protocol of Internet of Things.

CO2:Analyze the tools and design methods of Internet of Things

CO3:Identify the services offered by IoT physical servers and cloud environment.

CO4:Analyze the physical devices and apply analytic tool for IoT.

CO5:Design and develop an IOT solution for a real time problem.

UNIT-I: INTRODUCTION TO INTERNET OF THINGS

Introduction - Physical Design of IoT - Logical Design of IoT - IoT Enabling Technologies - IoT Levels & Deployment Templates –Applications—of IOT

UNIT-II-IOT ARCHITECTURE AND PROTOCOL

History of IOT,- Four Pillars of IoT -Machine to Machine- Difference between IoT and M2M - SDN and NFV for IoT **-** Protocols – IEEE 802.15.4 – BACNet Protocol– Zigbee Architecture

UNIT-III DEVELOPINGINTERNETOFTHINGS
IoT Platforms Design Methodology - IoT Design Methodology- IoT Systems - Logical Design using Python – Python Web Application Framework - Python Packages of Interest for IoT

UNIT IV- IOT PHYSICAL SERVERS & CLOUD OFFERINGS

Introduction to Cloud Storage Models & Communication APIs - WAMP - AutoBahn for IoT-Xively Cloud for IoT - Designing a RESTful Web API - Amazon Web Services for IoT - IoT Messaging Platform

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UNIT V- IOT PHYSICAL DEVICES & ENDPOINTS

Basic building blocks of an IoT Device –Sensors-actuators-Arduino -Raspberry Pi- Difference between Arduino -Raspberry -Interfacing Arduino &Raspberry- pcDuino -BeagleBone Black –

TEXT BOOKS:

1. 1.Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, **"**From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence**"**, 1st Edition, Academic Press, 2014.

2. Arshdeep Bahga and Vijay Madisetti," Internet of Things: A Hands-on Approach",Universities press,2015

REFERENCE BOOKS:

1. Honbo Zhou , "The Internet of Things in the Cloud: A Middleware Perspective" CRC Press ,2012
2. Dieter Uckelmann; Mark Harrison; Florian Michahelles, "Architecting the Internet of Things", Springer , 2011
3. Olivier Hersent, Omar Elloumi and David Boswarthick, "The Internet of Things: Applications to the Smart Grid and Building Automation "Wiley ,2012

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CSE18R407	VEHICULAR ADHOC NETWORK	L	T	P	C
		3	0	0	3

PRE-REQUISITES : CSE18R302/ Fundamentals of Networking

COURSE OUTCOME

CO1 : Understand the basic Traffic modeling of VANET infrastructure.

 CO2 : Analyze the types of data dissemination in VANET**.**

CO3 : Understand the concepts behind Communication and propagation models of

   VANET.

CO4 : Analyze the message coding used   in VANET application.

CO5 : Apply the cryptographic protocols to secure Vehicular Communication .

UNIT I INTRODUCTION TO VANETS

Infrastructure in Vehicular Communications : Status, Challenges and Perspectives – Architecture of Vehicular Ad Hoc Networks – Traffic Engineering – Traffic Monitoring Models for Traffic Flow and Vehicle Motion – Co-operative Vehicular Safety Applications – Enabling Technologies–VANET – enabled Active Safety Applications

UNIT II INFORMATION DISSEMINATION AND MOBILITY MODELING IN VANETS

Introduction – Obtaining Local Measurements – Information Transport – Protocols for Information Transport – Improving Network Connectivity – What to Transport – Summarizing Measurements – Geographical Data Aggregation –Types of Vehicular Mobility Modeling for VANET

UNIT III PHYSICAL LAYER AND MAC LAYER FOR VEHICULAR COMMUNICATIONS

Wireless Propagation Theory – Channel Metrics – Measurement Theory – Empirical Channel Characterization at 5.9 GHz – MAC Layer and Scalability Aspects of Vehicular Communication Networks – Communication based on IEEE 802.11 p – Performance Evaluation and Modeling – Aspects of Congestion Control

UNIT IV   APPLICATION LEVEL MESSAGE CODING AND COMPOSITIONS

Introduction to Application Environment – Safety Applications and data requirements – Desirable Architectural features – Broadcast Characteristics – Message Dispatcher – Data element dictionary – Message Construction – Example Applications – Emergency brake warning

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UNIT V DATA SECURITY AND STANDARDS IN VEHICULAR COMMUNICATION NETWORKS

Challenges of Data Security In Vehicular Networks – Network, Applications, And Adversarial Model – Network Model – Application Model – Attacker Model – Security Infrastructure – Cryptographic Protocols – Privacy Protection Mechanisms

REFERENCES :

1. Hannes Hartenstein and Kenneth P Laberteaux, "VANET Vehicular Applications and Inter-Networking Technologies", Wiley 2010

2. Mohamed Watfa, "Advances in Vehicular Ad-Hoc Networks: Developments and Challenges", Information Science Reference , 2010

3. Stephan Olariu, Michele C. Weigle "Vehicular Networks: From Theory to Practice", Chapman and Hall/CRC , 2009

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CSE18R408	WIRELESS SENSOR NETWORK	L	T	P	C
		3	0	0	3

PRE-REQUISITES : CSE18R302/ Fundamentals of Networking

COURSE OUTCOMES : :

CO1: In-depth understanding the insight of wireless sensor networks and

its technologies.

CO2: Understanding the architecture and the components associated to

wireless sensor networks.

CO3: Identifying the networking sensors and protocols of wireless sensor

networks

CO4: Analyzing the various routing protocols, routing and topologies

associated with wireless sensor networks.

CO5: Applying the wireless sensor networking concepts in real world

scenario.

UNIT I OVERVIEW OF WIRELESS SENSOR NETWORK

Introduction, Brief Historical Survey Of Sensor Networks, And Background Of Sensor Network Technology, Ah-Hoc Networks, Challenges For Wireless Sensor Networks-Characteristics Requirements-Required Mechanisms, Difference Between Mobile Ad-Hoc And Sensor Networks, Enabling Technologies For Wireless Sensor Networks.

UNIT-II: ARCHITECTURES

Single-Node Architecture - Hardware Components, Energy Consumption Of Sensor Nodes, Operating Systems And Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals And Figures Of Merit, Gateway Concepts.

UNIT-III: NETWORKING SENSORS

Physical Layer And Transceiver Design Considerations, MAC Protocols For Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC,

Zigbee: IEEE 802.15.4 MAC Layer, The Mediation Device Protocol, Wakeup Radio Concepts, Address And Name Management, Assignment Of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing.

UNIT-IV: INFRASTRUCTURE ESTABLISHMENT

Routing And Data Gathering Protocols Routing Challenges And Design Issues In Wireless Sensor Networks, Flooding And Gossiping – Data Centric Routing – SPIN – Directed Diffusion – Energy Aware Routing - Gradient-Based Routing - Rumor-Routing – COUGAR – ACQUIRE – Hierarchical Routing - LEACH, PEGASIS – Location Based Routing – GF, GAF, GEAR, GPSR. Topology Control, Clustering, Time Synchronization, Localization And Positioning, Sensor Tasking And Control.

UNIT-V: APPLICATIONS OF WIRELESS SENSOR NETWORK

WSN Applications - Sensor And Robots, Home Control - Building Automation - Industrial Automation - Medical Applications - Reconfigurable Sensor Networks - Highway Monitoring - Military Applications - Civil And Environmental Engineering Applications - Wildfire Instrumentation - Habitat Monitoring - Nanoscopic Sensor Applications – Case Study: IEEE 802.15.4 LR-Wpans Standard - Target Detection And Tracking – Contour−Edge Detection - Field Sampling.

TEXT BOOKS

1. Kazem Sohraby, Daniel Minoli and Taieb Znati, – Wireless Sensor Networks Technology, Protocols, and Applications–, John Wiley & Sons, 2007.

2. Holger Karl and Andreas Willig, –Protocols and Architectures for Wireless Sensor Networks‖, John Wiley & Sons, Ltd, 2005.

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REFERENCE BOOKS:

1. KazemSohraby, Daniel Minoli, TaiebZnati ,‖Wireless Sensor Network‖Wiley,March 2007

2. Ananthram Swami, Qing Zhao, Yao-Win Hong, Lang Tong ,‖Wireless SensorNetworks Signal Processing and Communications‖ John Wiley & Sons,2007

3. Murthy ,─Ad Hoc Wireless Networks: Architectures And Protocols‖, PearsonEducation ,2007

4. C. S. Raghavendra ,‖Wireless sensor Networks‖ Springer ,2004

5. Sridhar S. Iyengar, NandanParameshwaran, Vir V. Phoha, N. Balakrishnan, Chuka D. Okoye,‖Fundamentals of Sensor Network Programming: Applications and Technology –, Wiley Publications, 2011

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HONORS ELECTIVES

CSE18R322	ADVANCED COMPUTER ARCHITECTURE	L	T	P	Credit
		3	0	0	3

Pre-requisite : CSE18R174 / Computer Organization and Architecture	Course Category : Honors Elective Course Type　　　: Theory

Course Objectives :

　To introduce students about the principles of computer design, instruction set design concepts, performance enhancements, new and alternative computer architectures, and the design and implementation of high performance computing systems.

　To equip students with the skills to undertake performance comparisons, improve the performance of applications, and develop applications to solve computationally intensive problems.

COURSE OUTCOMES :

CO1:Understand the fundamentals of computer design.

CO2:Apply the knowledge of pipelining and ILP to solve the designing issues

CO3:Understand the various issues in architecture

CO4:Analyze the various multi processor architecture

CO5: Demonstrate the memory and I/O interface concepts

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S	M	M	M	M								M	L		L
CO3	S												M			
CO4	S	M	M	M	M								M	L		L
CO5	S	S	S	S	S						M	M	M	L		L

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UNIT IFUNDAMENTALS OF COMPUTER DESIGN

Review of Fundamentals of CPU, Memory and IO – Trends in Technology, Power, Energy and Cost, Dependability – Performance Evaluation- CPU Organization- Coprocessor - Pipeline Design And Processing

UNIT II PIPELINING AND ILP

Fundamentals of Computer Design - Measuring and Reporting Performance - Instruction Level Parallelism and Its Exploitation - Concepts and Challenges - Overcoming Data Hazards with Dynamic Scheduling – Dynamic Branch Prediction

UNIT III THREAD LEVEL PARALLELISM

Multi-threading – Multiprocessors - Centralized and Distributed Shared Memory Architectures –Cache Coherence Issues - Performance Issues – Synchronization Issues – Models of Memory Consistency – Buses,-SMT Architecture and Performance

UNIT IV MULTIPROCESSOR ARCHITECTURE

Taxonomy of Parallel Architectures - Centralized Shared Memory Architecture - Synchronization - Memory Consistency - Symmetric and Distributed Shared Memory – Architectures - SISD, MISD, MIMD, Single Instruction Multiple Data Stream (SIMD) Architectures.

UNIT V MEMORY AND I/O

Memory Hierarchy - Memory Technologies - Cache Performance – Optimizations of Cache Performance - Main Memory and Performance – Types of Storage Devices – RAID - Virtual Memory and Virtual Machines – Input Output Interface

TEXT BOOKS:

John L. Hennessey and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier, Fifth edition, 2012.

Richard Y. Kain, "Advanced Computer Architecture a Systems Design Approach", PHI, 2011.

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REFERENCE BOOKS:

Kai Hwang and Faye Briggs, "Computer Architecture and Parallel Processing", Mc Graw-Hill International Edition, 2000.

John P.Hayes, 'Computer architecture and Organization', Tata McGraw Hill, Third edition, 1998.

David E. Culler, Jaswinder Pal Singh, "Parallel computing architecture : A hardware/software approach" , Morgan Kaufmann /Elsevier Publishers, 1999.

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CSE18R323	HIGH PERFORMANCE COMPUTING	L	T	P	Credit
		3	0	0	3

Pre-requisite : CSE18R371 / Computer Networks	Course Category : Honors Elective
	Course Type : Theory

COURSE OBJECTIVES :

To give students solid foundations for developing, analyzing, and implementing parallel and locality-efficient algorithms by making them to understand the architecture of several types of high performance computers and the implications on the performance of algorithms on these architectures.

COURSE OUTCOMES :

CO1 :Describe architectural hardware and software issues for high performance computing systems.

CO2: Recognize the importance of Load Sharing and balancing for high performance computing systems.

CO3:Understand various parallel programming languages and HPC environments with particular reference to Grid Computing

CO4:Understand the role of cloud computing for high performance computing

CO5 :Understand various task scheduling methods for high performance computing.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S	M	M	M	M								M	L		L
CO3	S												M			
CO4	S	M	M	M	M								M	L		L
CO5	S	S	S	S	S						M	M	M	L		L

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UNIT I CLUSTER COMPUTING

Introduction to Cluster Computing - Scalable Parallel Computer Architectures - Cluster Computer and its Architecture - Classifications - Components for Clusters - Cluster Middleware and Single System Image - Resource Management and Scheduling - Programming Environments and Tools - Applications - Representative Cluster Systems - Heterogeneous Clusters - Security - Resource Sharing - Locality - Dependability - Cluster Architectures - Detecting and Masking Faults - Recovering from Faults - Condor - Evolution of Metacomputing.

UNIT II LOAD SHARING AND BALANCING

Evolution - Job and Resource Management Systems - State-of-the- Art in RMS and Job - Rigid Jobs with Process Migration - Communication-Based Scheduling - Batch Scheduling - Fault Tolerance - Scheduling Problem for Network Computing - Algorithm - ISH - MCP and ETF - Dynamic Load Balancing - Mapping and Scheduling - Task Granularity and Partitioning - Static and Dynamic Scheduling.

UNIT III GRID COMPUTING

Introduction to Grid Computing - Virtual Organizations - Architecture - Applications - Computational - Data - Desktop and Enterprise Grids - Data-intensive Applications - High-Performance Commodity Computing - High-Performance Schedulers - Grid Middleware: Connectivity - Resource and Collective Layer - Globus Toolkit - GSI - GRAM - LDAP - GridFTP - GIIS - Heterogeneous Computing Systems - Mapping Heuristics: Immediate and Batch Mode - Immediate: MCT - MET - Switching Algorithm - KPB and OLB - Batch: Min-Min - Max-Min - Sufferage - Duplex - GA - SA - GSA - Tabu and A* - Expected Time to Compute Matrix - Makespan - Heterogeneity: Consistent - Inconsistent and Partially-Consistent - QoS Guided Min-Min - Selective Algorithm - Grid Computing Security - Introduction to GridSim - Architecture - Grid Resource Broker - Grid Referral Service.

UNIT IV CLOUD COMPUTING

Introduction to Cloud Computing - Types: Deployment and Service Models - Characteristics - Applications - Service-Level Agreement - Virtualization - High-Throughput Computing: Task Computing and Task-based Application Models - Market-Based Management of Clouds - Energy-Efficient and Green Cloud Computing Architecture - Resource Allocation - Leases.

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UNIT V TASK SCHEDULING

Task Scheduling: RR - CLS and CMMS - Workflow Scheduling - Montage - Epigenomics - SIPHT - LIGO - CyberShake - Task Consolidation - Introduction to CloudSim - Cloudlet - Virtual Machine and its Provisioning - Time and Space-shared Provisioning.

TEXT BOOKS:

R. Buyya, High Performance Cluster Computing: Architectures and Systems, Vol:1, Pearson Education, 2008.

I. Foster and C. Kesselman, The Grid: Blueprint for a New Computing Infrastructure, Morgan Kaufmann, Elsevier, 2004.

REFERENCE BOOKS:

A. Chakrabarti, Grid Computing Security, Springer, 2007.

B. Wilkinson, Grid Computing: Techniques and Applications, CRC Press, 2009.

C. S. R. Prabhu, Grid and Cluster Computing, PHI, 2008.

B. Sosinsky, Cloud Computing Bible, Wiley, 2011.

D. Janakiram, Grid Computing, Tata McGraw-Hill, 2005.

R. Buyya, C. Vecchiola and S. T. Selvi, Mastering Cloud Computing Foundations and Applications Programming, Morgan Kaufmann, Elsevier, 2013.

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CSE18R324	AUGMENTED REALITY	L	T	P	Credit
		3	0	0	3

Pre-requisite : NIL	Course Category : Honors Elective
	Course Type : Theory

COURSE OBJECTIVES :

 To introduce students to augmented reality technology

 To expose students to the various capabilities of augmented reality technology

 To equip student with technical knowledge in creating an augmented reality application

COURSE OUTCOMES :

CO1:Understand the basic concept and display devices used for augmented reality.

CO2:Understand and apply various tracking systems using in AR

CO3:Understand the visualization through camera and analyze the visualization challenges.

CO4:Apply modeling, annotations and collaborating and navigating with AR environment

CO5:Analyze the software engineering requirements for an AR developer and predict the future of AR.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S	M	M	M	M								M	L		L
CO3	S												M			
CO4	S	M	M	M	M								M	L		L
CO5	S	S	S	S	S						M	M	M	L		L

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UNIT I   INTRODUCTION OF AUGMENTED REALITY

Definition and Scope, Examples, Related Fields, Displays – Multimodal Displays, Visual Perception, Spatial and Visual Displays

UNIT II TRACKING

Coordinate system, Characteristics of Tracking Technology,   Stationary Tracking System, Mobile Sensors, Optical Tracking, Computer Vision for Augmented Reality

UNIT III   CALIBRATION, REGISTRATION, COHERENCE, VISUALIZATION, INTERACTION

Camera and Display Calibration, Registration, Visual Coherence, Situated Visualization Challenges and Registration, Annotations and Labeling, X-ray Visualization, Spatial Manipulation and Information Filtering

UNIT IV   MODELING, ANNOTATIONS, AUTHORING, NAVIGATION AND COLLOBORATION

Specifying Geometry and Appearance, Annotation, Requirements, Elements and Solutions of AR Authoring, Navigation, Properties, Co-located and Remote Collaboration

UNIT V   SOFTWARE ARCHITECTURE AND FUTURE

AR Application and Software Engineering Requirements, Developer Support and Wish List, Interfacing with Smart Objects, Augmented Human, AR as a Social Computing Platform

TEXT BOOK:

1.   D.Schmalstieg, T.Hollerer, "Augmented Reality: Principles & Practice", Addison Wesley - Pearson Education, 2016

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CSE18R325	VISUAL CRYPTOGRAPHY	L	T	P	Credit
		3	0	0	3

Pre-requisite : NIL	Course Category : Honors Elective
	Course Type : Theory

COURSE OBJECTIVES :

To make students to understand about visual cryptography using a variety of applications

COURSE OUTCOMES :

CO1: Understand the fundamentals of images

CO2:Analyze the security techniques for images

CO3:Construct visual crypto systems

CO4:Analyze the various schemes of visual crypto systems

CO5:Construct color visual crypto system

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S	M	M	M	M								M	L		L
CO3	S												M			
CO4	S	M	M	M	M								M	L		L
CO5	S	S	S	S	S						M	M	M	L		L

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UNITI FUNDAMENTALS OF IMAGE PROCESSING

Digital Image Processing: Fundamentals:-Digital Image Representation-Coordinate Conversions - Images As Matrices - Image Types-Intensity Images - Binary Images - RGB Images; Color Image Processing:- - Colour Image Representation RGB Model - CMY Model - CMYK Model - HSI Model. Image File Formats.

UNIT II PRINCIPLES OF STEGANOGRAPHY

Principles of Steganography and Digital Watermarking and Their Applications. Secret Sharing-Introduction - History of Secret Sharing - Principle of Secret Splitting - Phases of Secret Sharing - Access Structures - Threshold Schemes - Shamir's Scheme, Applications.

UNIT III VISUAL CRYPTOGRAPHY

Visual Cryptography-Introduction-History of Visual Cryptography - Construction of Visual Cryptography Schemes - Basis Matrices - Construction of 2-Out-of-2 Visual Cryptography Schemes - Construction of 2-Out-of-2 Visual Cryptography Schemes With Square Pixel Expansion - Construction of Visual Cryptography Schemes With Consistent Image Size.

UNIT IV VISUAL CRYPTOGRAPHY SCHEMES

Visual Cryptography Schemes-Construction of 2-Out-of-N Visual Cryptography Schemes - Basis Matrices for 2-Out-Of-N Visual Cryptography Schemes - Construction of N-Out-of-N Visual Cryptography Schemes - Basis Matrices For N-Out-of-N Visual Cryptography Schemes - Construction of K-Out-of-N Visual Cryptography Schemes - Basis Matrices for K-Out-of-N Visual Cryptography Schemes.

UNIT V APPLICATIONS

Colour Visual Cryptography –Subpixel Layout of Colour Visual Cryptography - Variations of Colour Visual Cryptography Schemes-Constructing A '2 Out of 2' Colour Visual Cryptography Schemes - Constructing A '2 Out of N' Colour Visual Cryptography Schemes - Applications of Visual Cryptography.

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REFERENCE BOOKS:

1.   BorkoFurht, EdinMuharemagic and Daniel Socek, "Multimedia Encryption and Watermarking ", Springer,2007

2.   Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", Pearson Education 3rd Edition, 2010

3.   Jen-Shyang Pan, Hsiang-Cheh Huang and Lakhi C. Jain, "Intelligent Watermarking Techniques", World Scientific,2007

4.   JosefPieprzyk, Thomas hardjino and Jennifer Sebberry,Fundamentals of computer security, Springer International 2nd   Edition,2004.

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CSE18R420	VIDEO ANALYTICS	L	T	P	Credit
		3	0	0	3
Pre-requisite :CSE18R370/ Big Data Analytics	Course Category : Honors Elective				
	Course Type : Theory				

COURSE OBJECTIVES :

To address the research issues towards developing algorithms that can perform high-level visual recognition tasks on real-world images and videos.

To review and discuss current approaches to high-level visual recognition problems, such as background modeling, object recognition and categorization, tracking, scene understanding, human motion understanding, etc.

COURSE OUTCOMES :

CO1:Understand the various data analytic tools

CO2:Apply principles of Data Science to the analysis of large-scale problems

CO3:Understand the fundamental principles of video analytics and their application

CO4:Understand behavioral analysis and identify suspicious activity of human

CO5:Analyze the various human face recognition and gait algorithms

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S	M	M	M	M								M	L		L
CO3	S												M			
CO4	S	M	M	M	M								M	L		L
CO5	S	S	S	S	S						M	M	M	L		L

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UNIT I INTRODUCTION TO BIG DATA AND DATA ANALYSIS

Introduction to Big Data Platform – Challenges of Conventional Systems – Web Data – Evolution of Analytic Scalability – Analytic Processes and Tools – Analysis Vs Reporting – Modern Data Analytic Tools – Data Analysis: Regression Modelling – Bayesian Modelling – Rule Induction.

UNIT II MINING DATA STREAMS

Introduction to Stream Concepts – Stream Data Model and Architecture – Stream Computing –Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream–Estimating Moments – Counting Oneness in a Window – Decaying Window – Real Time Analytics Platform(RTAP) Applications – Case Studies.

UNIT III VIDEO ANALYTICS

Introduction – Video Basics – Fundamentals for Video Surveillance – Scene Artifacts – Object Detection and Tracking: Adaptive Background Modelling and Subtraction – Pedestrian Detection and Tracking – Vehicle Detection and Tracking – Articulated Human Motion Tracking in Low Dimensional Latent Spaces.

UNIT IV   BEHAVIOURAL ANALYSIS AND ACTIVITY RECOGNITION

Event Modelling – Behavioural Analysis – Human Activity Recognition – Complex Activity Recognition – Activity modeling using 3D shape - Video summarization – shape based activity models – Suspicious Activity Detection.

UNIT VHUMAN FACE RECOGNITION AND GAIT ANALYSIS

Introduction: Overview of Recognition algorithms – Human Recognition using Face: - Face Recognition from still images – Face Recognition from video – Evaluation of Face Recognition Technologies – Human Recognition using gait: HMM Framework for Gait Recognition – View Invariant Gait Recognition – Role of Shape and Dynamics in Gait Recognition.

`

REFERENCE BOOKS:

1. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.

2.   Yunqian Ma, Gang Qian, "Intelligent Video Surveillance: Systems and Technology", CRC Press (Taylor and Francis Group), 2009.

3.   Michael Berthold, David J.Hand, "Intelligent Data Analysis", Springer, 2007.

4.   Rama Chellappa, Amit K.Roy– Chowdhury, Kevin Zhou.S, "Recognition of Humans and theirActivities using Video", Morgan & Claypool Publishers, 2005.

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CSE18R421	NEXT GENERATION NETWORKS	L	T	P	Credit
		3	0	0	3
Pre-requisite : CSE18R371/ Computer Networks	**Course Category : Honors Elective** **Course Type** : Theory				

COURSE OBJECTIVES :

To make students to understand the core technologies, theories, and dilemmas that face next generation network engineers in this field.

To introduce students the best practices about how to design, deploy, and troubleshoot next generation networks.

COURSE OUTCOMES :

CO1: Understand the technical, economic and service advantages of next generation networks

CO2 :Familiar with NGN Functional Architecture of a next generation network (NGN) with reference

CO3:Analyze various NGN key development areas such as Access Network Area, Core Transport Network Area, Service Creation Area and Advanced Technologies for Network and Service Management.

CO4: Compare various NGN Standards in the vein of TMF, NGOSS, 3GPP and LTE/SAE.

CO5: Evaluate various NGN Wireless LANs with respect to OFDM device – High Throughput and Robust Performance.

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MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S	M	M	M	M								M	L		L
CO3	S												M			
CO4	S	M	M	M	M								M	L		L
CO5	S	S	S	S	S						M	M	M	L		L

UNIT I INTRODUCTION

Next Generation Networks (NGN) Vision, Scenarios and Advances – NGN Networks : Perspectives and Advances – Some Possible Scenarios – Virtual International Congress – Virtual Class Rooms – e-Education and Experimental Laboratory – Virtual Home – Home Networks – Automatic Traffic and Car Driving – NGN Requirements on Technology and Management.

UNIT II NGN FUNCTIONAL ARCHITECTURE

ITU NGN Functional Architecture – Proposed NGN Functional Architecture – NGN Network Operator – NGN Network Service Provider – NGN Customer and CTE – Network and Service Evaluation towards NGN- Fixed Network Evaluation – Mobile Network Evaluation – Internet Evaluation

UNIT III   NGN KEY DEVELOPMENT AREAS

Terminal Area – Access Network Area – Backhaul Network Area – Core Transport Network Area – Service Creation Area – Network Control and Managerial Area – Service Control and Management – Advanced Technologies for Network and Service Management.

UNIT IV   NGN STANDARDIZATION

ITU and GSI NGN – ETSI and TISPAN - NGN – ATIS and NGN – CJA and NGN - TMF and NGOSS, NGMN Alliance and NGMN - 3GPP and LTE/SAE – NGMN Alliance and NGMN, 3GPP and LTE/SAE

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UNIT V   NEXT GENERATION WIRELESS LANS

An overview of IEEE 802.11 – History of high throughput and 802.11 n- Environments and applications of 802.11 n – Major features of 802.11 n – Orthogonal Frequency Division Multiplexing – MIMO/SDM Basics – Physical Interoperability with 11 a/g legacy OFDM device – High Throughput and Robust Performance

REFERENCE BOOKS:

- Jingming Li Salina and Pascal Salina, "Next Generation Networks", Prospective and Potentials , John Wiley and Sons, 2007.

- Thomas Plavyk, "Next generation Telecommunication Networks, Services and Management", Wiley & IEEE Press Publications, 2012.

- Eldad Perahia and Robert Stacey, "Next Generation Wireless LANs", Cambridge University Press, 2008.

- Monique J. Morrow, "Next Generation Networks", CISCO Press, 2007.

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CSE18R422	SOFTWARE DEFINED NETWORKING	L	T	P	Credit
		3	0	0	3
Pre-requisite : CSE18R371/ Computer Networks	Course Category : Honors Elective Course Type : Theory				

COURSE OBJECTIVES :

To make students to learn about Software Defined Networking, an emerging Internet architectural framework, including the main concepts, architectures, algorithms, protocols and applications and related topics including Data Center Networks.

COURSE OUTCOMES :

CO1:Understand the Control Planes and Data Planes in Software Defined Networking

CO2:Understand the operations of SDN Controllers

CO3:Compare the SDN Solutions for the Data Centre Network

CO4:Analyze the Use cases of Software Defined Networking

CO5: Implement an Open Flow Switch

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S	M	M	M	M								M	L		L
CO3	S												M			
CO4	S	M	M	M	M								M	L		L
CO5	S	S	S	S	S						M	M	M	L		L

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UNIT I INTRODUCTION

Introduction – Centralized and Distributed Control and Data Planes – Evolution versus Revolution – The Control Plane – Data Plane – Moving Information between Planes – Distributed Control Planes – IP and MPLS – Creating IP Underlay – Convergence Time – Load Balancing – High availability – creating the MPLS overlay – Replication – Centralized Control Planes – ATM/LANE – Route Servers

UNIT II SDN CONTROLLERS

Introduction – General Concepts – Layer 3 Centric – Plexxi – Cisco OnePK – Network Programmability – The Management Interface – The Application – Network Divide – The Command line Interface – NETCONF and NETMOD- SNMP- Modern Programmatic Interfaces- I2RS – Modern Orchestration – OpenStack- CloudStack- Puppet.

UNIT III NETWORK FUNCTION VIRTUALIZATION

The Multitenant Data Centre – The virtualized Multitenant Data Centre – SDN Solutions for the Data Centre Network – VLANs- EVPN – VxLAN – NVGRE – Network Function Virtualizations – Virtualization and Data Plane I/O – Services Engineered Path – Service Locations and Chaining – NFV at ETSI – Non- ETSI NFV Work

UNIT IV USE CASES

Use cases for Bandwidth Scheduling, Manipulation, and Calendaring – Bandwidth Calendaring – Big Date and Application Hyper – Virtualization for Instant CSPF- Use cases for Data Centre Overlays, Big data, and Network Function Virtualization – Use case for Input Traffic Monitoring, Classification, and Triggered Actions.

UNIT V OPEN FLOW

Introduction to OpenFlow – Building Blocks – OpenFlow Messages – Northbound Interface- Implementing OpenFlow Switch – OpenFlow Reference Switch – Hardware Implementations – Software based Switches – Openflow in Cloud Computing.

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REFERENCE BOOKS:

Thomas D.Nadeau and Ken Gray, "Software Defined Networks", O'reilly, 2013

Siamak Azodolmolky, "Software Defined Networking with OpenFlow", PACKT Publishing, 2013

Rajesh Kumar Sundarrajan, "Software Defined Networking(SDN)- a Definitive Guide", E-book, March 2014.

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CSE18R423	SERVICE ORIENTED ARCHITECTURE	L	T	P	Credit
		3	0	0	3
Pre-requisite : NIL	Course Category : Honors Elective				
	Course Type : Theory				

COURSE OBJECTIVES :

To introduce the concepts and design principles of SOA, Non-technical aspects such as governance, impact on culture and organization, as well as the various interoperability standards, technology infrastructure and security considerations associated with SOA implementations.

COURSE OUTCOMES :

CO1:Understand fundamental and basic principles of service orientation

CO2:Understand web service composition, orchestration and Choreography

CO3:Analyse the SOA techniques for Web services.

CO4:Analyse web service implementation in various SOA platforms.

CO5:Analyse SOA for real time operations and apply security.

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S	M	M	M	M								M	L		L
CO3	S												M			
CO4	S	M	M	M	M								M	L		L
CO5	S	S	S	S	S						M	M	M	L		L

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UNIT I   INTRODUCTION TO SERVICE ORIENTED ARCHITECTURE

Introduction - Defining SOA-Evolution of SOA-Service Oriented Enterprise-Comparing SOA to Client-Server and Distributed Internet Architectures-Basic SOA Architecture-Concepts-Key Service Characteristics-Technical Benefits-Business Benefits.

UNIT II WEB SERVICES

Web Services – Service Descriptions – Messaging with SOAP –Message Exchange Patterns – Coordination –Atomic Transactions – Business Activities – Orchestration – Choreography - Service Layer Abstraction – Application Service Layer – Business Service Layer – Orchestration Service Layer.

UNIT III   SERVICE ORIENTED ANALYSIS

Service Oriented Analysis – Business-Centric SOA – Deriving Business Services- Service Modeling - Service Oriented Design – WSDL Basics – SOAP Basics – SOA Composition Guidelines – Entity-Centric Business Service Design – Application Service Design – Task Centric Business Service Design.

UNIT IV SOA PLATFORM

SOA Platform Basics – SOA Support in J2EE – Java API for XML-Based Web Services (JAX-WS) - Java Architecture for XML Binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML Based RPC (JAX-RPC)- Web Services Interoperability Technologies (WSIT) - SOA Support in .NET – Common Language Runtime - ASP.NET Web Forms – ASP.NET Web Services – Web Services Enhancements (WSE).

UNIT V REAL TIME OPERATION AND SECURITY

Goal of the Real Time Enterprise - Delivering Real Time with the SOA - Real Time Virtual Data Warehouse - Setting Business Level Agreements. Security: Risks of Loose Coupling - Layers of SOA Security - Solutions to SOA Security.

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TEXT BOOKS:

Thomas Erl, "Service-Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2007.

Eric Newcomer, Lomow, "Understanding SOA with Web Services", Pearson Education, 2005.

REFERENCE BOOKS:

1.   JamesMcGovern,Sameer Tyagi,Michael E Stevens,Sunil Mathew, "Java Web Services   Architecture", Elsevier, 2003.

2.   Newcomer, Lomow, "Understanding SOA with Web Services", Pearson Education,   2005.

3.   Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services, An Architect's Guide", Pearson Education, 2005.

4.   Dan Woods and Thomas Mattern, "Enterprise SOA Designing IT for Business Innovation", O'REILLY, First Edition, 2006.

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CSE18R424	VULNERABILITY MANAGEMENT	L	T	P	Credit
		3	0	0	3
Pre-requisite : CSE18R352/ Network & Information Security		Course Category : Honors Elective			
		Course Type : Theory			

COURSE OBJECTIVES :

   To focus on the concept and operational aspects of information security vulnerability management with an understanding about network and system monitoring, risk assessment and mitigation, patch management, and incident response.

COURSE OUTCOMES :

CO1:Analyze the need for vulnerability management

CO2:Understand the fundamental concepts and technology for vulnerability management.

CO3:Understand VM processing concepts in risk assessment.

CO4:Understand and generate various VM reports

CO5:Analyze the vulnerability strategies and principles

MAPPING OF COURSE OUTCOMES WITH PO, PSO:

	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	S												M			
CO2	S	M	M	M	M								M	L		L
CO3	S												M			
CO4	S	M	M	M	M								M	L		L
CO5	S	S	S	S	S						M	M	M	L		L

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UNIT I   INTRODUCTION

Introduction -Vulnerability experience-Program and organization

UNIT II TECHNOLOGY

Technology-General Architecture-Agents-Passive Network Analysis-Active Scanning Technology – Hybrid Approach-CVE-The Standard for Vulnerability Test Data-NVD-SCAP

UNIT III PROCESS

VM Process-Baselines-ITIL ITSM Processes –IAVA Process-Data Classification-Risk Assessment

UNIT IV REPORTING

Discovery Reports-Evaluation Reports-Profile Reports-Audit Reports-Active Scanning-Audit Trends and Performance Reports-Compliance Reports –Planning-Charter Development Business Case –Requirements Documents-REP-Implementation Plan

UNIT V STRATEGIC VULNERABILITY

Operating Environment –Management External Factors –Controlling Internal Vulnerability Principles of Mitigation-Understanding The Enemy-Cross Discipline Opportunities –Cross Technology Opportunities.

TEXT BOOK:

1.   Park Foreman, "Vulnerability Management", Auerbach Publication, Taylor And Francis Group,2010

REFERENCE BOOKS:

1.   Wolfgang Kandek,"Vulnerability Management", Second Edition ,2004

2.   Gheorghe,A., "Integrated risk and Vulnerability Management assisted by decision support systems", Springer 2005   .

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OPEN ELECTIVES (BASIC SCIENCE AND MATHEMATICS)

OEE18R009	LASER TECHNOLOGY	L	T	P	C
		3	0	0	3

Course Outcomes:

At the end of the course, the students will be able to

CO-1: an ability to enhance the modern technological aspects in laser

CO-2: To correlate the basic concept of theoretical principles in laser

CO-3: an ability to improve the knowledge of various types of laser

CO-4: enormous interest to study the various properties of laser.

CO-5: knowledge of laser applications in various engineering fields

Unit - I:Absorption and Emission of Radiation

Concept of coherence – spatial and temporal - Conditions for Producing Laser - spontaneous and stimulated emission - Population Inversion-different methods- Einstein coefficients – negative absorption – Gain and Gain saturation - Saturation intensity - shape and width of spectral lines.

Unit - II: Threshold Condition and Resonators

Rate equations – optical excitation in three and four level lasers – standing waves in laser – cavity theory – dichroic filter – modes, diffraction theory of the Fabry – Perot interferometer – Types of resonators – stability diagram

Unit - III: Types of Lasers

Principle, construction, working-Gas lasers:He-Ne laser, , CO_2 laser- Liquid lasers: dye lasers, solid state laser:Ruby laser, Nd-YAG laser-applications.

Unit - IV: Ultrafast Photonics and Laser Q Switching

Introduction to ultrashort pulse lasers and amplifiers – wavelength conversion – time-resolved experiments – applications of ultrashort pulses – Mode locking – second harmonic generation – theory and experiment – materials for optical second harmonic generation

Unit - V: Applications

Measurement of distance, velocity, rotation with lasers – laser in communications and computer technology– holography – industrial applications – cutting, drilling & welding – lasers in medicine – laser in research and development

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Reference Books

1. Simon Hooker & Colin Webb "Laser Physics" Oxford Press, 2010.

2. William T. Silfvast "Laser Fundamentals" Cambridge University Press, Second Edition, 2008.

3. William S. C. Chang "Principles of Lasers and Optics" Cambridge University Press, 2007.

4.Yehoshua Y. Kalisky "The Physics and Engineering of Solid State Lasers" SPIE Press, 2006.

5. Mark Csele" Fundamentals of light sources and lasers" John Wiley and sons, New jersey 2004

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OEE18R003	**Mathematical Biology**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**3**

Course Objective:

To enable the students to understand the concepts of models for single species, interacting populations and dynamics of marital interaction.

Course Outcomes:

Upon successful completion of this course, students will be able to

CO1. learn continuous population models for single species

CO2. learn discrete population models for a single species

CO3. understand models for interacting populations

CO4. Analyze the various competitive models..

CO5. model the dynamics of marital interaction.

Unit-I: Continuous Population Models for Single Species

Continuous Growth Models, Insect Outbreak Model: Spruce Budworm, Delay Models. Linear Analysis of Delay Population Models: Periodic Solutions, Real Life Problems related to Growth Model.

Unit-II: Discrete Population Models for a Single Species

Introduction: Simple Models, Cob webbing: A Graphical Procedure of Solution, Discrete Logistic-Type Model: Chaos, Stability, Periodic Solutions. Discrete Delay Models, Tumor Cell Growth.

Unit-III: Models for Interacting Populations

Predator-Prey Models: Lotka-Volterra Systems, Complexity and Stability, Realistic Predator-Prey Models, Analysis of Predator-Prey Model with Limit Cycle, Periodic Behavior: Parameter Domains of Stability.

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Unit-IV: Competitive Models

Competition Models: Competitive Exclusion Principle, Mutualism or Symbiosis, General Models and Cautionary Remarks, Threshold Phenomena, Discrete Growth Models for Interacting Populations, Predator- Prey Models : Detailed Analysis.

Unit-V: Modelling the Dynamics of Marital Interaction: Divorce Prediction and Marriage Repair

Psychological Background and Data: Gottman and Levenson Methodology, Maital Typology and Modelling Motivation, Modelling Strategy and the Model Equations, Steady States and Stability.

Text Book:

1. J. D. Murray, Mathematical Biology: I. An Introduction, Third Edition, *Springer-verlag Berlin Heidelberg,* 2002.

REFERENCE BOOKS:

1. R.M. Anderson and R. M. May, editors, Infectious Disease of Humans : Dynamics and Control. *Oxford University Press, Oxford*, 1991..
2. O. Diekmann and J. A. P. Heesterbeek. Mathematical Epidemiology of Infectious Diseases: Model Building, *Analysis and Interpretation. John Weily, New York*, 2000.

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OEE18R005	COMBINATORICS	L	T	P	C
	(With effect from June 2018)	3	1	0	3

Course Objectives:

To enable the students to understand the concepts of permutation, combination and inclusion and exclusion principle.

Course outcomes:

Upon successful completion of this course, students will be able to

CO1. understand the rules of sum and product of permutations and combinations.

CO2. analyze the concepts of pigeonhole principle and its applications.

CO3. identify solutions by the technique of generating functions

CO4. understand the concepts of Pascal's triangle, the binomial Theorem and unimodality of binomial Coefficients.

CO5. understand the concepts of the principle of inclusion-exclusion and their applications.

Unit I - Permutations and Combinations
Four Basic Counting Principles, Permutations of sets, Combinations (Subsets) of Sets, Permutations of Multi-sets, Combinations of Multi-sets.

Unit II - The Pigeonhole Principle:
Pigeonhole Principle: Simple Form, Pigeonhole Principle: Strong Form, A Theorem of Ramsey.

Unit III - Generating Permutations and Combinations:
Generating Permutations, Inversions in Permutations, Generating Combinations, Generating r-Subsets**.**

Unit IV - The Binomial Coefficients:

Pascal's Triangle, The Binomial Theorem, Unimodality of Binomial Coefficients, The Multinomial Theorem, Newton's Binomial Theorem.

Unit V - The Inclusion-Exclusion Principle and Applications: The Inclusion-Exclusion Principle, Combinations with Repetition, Derangements, Permutations with Forbidden Positions, Another Forbidden Position Problem.

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Text Book : Richard A. Brualdi, Introductory Combinatorics, Pearson Education, Inc, China machine press, Fifth Edition, 2009

References :

1. Miklos Bona, A walk through Combinatorics, (Second Edition), *World Scientific Publ. Co.,* 2008.
2. C. L. Liu, Introduction to Combinatorial Mathematics, *Mc Graw Hill Book Company, New York,* 1968.

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OEE18R008	Photonics and Optoelectronic Devices	L	T	P	C
		3	0	0	3

Course Outcomes:

At the end of the course, the students will be able to

CO-1: Know the fundamentals of fibre based optical devices

CO-2: Understand the basic of integrated optical devices

CO-3: Learn about the opto-electronic devices

CO-4: Understanding of nanostructured materials

CO-5: Understanding of quantum devices with applications

Unit – I: Optical Fibre based Devices

Introduction to optical Fibre; Fused single mode fibre directional coupler, Polished single mode fibre directional coupler ;Fibrepolariser; Wavelength multiplexer and demultiplexer; Optical fibre switches and intensity modulators; Optical fibre phase modulator; Optical fibre frequency modulator; Optical fibre amplifiers

Unit – II: Integrated Optics based Devices

Optical directional coupler: directional coupler wavelength filter, polarisation splitting directional coupler; Polarisers: leaky mode polariser , metal clad polariser; Phase modulator; Optical switch; Acousto-optic devices : mode converter , tunable wavelength filter, Bragg type modulator , Bragg type deflector; Magneto-optic devices : TE-TM mode converter, modulators and switches, Ti / LiNbO$_3$ based optical devices.

Unit – III: Optoelectronic Devices

Semiconductor Lasers: homojunction, heterojunction and surface emitting lasers, quantum well lasers; Modulation of lasers; Photodetectors: PIN, Avalanche photodiodes; Optoelectronic modulation and switching devices; Electro-optic Devices; Optoelectronic Integrated circuits; SiO$_2$ / Si based optoelectronic devices.

Unit – IV:Nanophotonics

Nanocomposites: Nanocomposite Waveguides, Random Lasers, Nanocomposites for optoelectronics-Basics of nano-photonics-Introduction to MEMS and NEMS-Working principles: as micro sensors-biosensors, chemical sensors and optical sensors. MEMS/NEMS

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applications: Applications in automotive industry-health care- aerospace-industrial product-consumer products.

Unit – V:Quantum Devices

Low-dimensional structures: Quantum wells, Quantum wires, and Quantum dots; Density of states in low-dimensional structures; Resonant tunneling phenomena and applications in diodes and transistors; Applications of quantum devices: quantum well and quantum dot lasers, ultra-fast switching devices, high density memories, dc and rf squids, multi-state logic circuits, long wavelength detectors ; Quantum Computing (Qualitative)

Reference Books:

1. Joachim Piprek, Semiconductor optoelectronic devices, Academic press Hardbound,   2003

2. A.K. Ganguly, Optoelectronic devices and circuits, Narosa publication, 2007

3. Shun Lien Chuang, Physics of Optoelectronic Devices, Wiley-Interscience; 1st ed.,

1995

4. Goure and I Verrier, Optical Fibre Devices, Taylor& Francis; 1st ed., 2001

5. Ray Tricker,Optoelectronics and Fiber Optic Technology,Newnes, 2002

6. K Krishna Reddy M Balakrishna Rao, Nanostructures & Quantum Devices, Campus
    Books International,2007

7.RahmanFaiz, Nanostructures in Electronics and Photonics, Pan Stallion press (Year)

8. Guozhong Cao, Nano structures &nanomaterials: synthesis, properties & applications, Imperial College Press, 2004

9. Todd D. Steiner, Semiconductor nanostructures for optoelectronic application, Artech House, INC.,2004

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OEE18R006	Industrial Chemistry for Engineers	L	T	P	C
		3	0	0	3
Course Outcome(s)					

CO1 To apply the knowledge of electrochemistry to understand the working mechanism of batteries and sensors.

CO2 To understand the process involved in refining of petroleum, cracking of crude oil and manufacturing of fuel gases and to analyze the flue gas.

CO3 To understand the process of adsorption and colloidal state of materials.

CO4 To understand the formulation of protective coatings and to know the process of manufacturing and cleansing action of soaps.

CO5 To know the constituents, composition and manufacturing process of cement, glass and ceramics.

Unit - I: Energy Storage Devices and Sensors

Batteries - primary and secondary cells. Primary cell - Dry cell, Mercury cell. Secondary cell - Lead acid battery, Lithium battery. Solar cells & fuel cells (H_2-O_2, PEFC and SOFC) - principle, construction, working and application. Electrochemical sensors - working, application and merits.

Unit - II: Fuels and Combustion

Petroleum: Origin, refining, cracking - thermal and catalytic, reforming – thermal and catalytic, knocking and octane number, synthetic petrol - Fischer-Tropsch and Bergius method.

*Fuel Gases***:** Large scale production, storage, hazards and uses of LPG, coal gas, water gas, producer gas, and oil gas. Combustion (Problems). Mass analysis from volume analysis and vice versa. Analysis of flue gas (Orsat's apparatus).

Unit- III: Applications of Adsorption and Colloidal State

Adsorption: Classification of Adsorption – Adsorption of Gases on Solids – Adsorption from Solutions – Applications of Adsorption.

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Colloidal state: Types of colloidal solution –Preparation and purification of colloidal solutions – Characteristics of colloidal solution –Coagulation of sols – Origin of charge on colloids – Stability of colloids – Applications of Colloids – Protective colloids – Emulsions – Gels – Micelles.

Unit - IV: Organic Protective Coatings and Soaps

*Paints & Varnishes***:** Requirements of a good paint. Primary constituents of paints, dispersion medium (solvent), binder, pigments, formulation of paints and varnishes.

Soaps: Classification of soap, manufacture of soaps by hot and cold process, cleansing action of soap and classification of detergents (anionic and cationic).

Unit - V: Siliceous Materials

Cement: Manufacture - Wet Process and Dry process, types, analysis of major constituents, setting of cement, reinforced concrete.

Glass: Composition and manufacture of glass .Types of glasses- optical glass, coloured glasses and lead glass.

Ceramics: Types- raw materials - white wares, manufacture and uses.

Reference Books:

1) Jain and Jain, *Engineering Chemistry*, 15th Edition, .Dhanpat Rai Publishing Company, New Delhi, 2005.
2) B.N. Chakrabarty, *Industrial Chemistry*, Oxford & IBH Publishing Co, New Delhi, 1981.
3) B.K. Sharma, *Industrial Chemistry*, 11th Edition, Goel Publishing House, Meerut, 2000.

P.P. Singh, T.M. Joesph, R.G. Dhavale, *College Industrial Chemistry*, 4th Edition, Himalaya Publishing House, Bombay, 1983.

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OEE18R004	MATHEMATICAL MODELLING	L	T	P	C
		3	1	0	3
	(With effect from June 2018)				

Course Objective:

To make the students to be capable of doing simple mathematical modelling using differential equations and difference equations.

Course Outcomes:

Upon successful completion of this course, Students will be able to

CO1: understand the mathematical modelling of ordinary differential equation of first order.

CO2:know about the concepts of mathematical modelling in difference equations and Linear difference equations.

CO3: know mathematical modelling through partial differential equation and study about the mass-balance equations.

CO4: know the first and second methods of obtaining partial differential equation models.

CO5: Study about the mathematical modelling through delay differential and functional equations.

Unit I:

Review of ODE and System of First Order ODE - Mathematical modelling in population dynamics-Epidemics through systems of ODE of first order - Mathematical modelling through systems of ordinary differential equations of the first order.

Unit II:

Difference Equation and its solution - Mathematical modelling through difference equations - The need for mathematical modeling through difference equations some simple models-Basic theory of linear difference equations with constant coefficients.

Unit III:

Review of PDE and solution of simple linear PDEs, Mathematical modelling through Partial differential equation -situation giving rise to Partial differential equation models-Mass-balance equations.

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Unit IV:

First method of getting Partial differential equation models-Momentum balance equations the second method of obtaining PDE models.

Unit V:

Integral Equations - Solution of Simple Integral Equations - Mathematical modelling through functional Integral , delay differential and differential difference equations.

Text Book:

J.N. Kapur, Mathematical modelling, *New age international publishers,* 2005 (Reprint).

Reference Book: Frank R. Giordano, William P. Fox, Steven B. Horton , A First Course in Mathematical Modelling , *Cengage Learning Publishers, 5th Edition*, 2013.