Bharath
INSTITUTE OF HIGHER EDUCATION AND RESEARCH
(Declared as Deemed-to-be University under section 3 of UGC Act, 1956)
(Vide Notification No. F.9-5/2000 - U.3, Ministry of Human Resource Development, Govt. of India, dated 4th July 2002)

B.Tech Information Technology

(Four Years)

(Choice Based Credit System)

CURRICULUM AND SYLLABUS- 2018

DEPARTMENT OF INFORMATION TECHNOLOGY

SCHOOL OF COMPUTING

BHARATH INSTITUTE OF SCIENCE AND TECHNOLOGY

CHENNAI-600 073, TAMIL NADU

DEPARTMENT OF INFORMATION TECHNOLOGY

B.Tech – INFORMATION TECHNOLOGY

DEPARTMENT VISION

To produce competent IT professionals who are technically sound and ethically strong for the industries, community and research organizations at the national and global levels through excellence in teaching, research and consultancy

DEPARTMENT MISSION

Information Technology Department shall strive to be excellence

MS1: By developing the students, strong in engineering fundamentals, proficientintechnicalskills,stronginethicalvaluesandknowledgeablein applyingtheskillsforthewelfareofthesocietythroughcompetentfaculty.

MS2: By providing state of the art facilities in which higher studies and research flourish amongst the students.

MS3: By enhancing the collaborative partnership between Industry, R&D organization to promote research among faculty, students and also preparing the student to be an entrepreneur.

MS4: By bringing out the aggregate identity and accentuating moral esteems of students

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: PREPARATION:

To provide strong foundation in mathematical, scientific and engineering fundamentals necessary to analyze, formulate and solve solve hardware / software engineering problems.

PEO2: CORE COMPETENCE:

To enhance the skills and experience in defining problems in the core areasofInformationTechnologyandrelatedengineeringsoastoanalyze, design, and synthesizedata

PEO3: PROFESSIONALISM:

To enhance their skills and embrace new thrust areas through self- directed professional development and post-graduate training or education.

PEO4: SKILL:

To provide Industry based training for developing professional skills and soft skills such as proficiency in languages, technical communication, verbal, logical, analytical, comprehension, team building, inter personal relationship, group discussion and leadership skill to become a better professional.

PEO5: ETHICS:

Apply the ethical and social aspects of modern Engineering and Technology innovations to the design, development, and usage of new products, machines, gadgets, devices, etc.

Mapping between PEOs Vs Mission:

PEO	DEPARTMENT MISSION			
	MS1	**MS2**	**MS3**	**MS4**
PEO1	**3**	**2**	**2**	**2**
PEO2	**3**	**1**	**3**	**3**
PEO3	**2**	**3**	**3**	**2**
PEO4	**3**	**2**	**3**	**3**
PEO5.	**2**	**3**	**1**	**2**

(Degree of Mapping High=3, Medium=2, Low=1)

PROGRAMME OUTCOMES (POs)

On completion of B.Tech in Information Technology Programmethe graduate will haveto

a) Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, andan engineering specialization to the solution of complex engineeringproblems.

b) Problem Analysis: Identify, formulate, review research literature, and analyse complex engineeringproblems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineeringsciences.

c) Design/Development of Solutions: Design solutions for complex engineering problems and designsystem components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

d) Conduct Investigations of Complex Problems: Use research- based knowledge and research methodsincluding design ofexperiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complexproblems.

e) Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modernengineering and IT tools including prediction and modelling to complex engineering activities with an understanding of thelimitations.

f) 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 engineeringpractice

g) Environment and Sustainability: Understand the impact of the professional engineering solutions insocietal and environmentalcontexts, anddemonstratetheknowledgeof,andneedforsustainabledevelopment

h) Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of theengineeringpractice.

i) Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

j) Communication: Communicateeffectivelyoncomplexengineering 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

k) 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 multidisciplinaryenvironments.

l) Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technologicalchange.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1: To identify, analyze and develop software systems using appropriate techniques and concepts related to user experience, predictive analysis and health care information systems through Information Technology.

PSO2: To design an algorithm or process within realistic constraints to meet the desired needs through analytical, logical and problem-solving skills.

PSO3: To apply state of the art IT tools and technologies, IT infrastructure management abilities in treading innovative career path as a prospective IT engineer.

MAPPING BETWEEN PROGRAMME EDUCATIONAL OBJECTIVES & PROGRAMME OUTCOMES

PEOs\POs	a	b	c	d	e	f	g	h	i	j	k	l
PEO1	√	√	√		√	-	-	-	-	√	√	√
PEO2	√	-	√	-	√	-	-	√	-	-	√	√
PEO3	√	√	-	√	√	√	√	√	√	√	√	√
PEO4	-	√	-	√	√	√	√	√	√	-	√	√
PEO5	-	-	√	-	-	-	-	√	-	-	-	√

MAPPING BETWEEN CORE COURSES &PROGRAMME OUTCOMES (Semester wise)

Sem	Courses\SOs	a	b	c	d	e	f	g	h	i	j	k	l	PSO1	PSO2	PSO3
I	**THEORY**															
	Communicative English	-	-	-	-	-	-	-	√	-	√	√	√	√	√	√
	Engineering Mathematics –I	√	√	-	√	-	-	-	-	-	-	-	-	√	√	√
	Waves and Optics	√	√	-	-	-	-	-	-	-	-	-	-	√	√	√
	Engineering Chemistry	√	√	-	-	-	-	-	-	-	-	-	-	√	√	√
	Basic Electrical & Electronics Engineering	√	√	√	-	-	-	-	-	√	-	-	-	√	√	√
	Biology for Engineers	√	-	√	-	-	√	√	-	√	-	√	--	√	√	√
	PRACTICAL															
	Wave Optics & Semiconductor Physics Lab	√	√	-	-	-	-	-	-	-	-	-	-	√	√	√
	Chemistry Lab	√	√	-	-	-	-	-	-	-	-	-	-	√	√	√
	Workshop/Manufacturing Practices Laboratory	√	√	√	-	-	-	-	-	-	-	-	-	√	√	√
	Basic Electrical &Electronics Engineering Laboratory	√	√	√	-	-	-	-	-	√	-	-	-	√	√	√
II	**THEORY**															
	Technical English	-	-	-	-	-	-	-	√	-	√	√	√	√	√	√
	Engineering Mathematics- II	√	√	-	√	-	-	-	-	-	-	-	-	√	√	√
	Semiconductor Physics	√	√	-	-	-	-	-	-	-	-	-	-	√	√	√
	Environmental Sciences	√	√	-	-	-	-	-	-	-	-	-	-	√	√	√
	Problem Solving and Python Programming	√	√	√	√	-	-	-	-	-	-	-	-	√	√	√
	Engineering Graphics & Design	√	√	√	√	-	-	-	-	-	-	-	-	√	√	√
	PRACTICAL															
	Wave Optics & Semiconductor Physics Lab	√	√	-	-	-	-	-	-	-	-	-	-	√	√	√
	Chemistry Lab	√	√	-	-	-	-	-	-	-	-	-	-	√	√	√
	ProblemSolving and Python Programming Laboratory	√	√	√	√	-	-	-	-	-	-	-	-	√	√	√
	THEORY															
	Probability & Queuing Theory	√	√	-	√	-	-	-	-	-	-	-	-	√	√	√
	Principles of Communication systems	√	√	√	-	-	-	-	-	-	-	-	-	√	√	√

III	Database Management Systems	√	√	√	√	-	-	-	-	-	-	-	-	√	√	√
	DataStructures andAlgorithms	√	√	√	-	-	-	-	-	-	-	-	-	√	√	√
	Object Oriented Analysis and Design	√	√	√	√	-	-	-	-	-	-	-	-	√	√	√
	Computer Architecture	√	√	√	-	-	-	-	-	-	-	-	-	√	√	√
	PRACTICAL															
	Database Management Systems Lab	√	√	√	-	-	-	-	-	-	-	-	-	√	√	√
	Object Oriented Programming Lab	√	√	√	-	-	-	-	-	-	-	-	-	√	√	√
	Data Structures lab	√	√	√	√	-	-	-	-	-	-	-	-	√	√	√
IV	**THEORY**															
	Discrete Mathematics	√	√	-	√	-	-	-	-	-	-	-	-	√	√	√
	Web Programming	√	√	√	-	√	√	-	-	-	-	-	-	√	√	√
	Operating System	√	√	√	-	-	-	-	-	-	-	-	-	√	√	√
	Software Engineering	√	√	√	√	√	-	-	-	√	-	-	-	√	√	√
	Digital System Design	√	√	√	√	√	√	-	-	-	-	-	-	√	√	√
	Data Communication and Computer Networks	√	√	√	-	√	√	-	-	-	-	-	-	√	√	√
	PRACTICAL															
	Networking Lab	√	√	√	√	√	√	-	-	-	-	-	-	√	√	√
	Web Programming Lab	√	√	√	-	-	-	-	-	-	-	-	-	√	√	√
	Operating System Lab	√	√	√	√	√	-	-	-	√	-	-	-	√	√	√
V	**THEORY**															
	Data Warehousing and Data Mining	√	√	√	√	√	√	-	-	√	-	-	√	√	√	√
	Mobile Communication	√	√	√	√	√	√	-	-	-	-	√	√	√	√	√
	Principles of Artificial Intelligence	√	√	√	-	-	-	-	-	-	-	-	-	√	√	√
	Formal Languages and Automata	√	√	√	-	√	√	-	-	-	-	-	-	√	√	√
	Organizational Behavior	-	-	-	-	-	-	√	√	√	√	√	-	√	√	√
	PRACTICAL															
	Data mining Lab	√	√	√	-	-	-	-	-	-	-	-	-	√	√	√
	IT -Workshop Lab	-	-	-	√	-	√	√	-	-	-	-	√	√	√	√
	THEORY															

VI	Grid and Cloud Computing	√	√	√	-	√	√	-	-	-	-	-	-	√	√	√
	Human Computer Interaction	√	√	√	√	√	√	-	-	-	-	√	√	√	√	√
	Data Analytics	√	√	√	√	√	√	-	-	√	-	-	√	√	√	√
	PRACTICAL															
	Data Analytics Lab	√	√	√	-	√	√	-	-	-	-	-	-	√	√	√
	Grid and Cloud Computing Lab	√	√	√	√	√	√	-	-	-	-	√	√	√	√	√
	Project-I	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Soft Skill	-	-	-	-	-	-	√	√	√	√	√	-	√	√	√
VII	**THEORY**															
	Wireless Networks	√	√	√	√	√	√	-	-	√	-	-	√	√	√	√
	Project-II	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
VIII	**THEORY**															
	PRACTICAL															
	Project-III	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

MAPPING BETWEEN PROGRAMME ELECTIVES& PROGRAMME OUTCOMES

Programme Elective	**Courses\POs**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**PSO 1**	**PSO2**	**PSO3**
Programme Elective-I	**THEORY**															
	Computer Vision	√	√	√	-	√	√	-	-	-	-	-	-	√	√	√
	Ad hoc and Sensor Networking	√	√	√	√	√	√	-	-	-	-	-	-	√	√	√
	Optimization Techniques	√	√	√	√	√	√	-	-	√	-	-	√	√	√	√
	Visual Analytics	√	√	√	√	√	√	-	-	√	-	-	√	√	√	√
	Health Informatics	√	--	√	-	√	-	-	-	-	-	-	-	√	√	√
	Software Testing	-	-	-	-	-	√	√	√	-	-	√	-	√	√	√
Programme Elective-II	High Speed Networks	√	√	√	-	√	√	-	-	-	-	-	-	√	√	√
	Natural language Processing	√	√	√	√	√	√	-	-	-	-	-	-	√	√	√
	Social Network Analysis	√	√	√	√	√	√	-	-	√	-	-	√	√	√	√
	Business Analytics	√	√	√	√	√	√	-	-	√	-	-	√	√	√	√
	Mobile Application Development	√	--	√	-	√	-	-	-	-	-	-	-	√	√	√
	Wavelet Transformsand itsapplications	-	-	-	-	-	√	√	√	-	-	√	-	√	√	√
	Cyber Forensics	√	√	√	-	√	√	-	-	-	-	-	-	√	√	√
	Virtual and Augmented Reality	√	√	√	√	√	√	-	-	-	-	-	-	√	√	√

Programme Elective-IIII	Applications of Data Mining	√	√	√	√	√	√	-	-	√	-	-	√	√	√	√
	Machine Learning Techniques	√	√	√	√	√	√	-	-	√	-	-	√	√	√	√
	Bio-Inspired Computing	√	--	√	-	√	-	-	-	-	-	-	-	√	√	√
	Software configuration management	-	-	-	-	-	√	√	√	-	-	√	-	√	√	√
Programme Elective-IV	Cloud Computing and Security	√	√	√	-	√	√	-	-	-	-	-	-	√	√	√
	Multi-agent System	√	√	√	√	√	√	-	-	-	-	-	-	√	√	√
	Mining Social Media	√	√	√	√	√	√	-	-	√	-	-	√	√	√	√
	Medical Image Processing	√	√	√	√	√	√	-	-	√	-	-	√	√	√	√
	Agile Methodology	√	--	√	-	√	-	-	-	-	-	-	-	√	√	√
	Multimedia compression techniques	-	-	-	-	-	√	√	√	-	-	√	-	√	√	√
Programme Elective-V	Internet of Things	√	√	√	-	√	√	-	-	-	-	-	-	√	√	√
	Artificial Intelligent Game	√	√	√	√	√	√	-	-	√	-	-	√	√	√	√
	Inferential statistics	√	√	√	√	√	√	-	-	√	-	-	√	√	√	√
	Deep Learning	√	--	√	-	√	-	-	-	-	-	-	-	√	√	√
	Software Quality	-	-	-	-	-	√	√	√	-	-	√	-	√	√	√
	Software Architecture	√	√	√	√	√	√	-	-	√	-	-	√	√	√	√
Programme Elective-VI	Quantum Computing	√	√	√	-	√	√	-	-	-	-	-	-	√	√	√
	Real Time Systems	√	√	√	√	√	√	-	-	-	-	-	-	√	√	√
	Computer Graphics	√	√	√	√	√	√	-	-	√	-	-	√	√	√	√
	Business Intelligence	√	√	√	√	√	√	-	-	√	-	-	√	√	√	√
	Information Theory and Coding	√	--	√	-	√	-	-	-	-	-	-	-	√	√	√
	Multi agent Intelligent Systems	√	√	√	-	-	√	√	√	-	-	√	-	√	√	√

CURRICULUM AND SYLLABUS – R2018

B–FACT: Bharath -**F**lexible **A**ccommodative **C**hoice Based Credit System for **T**echnology

(Applicable to the batches admitted from July 2018)

B.Tech – INFORMATION TECHNOLOGY

SEMESTER I – VIII

SEMESTER I								
Sl. No.	**Course Code**	**Category**	**Course Title**	**Contact Period**	**L**	**T**	**P**	**C**
THEORY								
1	U18HSEN101	HS	Communicative English	4	2	0	2	3
2	U18BSMA101	BS	Engineering Mathematic- I	4	4	0	0	4
3	U18BSPH101	BS	Waves and Optics	3	3	0	0	3
4	U18BSCH101	BS	Engineering Chemistry	3	3	0	0	3
5	U18ESEE101	ES	Basic Electrical and Electronics Engineering	3	0	0	3	3
6	U18BSBT101	BS	Biology for Engineers	2	2	0	0	2
PRACTICAL								
7	*U18BSPH2L2	BS	Wave Optics and Semi Conductor Physics Lab	3	0	0	3	0
	*U18BSCH2L4	BS	Chemistry Lab	3	0	0	3	0
8	U18ESME1L2	ES	Workshop/Manufacturing Practices Laboratory	5	1	0	4	3
9	U18ESEE1L3	ES	Basic Electrical and Electronics Engineering Practices Laboratory	3	0	0	3	2
ACTIVITY BASED COURSES								
10	U18MCAB203	MC	Yoga	2	0	0	2	0
11	U18MCAB204	MC	Physical health – NCC	2	0	0	2	0
Total				**31**	**14**	**0**	**17**	**23**

***Laboratory Classes will be conducted on alternative weeks for Physics andChemistry.The Lab Practical Examinations will be held only in the second semester (including thefirst semesterexperiments).**

SEMESTER II								
Sl. No.	**Code No.**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	U18HSEN201	HS	Technical English	3	2	1	0	3
2	U18BSMA201	BS	Engineering Mathematics- II	4	4	0	0	4
3	U18BSPH202	BS	Semi Conductor Physics	3	3	0	0	3
4	U18BSCH201	BS	Environmental Sciences	3	3	0	0	3
5	U18ESCS101	ES	Problem Solving and Python Programming	3	3	0	0	3
6	U18ESME101	ES	Engineering Graphics & Design	5	1	0	4	3
PRACTICAL								
7	*U18BSPH2L2	BS	Wave Optics andSemi Conductor PhysicsLab	3	0	0	3	2
8	*U18BSCH2L4	BS	Chemistry Lab	3	0	0	3	2
9	U18ESCS1L1	ES	Problem Solving and Python Programming Lab	3	0	0	3	2
ACTIVITY BASED COURSES								
10	U18MCAB101	MC	Physical health – Sports & Games	2	0	0	2	0
11	U18MCAB102	MC	Gardening & Tree Plantation -	2	0	0	2	0
Total				**34**	**16**	**1**	**12**	**25**

***Laboratory Classes will be conducted on alternative weeks for Physics andChemistry.The Lab Practical Examinations will be held only in the second semester (including thefirst semesterexperiments).**

SEMESTER III								
Sl.No.	**Code No.**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	**U**18BSMA304	BS	Probability & Queuing Theory	4	3	1	0	4
2	U18ESIT302	ES	Principles of Communication systems	3	3	0	0	3
3	U18PCIT303	PC	Database Management Systems	3	3	0	0	3
4	U18PCIT304	PC	Data Structures and Algorithms	3	3	1	0	3
5	U18PCIT305	PC	Object Oriented Analysis and Design	3	3	0	0	3
6	U18PCIT306	PC	Computer Architecture	3	3	0	0	3
PRACTICAL								
7	U18PCIT3L1	PC	Database Management Systems Lab	3	0	0	3	1
8	U18PCIT3L2	PC	Object Oriented Programming Lab	3	0	0	3	1
9	U18PCIT3L3	PC	Data Structures lab	3	0	0	3	1
ACTIVITY BASED COURSES								
10	U18MCAB305	MC	Culture- Learning an art form	2	0	0	2	0
11	U18MCAB306	MC	Culture – IntangibleCultural, heritage(festivals, Food ways, Localgames)	2	0	0	2	0
Total				32	18	2	13	**22**

SEMESTER IV								
Sl.No.	**Code No.**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	U18BSMA401	BS	Discrete Mathematics	4	3	1	0	4
2	U18PCIT401	PC	Web Programming	3	3	0	0	3
3	U18PCIT402	PC	Operating System Principles	3	3	0	0	3
4	U18PCIT403	PC	Software Engineering Methodologies	3	3	0	0	3
5	U18ESIT404	ES	Digital System Design	3	3	0	0	3
6	U18PCIT405	PC	Data Communication and Computer Networks	3	3	0	0	3
7	U18MCTH502	MC	Universal Human Values	2	2	0	0	0
PRACTICAL								
7	U18PCIT4L1	PC	Data Communication and Computer Networks Lab	3	0	0	3	1
8	U18PCIT4L2	PC	Web Programming Lab	3	0	0	3	1
9	U18PCIT4L3	PC	Operating System Design Lab	3	0	0	3	1
ACTIVITY BASED COURSES								
10	U18MCAB407	MC	Literature & Media –Literature, Cinema & Media	2	0	0	2	0
11	U18MCAB408	MC	Literature & Media – Group Reading of Classics	2	0	0	2	0
Total				32	18	1	13	22

SEMESTER V								
Sl. No.	**Code No.**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	U18PCIT501	PC	Data Mining	3	3	0	0	3
2	U18PCIT502	PC	Mobile Communication	3	3	0	0	3
3	U18PCIT503	PC	Principles of Artificial Intelligence	3	3	0	0	3
4	U18PCIT504	PC	Theory of computation	3	3	0	0	3
5	U18HSBA501	HS	Organizational Behavior	3	3	0	0	3
6	U18MCCH501	MC	Constitution of India	2	2	0	0	0
7		PE – 1	Professional Elective - I	3	3	0	0	3
PRACTICAL								
8	U18PCIT5L1	PC	Data mining Lab	3	0	0	3	2
9	U18PCIT5L2	PC	IT -Workshop Lab	3	0	0	3	1
ACTIVITY BASED COURSES								
11	U18MCAB509	MC	Self Development – Spiritual-Mindfulness & Meditation	2	0	0	2	0
12	U18MCAB510	MC	Self Development - religion and Inter-faith	2	0	0	2	0
Total				30	20	0	10	21

SEMESTER VI								
Sl.No.	**Code No.**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	U18PCIT601	PC	Grid and Cloud Computing	3	3	0	0	3
2	U18PCIT602	PC	Human Computer Interaction	3	3	0	0	3
3	U18PCIT603	PC	Data Analytics	3	3	0	0	3
4		PE	Professional Elective-II	3	3	0	0	3
5		PE	Professional Elective-III	3	3	0	0	3
6		OE	Open Elective-I	3	3	0	0	3
PRACTICAL								
7	U18PCIT 6L1	PC	Data Analytics Lab	3	0	0	3	2
8	U18PCIT 6L2	PC	Grid and Cloud Computing Lab	3	0	0	3	2
9	U18EEIT6L3	EE	Soft skill	2	0	0	2	1
ACTIVITY BASED COURSES								
10	U18MCAB609	MC	Social Services – Social Awareness	2	0	0	2	0
11	U18MCAB610	MC	Social Services – NSS	2	0	0	2	0
Total				38	20	0	18	22

SEMESTER VII								
Sl. No.	**Code No.**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	U18PCIT701	PC	Wireless Networks	3	3	0	0	3
2		PE	Professional Elective- IV	3	3	0	0	3
3		PE	Professional Elective- V	3	3	0	0	3
4		OE	Open Elective II	3	3	0	0	3
5	U18MCTH703	MC	Essence of Indian Knowledge Tradition	2	2	0	0	0
PRACTICAL								
6	U18PRIT7P1	EE	Project Phase-I	6	0	0	6	3
ACTIVITY BASED COURSES								
7	U18MCAB713	MC	Behavioral and interpersonal skills	2	0	0	2	0
8	U18MCAB714	MC	Nature – Nature club	2	0	0	2	0
Total				22	12	0	10	15

SEMESTER VIII								
Sl. No.	**Code No.**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1		PE	Professional Elective- VI	3	3	0	0	3
2		OE	Open Elective – III	3	3	0	0	3
3		OE	Open Elective – IV (MOOC)	2	2	0	0	2
PRACTICAL								
4	U18PRIT8P2	EE	Project Phase-I	12	0	0	18	9
ACTIVITY BASED COURSES								
5	U18MCAB815	MC	Innovation – Project based – Sc., Tech, Social, Design & Innovation	2	0	0	2	0
Total				29	9	0	20	17

Total : 168 Credits

	PROFESSIONAL ELECTIVE- I					
SUB.CODE	**SPECIALIZATION**	**SUBJECT NAME**	**L**	**T**	**P**	**C**
U18PEIT011	Image Processing	Computer Vision	3	0	0	3
U18PEIT012	Networking	Ad hoc and Sensor Networking	3	0	0	3
U18PEIT013	Soft Computing	Optimization Techniques	3	0	0	3
U18PEIT014	Data Science	Visual Analytics	3	0	0	3
U18PEIT015	Data Science	Health Informatics	3	0	0	3
U18PEIT016	Software	Software Testing	3	0	0	3
	PROFESSIONAL ELECTIVE- II					
U18PEIT021	Networking	High Speed Networks	3	0	0	3
U18PEIT022	Soft Computing	Natural Language Processing	3	0	0	3
U18PEIT023	Soft Computing	Social Network Analysis	3	0	0	3
U18PEIT024	Data Science	Business Analytics	3	0	0	3
U18PEIT025	Software	Mobile Application Development	3	0	0	3
U18PEIT026	Image Processing	Wavelet Transforms and its	3	0	0	3
		PROFESSIONAL ELECTIVE-				
U18PEIT031	Networking	Cyber Forensics	3	0	0	3
U18PEIT032	Image Processing	Virtual and Augmented Reality	3	0	0	3
U18PEIT033	Data Science	Applications of Data Mining	3	0	0	3
U18PEIT034	Data Science	Machine Learning Techniques	3	0	0	3
U18PEIT035	Soft Computing	Bio-Inspired Computing	3	0	0	3
U18PEIT036	Software	Software configuration	3	0	0	3
		PROFESSIONAL ELECTIVE-				
U18PEIT041	Networking	Cloud Computing and Security	3	0	0	3
U18PEIT042	Soft Computing	Multi-agent System	3	0	0	3
U18PEIT043	Data Science	Mining Social Media	3	0	0	3
U18PEIT044	Image Processing	Medical Image Processing	3	0	0	3
U18PEIT045	Software	Agile Methodology	3	0	0	3
U18PEIT046	Image Processing	Multimedia compression	3	0	0	3
	PROFESSIONAL ELECTIVE- V					
U18PEIT051	Networking	Internet of Things	3	0	0	3
U18PEIT052	Soft Computing	Artificial Intelligent Game	3	0	0	3
U18PEIT053	Soft Computing	Inferential statistics	3	0	0	3
U18PEIT054	Image Processing	Deep Learning	3	0	0	3
U18PEIT055	Software	Software Quality	3	0	0	3
U18PEIT056	Software	Software Architecture	3	0	0	3
PROFESSIONAL ELECTIVE- VI						
U18PEIT061	Soft Computing	Quantum Computing	3	0	0	3
U18PEIT062	Data Science	Real Time Systems	3	0	0	3
U18PEIT063	Image Processing	Computer Graphics	3	0	0	3
U18PEIT064	Artificial Intelligence	Business Intelligence	3	0	0	3
U18PEIT065	Data Science	Information Theory and Coding	3	0	0	3
U18PEIT066	Artificial Intelligence	Multi agent Intelligent Systems	3	0	0	3

LIST OF OPEN ELECTIVES COMMON TO ALL B.Tech PROGRAMMES

ALL THE COURSES WITH L=3, T=0, P=0 & C=3

1. U18OEBA001Sociology
2. U18OEBA002-Lean SixSigma
3. U18OEBA003-Cyber Law and Ethics
4. U18OEBA004-Economic Policies in India
5. U18OEBA005-Management InformationSystem
6. Total Engineering Quality Management
7. U18OEBA007-IndustrialPsychology
8. U18OEBA008-Entrepreneurship Development and IPR
9. U18OEBA009-Intellectual Property Rights
10. U18OEBA010-Engineering Economics and CostAnalysis
11. U18OEEN001- Soft Skills and InterpersonalCommunication
12. U18OEEN002-Indian Writing in English
13. U18OEEN003-Creative Writing
14. U18OEEN004- Proficiency in English and AccentTraining
15. U18OEMA001-Cryptography
16. U18OEMA002-Finite Automata Theory / FormalLanguages
17. U18OEMA003-LinearProgramming
18. U18OECE001 - Metro Systems and Engineering
19. U18OECE002-PollutionRegulations
20 U18OECE003-RoadSafety
21. U18OECE004- Infrastructure Development
22. U18OECE005- Project Safety Management
23. U18OECE006- Environment, Health and Safety inIndustries
24. U18OEME001-Design for Manufacturing andAssembly
25. U18OEME002IndustrialSafety
26. U18OEME003-Refrigeration and Cryogenics
27. U18OEME004- Product Design and Development
28. U18OEAU001-Electric and Hybrid Vehicles
29. U18OEAU002-Intelligent TransportationSystem
30. U18OEAU003-Vibration and Noise Control
31. U18OEAU004-Automotive Sensors andApplications
32. U18OEMT001-MEMS and Nano Technology
33. U18OEMT002-Non-Destructive Testing
34. U18OEMT003-BioMechatronics
35. U18OEMT004-Artificial Intelligence forRobotics
36. U18OEAE001-Industrial Aerodynamics
37. U18OEAE002- Elements of Aeronautics andAstronautics
38. U18OEAE003- Unmanned Aerial Vehicle
39. U18OEAE004- Introduction to Avionics
40. U18OEAE005-RocketPropulsion
41. U18OEEE001-GreenTechnologies
42. U18OEEE002-Electrical Safety and QualityAssurance
43. U18OEEE003-Energy Conservation Techniques
44. U18OEEE004-PLC and SCADA forIndustrial

45. U18OEEC-001-Communication Systems
46. U18OEEC-002-VLSIcircuits
47. U18OEEC-003-Image Processing Techniques
48. U18OEEC-004-Communication Networks
49. U18OEEC-005-An Introduction to DSP
50. U18OEEC-006-Basics ofIoT
51. U18OEBM001-Medical Radiation SafetyEngineering
52. U18OEBM002-Medical Waste Management
53. U18OEBM003-Quality Control in Healthcare
54. U18OEBM004-Wearable Technology
55. U18OEEI001-Analytical Methods andInstrumentation
56. U18OEEI002-Introduction to process DataAnalytics
57. U18OEEI003-Reliability and Safety in Processindustries
58. U18OEEI004-Multi sensor data fusion
59. U18OEBT001- Bioprocess Economics & PlantDesign
60. U18OEBT002-Brewingtechnology
61. U18OEBT003-Biomining
62. U18OEBT004-Industrial Safety Engineering
63. U18OEAC001-Geo- informatics for PrecisionFarming
64. U18OEAC002-Livestock and poultrymanagement
65. U18OEAC003-Extension methodologies and transfer of AgriculturalTechnologies
66. U18OEAC004-Soil and Water ConservationEngineering
67. U18OEIT001-Block Chain Technology
68. U18OEIT002-Semantic Web
69. U18OEIT003-Entrepreneurship Development
70. U18OEIT004-Ethical Hacking Techniques
71. U18OECS004-Mobile Application Development
72. U18OECS005-System Modelling andSimulation
73. U18OECS006-WebProgramming
74. U18OECS007-VirtualReality
75. U18OECS008- ECommerce
76. U18OEGE001-Metagenomics and Epigenomics
77. U18OEGE002-Molecular Genetics andGenomics
78. U18OEGE003-Principles of Molecular cellbiology

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HUMANITIES AND SOCIAL STUDIES INCLUDING MANAGEMENT COURSES (HS)

Sl.No.	Code No.	Course Title	Contact Periods	L	T	P	C
1	U18HSEN101	Communicative English	4	2	0	2	3
2	U18HSEN201	Technical English	3	2	1	0	3
3.	U18HSBA401	Organizational Behavior	3	3	0	0	3
Total Credits							**9**

LIST OF BASICS SCIENCE COURSES (BS)

Sl. No.	Course Code	Course Title	Contact Period	L	T	P	C
1	U18BSMA101	Engineering Mathematic- I	4	4	0	0	4
2	U18BSPH101	Waves and Optics	3	3	0	0	3
3	U18BSCH101	Engineering Chemistry	3	3	0	0	3
4	U18BSBT101	Biology for Engineers	2	2	0	0	2
5	U18BSPH2L2	Wave Optics and Semi Conductor Physics Lab	3	0	0	3	0
6	U18BSCH2L4	Chemistry Lab	3	0	0	3	0
7	U18BSMA201	Engineering Mathematics- II	4	4	0	0	4
	U18BSPH202	Semi Conductor Physics	3	3	0	0	3
8	U18BSCH201	Environmental Sciences	3	3	0	0	3
9	U18BSPH2L2	Wave Optics andSemi Conductor PhysicsLab	3	0	0	3	1.5
9	U18BSCH2L4	Chemistry Lab	3	0	0	3	1.5
10	U18BSMA304	Probability & Queuing Theory	4	3	1	0	4
11	U18BSMA401	Discrete Mathematics	4	3	1	0	4
TOTAL CREDITS							33

ENGINEERING SCIENCE COURSES (ES)

Sl. No.	Code No.	Course Title	Contact Periods	L	T	P	C
1	U18ESEE101	Basic Electrical & Electronics Engineering	3	3	0	0	3
2	U18ESME101	Engineering Graphics & Design	5	1	0	4	3
3	U18ESCS101	Problem Solvingand PythonProgramming	3	3	0	0	3
4	U18ESME1L2	Workshop/Manufacturing Practices Laboratory	5	1	0	4	3
5	U18ESEE1L3	Basic Electrical & Electronics Engineering Laboratory	3	0	0	3	1.5
6	U18ESCS1L1	Problem Solving and Python Programming Laboratory	3	0	0	3	1.5

7	U18ESIT302	Principles of Communication systems	3	3	0	0	3
8	U18ESIT404	Digital System Design	3	3	0	0	3
Total credits							**21**

LIST OF PROFESSIONAL CORE COURSES

Sl. No.	Code No.	Course Title	Contact Periods	L	T	P	C
1	U18PCIT303	Database Management Systems	3	3	0	0	3
2	U18PCIT304	Data Structures and Algorithms	3	3	1	0	3
3	U18PCIT305	Object Oriented Analysis and Design	3	3	0	0	3
4	U18PCIT306	Computer Architecture	3	3	0	0	3
5	U18PCIT3L1	Database Management Systems Lab	3	0	0	3	1.5
6	U18PCIT3L2	Object Oriented Programming Lab	3	0	0	3	1.5
7	U18PCIT3L3	Data Structures lab	3	0	0	3	1.5
8	U18PCIT401	Web Programming	3	3	0	0	3
9	U18PCIT402	Operating System Principles	3	3	0	0	3
10	U18PCIT403	Software Engineering Methodologies	3	3	0	0	3
11	U18PCIT405	Data Communication and Computer Networks	3	3	0	0	3
12	U18PCIT4L1	Networking Lab	3	0	0	3	1.5
13	U18PCIT4L2	Web Programming Lab	3	0	0	3	1.5
14	U18PCIT4L3	Operating System Design Lab	3	0	0	3	1.5
15	U18PCIT501	Data Mining	3	3	0	0	3
16	U18PCIT502	Mobile Communication	3	3	0	0	3
17	U18PCIT503	Principles of Artificial Intelligence	3	3	0	0	3
18	U18PCIT504	Theory of Computation	3	3	0	0	3
19	U18PCIT5L1	Data mining Lab	3	0	0	3	1.5
20	U18PCIT5L2	IT -Workshop Lab	3	0	0	3	1.5
21	U18PCIT601	Grid and Cloud Computing	3	3	0	0	3
22	U18PCIT602	Human Computer Interaction	3	3	0	0	3
23	U18PCIT603	Data Analytics	3	3	0	0	3
24	U18PCIT 6L1	Data Analytics Lab	3	0	0	3	1.5
25	U18PCIT 6L2	Grid and Cloud Computing Lab	3	0	0	3	1.5
26	U18PCIT701	Wireless Networks	3	3	0	0	3
Total Credits							63

SUMMARY OF CURRICULUM STRUCTURE AND CREDIT & CONTACT HOUR DISTRIBUTION

S.No	Sub Area	Credit As per Semester								No. of Credit	% of credit
		I	II	III	IV	V	VI	VII	VIII		
1	Humanities & Social Sciences **(HS**)	3	3	-	-	3	-	-	-	9	5.36
2	Basic Sciences **(BS)**	12	13	4	4					33	19.64
3	Engineering Sciences **(ES)**	7.5	7.5	3	3					21	12.50
4	Professional Core **(PC)**	-	-	16.5	16.5	15	12	3		63	37.50
5	Professional Electives**(PE)**					3	6	6	3	18	10.71
6	Open Electives (**OE)**	-	-	-			3	3	5	11	6.55
7	Employability Enhancement Courses **(EE)**Project Work, Soft Skill etc.	-	-	-			1	3	9	13	7.74
	Total Credit	22.5	23.5	23.5	23.5	21	22	15	17	168	100%
	Total Contact Hour	31	34	32	32	30	38	22	23	242 Hrs	

U18HSEN101	**COMMUNICATIVE ENGLISH**	**L**	**T**	**P**	**C**
	Total Contact Periods – 60	2	0	2	3
	Prerequisite – School English				
	Dept Designed by: ……Department of English				
OBJECTIVES	To gain fundamental knowledge of language and the uses in daily life.				

UNITI SPEAKING 6 hours

Speaking- Pronunciation, Intonation, Stress and Rhythm -Common Everyday Situations: Conversations and Dialogues -Communication at Workplace -Interviews -Formal Presentations -introducing one self – exchanging personal information- narrating events, -incidents , speaking about one's friend/pet -Wh- Questions- asking and answering-yes or no questions-partsofspeech.Vocabularydevelopment–prefixes-suffixes-articles,prepositions.

UNITII READING 6 hours

Reading – comprehension (multiple choice questions, short questions) - short narratives and descriptionsfromnewspapersincludingdialoguesandconversationsalsousedasshortreading texts--andlongerpassages-understandingtextstructure-useofreferencewordsanddiscourse markers-coherence-jumbled sentences vocabulary and structures- Vocabulary Building-The concept of Word Formation

UNITIII LISTENING 6 hours

Listening – listening to longer texts and filling in the table- product description- asking about routine actions and expressing opinions. –Listening to telephonic conversations -degrees of comparison- pronouns- direct vs indirect questions- Vocabulary development – single word substitutes-adverbs-IdentifyingCommonErrorsinWriting-Subject-verbagreement-Noun-pronounagreement

UNITIV WRITING 6 hours

Writing-letterwriting,formalandpersonalletters-afterlisteningtodialoguesorconversations and completing exercises based on them. Understanding text structure- use of referencewords and discourse markers-coherence-jumbled sentences -Tenses- simple present-simple past- present continuous and past continuous- Vocabulary development- synonyms-antonyms- phrasal verbs- Articles -Prepositions.

UNITV LANGUAGEDEVELOPMENT 6 hours

Writingshortessays–developinganoutline-identifyingmainandsubordinateideas-dialogue writing- listening to talks, conversations to complete the remaining, participating in conversations- short group conversations-Language development-modal verbs- present/ past perfect tense.– paragraph writing- topic sentence- main ideas short narrative descriptions . Synonyms, antonyms, and standard abbreviations- Basic Writing Skills- Sentence Structures- Use of phrases and clauses in sentences - Importance of proper punctuation - Creating coherence- Organizing principles of paragraphs in documents- Techniques for writing precisely.

SOFTSKILL LABORATORY 30

LIST OF EXPERIMENTS / EXCERCISES

1. Groupdiscussion
2. Making effectivepresentations
3. Watching interviews&conversations
4. Reading different genres of texts

5. International English Language Testing System(IELTS)
6. Test of English as a Foreign Language(TOEFL)
7. Mockinterviews
8. Time management &stressmanagement
9. Role play
10. Listening to lectures, discussions from TV/Radio.
11. Articulation of sounds-intonation.
12. Creative and critical thinking.

TEXT BOOKS:

1. English A Course book for Under Graduate Engineers and Technologists. Orient Black Swan Limited, Hyderabad:2015
2. Richards, C. Jack. Interchange Students' Book-2 New Delhi: CUP, 2015.

REFERENCES

1. Bailey, Stephen. Academic Writing: A practical guide for students. New York: Rutledge, 2011.
2. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, Cambridge: Reprint2011
3. Dutt P. Kiranmai and RajeevanGeeta. Basic Communication Skills, Foundation Books: 2013
4. Means,L.ThomasandElaineLanglois.English&CommunicationforColleges.Cengage Learning ,USA:2007
5. Practical English Usage. Michael Swan. OUP.2005.
6. Remedial English Grammar. F.T. Wood.Macmillan.2007
7. On Writing Well. William Zinsser. Harper Resource Book.2001

COURSE OUTCOMES	
CO1	The student will be able to comprehend the text with clarity
CO2	The capacity to read and listen will improve
CO3	Writing technical report will be learnt properly
CO4	Speaking skills will be acquired
CO5	Overall communication skills will make them employable

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
1				**M**			**H**		**M**						
2				**M**			**H**		**M**						
3				**M**			**H**		**M**						
4				**M**			**H**		**M**						
5				**M**			**H**		**M**						
Category	**HS**														
Approval	47th Meeting of Academic Council														

	ENGINEERING MATHEMATICS – I	L	T	P	C
U18BSMA101	Total Contact Periods – 60	3	1	0	4
	Prerequisite – School Level Mathematics				
	Course Designed by – Department of Mathematics				
OBJECTIVES	➢ The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate integration analysis and linearalgebra. ➢ It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics andapplications that they would find useful in their disciplines.				

UNITI THEORY OFEQUATIONS (9+3)Hours

Fundamental theory of algebra – number of roots of polynomial equations – conjugate pairs theorem (without proof) – Descartes rules of signs- symmetric functions of the roots – formation of equations – diminish the roots of an equations- Multiple roots – reciprocal equation.

UNITII DIFFERENTIAL CALCULUS – OneVariable (9+3)Hours

Representation of functions – limit of a function – continuity – Derivatives – Differentiation rule – Maxima and minima of functions of one variable – Rolle's Theorem – Mean Value Theorem – Taylor's and Maclaurin's Theorem with remainders

UNIT III DIFFERENTIAL CALCULUS -Several Variables (9+3) Hours

Partialderivatives–Euler'stheoremonHomogeneousfunctions-directionalderivatives–total derivative – Jacobian–Maxima and minima of twovariables.

UNIT IV INTEGRAL CALCULUS -OneVariables (9+3) Hours

Definite integrals – Substitution rule – Techniques of integration – Integration by parts – Trigonometric integrals – Trigonometric substitutions – Integrations of rational functions by partial fractions – Integrations of irrational functions-Beta, Gamma functions and their properties.

UNITV MATRICES (9+3)Hours

Characteristic Equations –Eigenvalue and Eigenvectors of the real matrix– Properties–- Cayley-Hamilton Theorem – Diagonalization of matrices – Reduction of quadratic form to canonical form by orthogonal transformation – Nature of Quadratic form.

TEXT BOOKS

1. Grewal B. S, Higher Engineering Mathematics, Khanna Publisher, Delhi –2014.
2. Kreyszig. E, Advanced Engineering Mathematics, 10th edition, John Wiley & Sons, Singapore,2012.

REFERENCE BOOKS

1. VeerarajanT,EngineeringMathematics,IIedition,TataMcGrawHillPublishers,2008.
2. Kandasamy P &co., Engineering Mathematics, 9th edition, S. Chand & co Pub.,2010.
3. N.P.Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint,2010.
4. GeorgeB.Thomas,Jr,MauriceD.Weir,JoelHass.,Thomas'Calculus,TwelfthEdition, Addison-Wesley,Pearson.
5. NarayananS.,ManickavachagamPillaiT.K.,RamanaiahG.,AdvancedMathematicsfor

Engineering students, Volume I (2nd edition), S.Viswanathan Printers and Publishers, 1992.

COURSE OUTCOMES (COs)	
CO1	To apply both the limit definition and rules of differentiation to differentiate functions. Also they will have a basic understanding of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
CO2	Toapplydefiniteintegralsofalgebraicandtrigonometricfunctionsusingformulas and substitution. Also they will have a basic understanding of Beta and Gama functions.
CO3	To apply differential and integral calculus to notions of curvature. Also apply differentiation to find maxima and minima of functions.
CO4	To apply multiple integrals to compute area and volume over curves, surface and domain in two dimensional and three dimensional spaces.
CO5	Identify Eigenvalue problems from practical areas using transformations; Diagonalising the matrix would render the Eigen values.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	H				L				M			M			
CO2	H				L				H						
CO3	M				M				M						
CO4	H				L				L						
CO5	M				L				M			M			
Category	Basic Science (BS)														
Approval	47th Meeting of Academic Council														

U18BSPH101	**WAVES AND OPTICS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite – Higher Secondary School Physics				
	Course designed by – Department of Physics				
OBJECTIVES: To develop Physics and Engineering strategies of Waves and Optics and to discuss their functionalities in modern optoelectronics.					

UNIT1 NON-DISPERSIVE TRANSVERSE AND LONGITUDINAL WAVES IN ONEDIMENSION 9hours

Introduction - Transverse wave on a string, the wave equation on a string, Harmonic waves, reflection and transmission of waves at a boundary, standing waves, longitudinal waves and the wave equation for them, acoustics waves and speed of sound. Waves with dispersion, superposition of waves, wave groups and group velocity.

UNIT2 ULTRASONICWAVES 9 hours

Production of ultrasonics by magnetostriction and piezoelectric methods - acoustic grating –

Detection - Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C – scan displays, Industrial and Medical applications – Sonogram.

UNIT3 THE PROPAGATION OF LIGHT AND GEOMETRIC OPTICS 9hours

Fermat'sprincipleofstationarytimeanditsapplicationse.g.inexplainingmirageeffect,laws of reflection and refraction, Light as an electromagnetic wave and Fresnel equations, reflectanceandtransmittance,Brewster'sangle,totalinternalreflection,andevanescentwave. Mirrors and lenses and optical instruments based onthem

UNIT4 WAVESOPTICS 9 hours

Huygens'principle,superpositionofwavesandinterferenceoflightbywavefrontsplittingand amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer. Fraunhofer diffraction from a single slit and a circular aperture, Diffraction gratings and their resolvingpower

UNIT5 LASERS 9 hours

Einstein'stheoryofmatterradiationinteractionandAandBcoefficients;amplificationoflight by population inversion, different types of lasers: gas lasers (He-Ne, CO2), solid-state lasers(Neodymium), Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, applications of lasers in science, engineering andmedicine.

TEXT BOOKS

1) M.N. Avadhanulu and P.G. Kshirsagar, "A Textbook of Engineering Physics" S.Chand Publishers, 2016 (for UNITs 1,3,4 &5)
2) G.Senthil Kumar, "Engineering Physics", VRB publishers, Chennai, 2015 (for UNIT2)

REFERENCE BOOKS

1) BrijLal and Subramanian, "Waves and Oscillation", VikasPublishsing House,2011
2) R.Murugesan,"Optics and Spectroscopy", S.Chand Publishers,2015
3) BrijLal and Subramanian,"Optics", S.Chand Publishers2006
4) Ian G. Main, "Vibration and waves in physics", Cambridge University Press,1978
5) H.J. Pain, "The physics of vibrations and waves", 6th edition, Wiley2006
6) AjoyGhatak, "Optics", Tata McGraw-Hill publishing company, New Delhi,2009
7) O. Svelto, "Principles of Lasers", Springer,2010
8) Online referenceWikipedia.org

COURSE OUTCOMES (COs)	
CO1	Understand the basic concept of waves and lights
CO2	Understand the importance of Ultrasonic waves and Non-DestructiveTesting
CO3	Understand the propagation of light and geometrical optics
CO4	Understand the optical phenomenon like interference, diffraction and superposition ofwaves
CO5	Understand the concept of laser and its applications

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	H							L	M			M			

CO2	H							L	M						
CO3	M							H	M			M			
CO4	H							L	M						
CO5	H							L	M			M			
Category	Basic Sciences (BS)														
Approval	47th Meeting of Academic Council														

U18BSCH101	**ENGINEERING CHEMISTRY**	**L**	**T**	**P**	**C**
	Total Contact Periods – 45	3	0	0	3
	Prerequisite – School Level Chemistry				
	Course Designed by – Department of Chemistry				
OBJECTIVES: To gain fundamental knowledge of Engineering Chemistry and its applications					

UNITI WATERTECHNOLOGY 9 hours

Introduction - Characteristics: Hardness of Water – Types - Temporary and Permanent Hardness - Estimation by EDTA method. Alkalinity – Types of Alkalinity - Phenolphthalein and Methyl Orange Alkalinity - Determination – Domestic Water Treatment – Disinfection methods (Chlorination, Ozonation, and UV Treatment). Boiler feed water – Requirements – Disadvantagesofusinghardwaterinboilers(Causticembrittlement,Boilercorrosion,Priming and foaming) – Prevention of scale formation – softening of hard water - Internal treatment (Calgontreatmentmethod)–Externaltreatment–Demineralizationprocess–Desalinationand Reverseosmosis.

UNITII PHASE RULEAND ALLOYS 9 hours

Introduction: Statement of Phase Rule and Explanation of terms involved – One component system – Water system – Construction of phase diagram by thermal analysis - Condensed phase rule - Two Component System : Simple eutectic systems (lead-silver system) – eutectic temperature – eutectic composition – Pattinson's Process of desilverisation of Lead.

Alloys: Importance, ferrous alloys – nichrome and stainless steel – 18/8 stainless steel -heat treatment of steel – annealing –hardening – tempering - normalizing – carburizing - nitriding. Non- ferrous alloys: Brass and Bronze.

UNIT III NON-CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES 9 hours

Introduction:Nuclearfissionandnuclearfusionreactions–differencesbetweennuclearfission and nuclear fusion reactions – nuclear chain reactions – nuclear energy critical mass - super critical mass - sub - critical mass Light water nuclear reactor for Power generation – breeder reactor. Solar energy conversion – solar cells – wind energy. Fuel cells – hydrogen – oxygen fuel cell. Batteries: Primary and secondary Batteries – differences between Primary and secondary Batteries Secondary batteries: Lead–acid storage battery –working –uses. Nickel–cadmium battery -working –uses. Solid – state battery: Lithiumbattery.

UNITIV FUELS 9hours

Introduction: Calorific value – types of Calorific value - gross calorific value – net calorific value. Analysis of Coal – Proximate and ultimate analysis – hydrogenation of coal - Metallurgical coke –manufacture by Otto-Hoffmann method. Petroleum processing and fractions– cracking – catalytic cracking – types – fixed bed catalytic cracking method-Octane

number and Cetane number. Synthetic petrol – Bergius processes – Gaseous fuels- water gas, producer gas, CNG and LPG. Flue gas analysis – importance - Orsat apparatus.

UNITV NANOCHEMISTRY 9 hours

Introduction:Nanochemistry:Definition-Classificationbasedondimensions-Sizedependent properties. Types of nanomaterials: Nanoparticles: Synthesis by Bottom-up and top-down approaches - Nanoporous materials: Synthesis by sol-gel method. Nanowires: Synthesis by VLS mechanism. Carbon Nanotubes (CNTs): Single walled and Multi walled nanotubes - Mechanical and electrical properties of CNTs - Applications of CNTs - Synthesis of CNTs by Electric arc discharge method and Laser ablation method. Nanochemistry in biology and medicines – nanocatalysis.Nano composites – sensors and electronicdevices.

TEXT BOOKS:

1. P.C.Jain and Monica Jain, "Engineering Chemistry" DhanpatRai Pub, Co., New Delhi (2002).
2. S.S.Dara"AtextbookofEngineeringChemistry"S.Chand&Co.Ltd.,NewDelhi(2006).
3. P. J. Lucia, M. Subhashini, "Engineering Chemistry, Volume 1", Crystal Publications, Chennai,(2007).
4. S.Vairam,P.KalyaniandSubaRamesh,―EngineeringChemistry‖,WileyIndia PVT, LTD, New Delhi,2013.
5. G. B. Sergeev, Nano chemistry, Elsevier Science, New York,2006.

REFERENCES BOOKS:

1. B.K.Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut(2001).
2. Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi(2008).

COURSE OUTCOMES (COs)	
CO1	To impart knowledge to the Students about the principles, water characterization, conversant with boiler feed water requirements and water treatment techniques.
CO2	To make them understand the industrial importance of Phase rule and its applications to single and two componentsystems and appreciate the purpose and significance of alloys
CO3	To make the students to be well versed with the principles of Conventional and non-conventional energy sources and energy storage devices.
CO4	To make the students to have a deep knowledge of the Chemistry of Fuels and calorific value, manufacture of solid, liquid and gaseous fuels.
CO5	To make them understand the Nanochemistry, Types of nanomaterials: Nanoparticles,Nanochemistry in biology and medicines.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	H			M					M						
CO2	H			L					M						
CO3	H			L					M						
CO4	H			L					M						
CO5	H			L					M						
Category	Basic Sciences (BS)														
Approval	47th Meeting of Academic Council														

U18ESEE101	BASIC ELECTRICAL & ELECTRONICS ENGINEERING	L	T	P	C
	Total Contact Periods – 45	3	0	0	3
	Prerequisite – School Level Physics				
	Course Designed by – Department of Electrical & Electronics Engineering				
OBJECTIVES	To gain fundamental knowledge of Electrical and Electronics Engineering and its applications				

UNIT1 DCCIRCUITS 12 hours

Electrical circuit elements, voltage and current sources, Fundamentals Relationship of VI for RLC circuit, Ohms Law, Source Transformation ,Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Basics of Superposition, Thevenin and Norton Theorems,,Maximum Power Transfer Theorem.

UNITII ACCIRCUITS 9 hours

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance.Time-domain analysis of first-order RL and RC circuits. Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNITIII ELECTRICAL MACHINES&TRANSFORMERS 9 hours

Principles of operation and characteristics of; DC machines,Synchronous machines, three phaseandsinglephaseinductionmotors.Transformers(singleandthreephase)regulationand efficiency,all day efficiency and auto-transformer.

UNIT4 SEMICONDUCTOR DEVICESANDAPPLICATIONS 9 hours

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE,CCConfigurationsandCharacteristics–ElementaryTreatmentofSmallSignalAmplifier and its applications, Introduction toOP-AMP.

UNIT5 DIGITALELECTRONICS 6hours

BinaryNumberSystem–LogicGates–BooleanAlgebra–HalfandFullAdders–Flip-Flops – Registers and Counters – Fundamentals of A/D and D/A Conversion.

TEXT BOOKS:

1. JohnBird,,ElectricalCircuitTheory&Technology,Taylor&FrancisLtd,6th,edition.2017.
2. SmarajitGhosh,FundamentalsofElectricalandElectronicsEngineering,SecondEdition, PHI Learning,2007.
3. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press,2011.
4. E. Hughes, “Electrical and Electronics Technology”, Pearson, 10th Edition,2011.
5. V. D. Toro, “Electrical Engineering Fundamentals”, Pearson, 2nd Edition,2015.
6. Millman and Halkias, “Integrated Electronics”, McGraw Higher Ed, 2nd Edition,2011.
7. Vincent Del Toro, `Electrical Engineering Fundamental,Prentice Hall, 2nd Edition, 2015.
8. K.A.Krishnamurthy and M.R.Raghuveer, `Electrical and Electronics Engineering for Scientists', New Age International Pvt Ltd Publishers, 2011.

REFERENCES:

1. D.P.KothariandI.J.Nagrath,"BasicElectricalEngineering",TataMcGrawHill,Third Reprint,2016.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Higher Ed, 1st Edition, 2011.
3. Jacob Millman and Christos C-Halkias,"Electronic Devices and Circuits", McGraw Higher Ed, 4th Edition,2015.

COURSE OUTCOMES (COs)	
CO1	To gain knowledge regarding the various laws and principles associated with DC Circuits.
CO2	To gain knowledge regarding fundamentals of AC circuits.
CO3	To gain knowledge regarding electrical machines and transformers.
CO4	To gain knowledge regarding various types of semiconductor devices and small signal amplifiers.
CO5	To gain knowledge on principles of digital electronics systems.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	H		M						M		H	L			
CO2	M		H						M		H				
CO3	H		M						L		M				
CO4	H		M						H		H	L			
CO5	H		M						M		M	M			
Category	Engg Sciences (ES)														
Approval	47th Meeting of Academic Council														

U18BSBT101	**BIOLOGY FOR ENGINEERS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	2	0	0	2
	Prerequisite – Higher Secondary level biology, basic concepts in cell signaling				
	Course Designed by – Dept of Industrial Biotechnology				
OBJECTIVES: To provide a basic understanding of the biological systems and its applications in the industrial sector					

UNITI INTRODUCTIONTOLIFE 6 hours

Characteristicsoflivingorganisms-Basicclassification-celltheory-structureofprokaryoticand eukaryotic cell- Introduction to biomolecules - general classification and important functions of carbohydrates-lipids-proteins-nucleic acids –vitamins

UNITII BIODIVERSITY 6hours

Plant System: basic concepts plant growth-nutrition-photosynthesis-Animal System: elementary study of digestive-respiratory-circulatory-excretory systems and their functions. Microbial System -types of microbes-economic importance and control of microbes.

UNITIII GENETICS ANDIMMUNESYSTEM 6hours

Evolution: theories of evolution- evidence of laws of inheritance-variation and speciation-nucleic acids as a genetic material-central dogma - immunity-antigens-antibody-immune response.

UNITIV HUMANDISEASES 6hours

Definition- causes, symptoms, diagnosis, treatment and prevention of diabetes, cancer, hypertension, AIDS and Hepatitis

UNITV BIOLOGY AND ITSINDUSTRIALAPPLICATION 6hours

Transgenic plants and animals-stem cell and tissue engineering-bioreactors-biopharming-recombinant vaccines-cloning-bioremediation-biofertilizer-biocontrol- biosensors-biopolymers-bioenergy-biomaterials-biochips

TEXT BOOKS:

1. A Text book of Biotechnology, R.C.Dubey, S. Chand Higher Academic Publications, 2013
2. Diseases of the Human Body, Carol D. Tamparo and Marcia A. Lewis, F.A. Davis Company,2011.
3. Biomedical instrumentation, Technology and applications, R. Khandpur, McGraw Hill Professional,2004

REFERENCE BOOKS

1. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis,2011
2. Cell Biology and Genetics (Biology: The UNITy and diversity of life Volume I), Cecie Starr, Ralph Taggart, Christine Evers and Lisa Starr, Cengage Learning,2008
3. Biotechnology Expanding horizon, B.D. Singh, Kalyani Publishers,2012

COURSE OUTCOMES (COs)	
CO1	To understand the basic concepts of the cell and its structure
CO2	To understand about biodiversity and its conservation
CO3	To know the fundamentals of genetics and the immune system
CO4	To create an awareness about human diseases
CO5	To give a basic knowledge of the applications of transgenics

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	H								M						
CO2	H								M						
CO3	H								M						
CO4	M								M						
CO5	H								M						
Category	Basic Sciences (BS)														
Approval	47th Meeting of Academic Council														

U18BSPH2L2	**WAVE OPTICS AND SEMICONDUCTOR PHYSICS LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	2	0	0	2
	Prerequisite – Higher Secondary School Physics				
	Course Designed by – Department of Physics				
OBJECTIVES: To impart knowledge of practical Physics to the students					

Physics Lab experiments for Semester I & II

List of Experiments for Waves and Optics – Common for all branches

1) Ultrasonic Interferometer
2) Air-wedgeExperiment
3) Particle sizedetermination
4) Determination of acceptanceangle
5) Determination of LaserWavelength
6) Spectrometer – Determination of wavelength usinggrating

List of Experiments for Semiconductor Physics – Circuit branches

1) Determination of Band Gap
2) Zener diodecharacteristics
3) p-n junction diodeCharacteristics
3) TransistorCharacteristics
5) V-I characteristics using LDRcircuit
6) Carey Foster'sBridge

COURSE OUTCOMES (COs)														
CO1	To Understand the fundamental concept of optics													
CO2	To Understand the concept of production of ultrasonic waves													
CO3	To Understand the functions of semiconductor													
Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low														
COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	H		M						M						
CO2	H		M						M			H			
CO3	H		M						M						
Category	Basic Science (BS)														
Approval	47th Meeting of Academic Council														

U18BSCH2L4	**CHEMISTRY LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	0	0	3	1.
	Prerequisite – Engineering Chemistry				
	Course Designed by – Department of Chemistry				
OBJECTIVES: To enhance the practical knowledge on Chemistry through Volumetric and circuit experiments					

LIST OF EXPERIMENTS

1. DeterminationofTotalHardness,TemporaryHardnessandPermanenthardnessofWater by EDTAmethod
2. Estimation of Alkalinity -Titrimetry
3. Estimation of DissolvedOxygen
4. Estimation of Chlorides in Water by Argentometric Method (MOHR'SMethod)
5. Estimation of Copper by EDTAmethod
6. Estimation of Iron in Water bySpectrophotometry
7. Conductometric Titration of Strong Acid with StrongBase
8 Determination of Molecular weight of a polymer by Viscosity AverageMethod
9. pH measurements for Acid - alkaliTitrations
10 Determination of rate of corrosion by weight lossmethod.
11. Conductometric Precipitationtitration
12. Determination of WaterCrystallization

REFERENCES

1. R. Jeyalakshmi, "Practical Chemistry", Devi Publications2014.
2. S.S. Dara, A text book on experiments and calculationEngg.

COURSE OUTCOMES (COs)	
CO1	Students will able to analyze - hardness, Alkalinity, Dissolved oxygen, Chlorides inWaterbyArgentometricMethod,DeterminationofWaterofCrystallizationand as well as estimation of Copper by EDTA method using volumetricanalysis.
CO2	Students will understand basic principle of spectrophotometric method
CO3	Students will learn Conductometric Titration of Strong Acid with Strong Base and and Conductometric Precipitation titration.
CO4	Student will be able to analyze Determination of Molecular weight of a polymer by Viscosity Average Method
CO5	Student will understand about pH measurements for Acid - alkali Titrations and rate of corrosion by weight loss method

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	H		M						M						
CO2	H		M						M						
CO3	H		M						M						
CO4	H		M						M						
CO5	H		M						M						
Category	Basic Sciences (BS)														
Approval	47th Meeting of Academic Council														

U18ESME1L2	**WORKSHOP/MANUFACTURING PRACTICES**	**L**	**T**	**P**	**C**
	Total Contact Periods – 75	1	0	4	3
	Prerequisite – NIL				
	Course Designed by – Department of MechanicalEngineering				

OBJECTIVES	To educate the students on common manufacturing processes employed in Industries.

SYLLABUS

Lectures&videos: 15 hours

Detailed contents

- Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods **3lecture**
- CNC machining,Additivemanufacturing **2lecture**
- Fitting operations&powertools **2lecture**
- Carpentry **2lecture**
- Plastic moulding,glasscutting **2lecture**
- Metalcasting **2lecture**
- Welding (arc welding & gaswelding),brazing **2lecture**

WORKSHOP PRACTICE:

1. Machineshop **6 hours**
   a) Facing
   b) Turning
   c) DrillingPractice

2. Fittingshop **6 hours**
   a) Fitting Exercises–Preparation of squarefitting
   b) Vee–fittingmodels.

3. Carpentry **9hours**
   a) Preparation Lapjoints.
   b) Mortise andTenonjoints.
   c) CrossHalf.
   d) DoveTail.

4. Weldingshop **(Arc welding 6 hrs + gas welding 3 hrs) 9hours**

Preparation of butt joints, lap joints and tee joints

5. SheetMetal working **9hours**
   a) Forming&Bending:
   b) Model making–Trays, funnels,etc.
   c) Different type ofjoints

6. Demonstration **6hours**

Smithy operations, upsetting, swaging, setting down and bending. Example–Exercise–Production of hexagonal headed bolt.

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

SUGGESTED TEXT/REFERENCE BOOKS:

1. 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.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology",4th edition, Pearson Education India Edition,2002.

3. Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education,2008.
4. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India,1998.
5. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

COURSE OUTCOMES (COs)	
CO1	Students will gain knowledge of the different manufacturing processes.
CO2	Students will be able to fabricate components with their own hands.
CO3	Students will gain practical knowledge of the dimensional accuracies and dimensional tolerances.
CO4	Students will be able to produce small devices of their interest.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	H		M						M						
CO2	H		M						M						
CO3	H		M						M						
CO4	H		M						M						
Category	Engg Science (ES)														
Approval	47th Meeting of Academic Council														

U18ESEE1L3	**BASIC ELECTRICAL AND ELECTRONIC ENGINEERING PRACTICESLABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	0	0	3	1.5
	Prerequisite – School Level Physics & Basic Electrical and Electronic Engineering				
	Course Designed by – Department of Electrical & Electronics Engineering				
OBJECTIVES: To enhance the practical knowledge on basics of electrical and electronics components and circuits.					

LIST OF EXPERIMENTS FOR BASIC ELECTRICAL ENGINEERING LAB

1. Verification of Ohms and Kirchoff's Voltage and CurrentLaws
2. Measurement of the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification.
3. Fluorescent lampwiring
4. Staircasewiring
5. Measurement of energy using single phase energymeter
6. Observation of the no-load current waveform on an oscilloscope and Measurement of Primary and secondary voltages and currents of aTransformer
7. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase inductionmachine.

8. Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

LIST OF EXPERIMENTS FOR BASIC ELECTRONICS ENGINEERING LAB

1. Measurement of ac signal parameters using cathode ray oscilloscope and function generator.
2. Characteristics – Half wave and Full waveRectifiers
3. Characteristics – Common Base transistorconfiguration
4. VerificationoftruthtablesofOR,AND,NOT,NAND,NORgatesandFlip-flops-JKand RS
5. Applications of OperationalAmplifier

COURSE OUTCOMES (COs)	
CO1	To handle basic electrical equipment and verify current and voltage law
CO2	To understand the steady-state and transient time-response of R-L, R-C, and R-L-C circuits
CO3	To understand domestic wiring procedures practically.
CO4	To analyze ac signal parameters using cathode ray oscilloscope and function generator
CO5	To understand all the fundamental concepts semiconductor Diode and Transistor
CO6	To understand all the fundamental concepts of logic Gates and Flip-Flaps

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	M			L			M		H	
	CO2	H	H	M			L			M		H	L
	CO3	H	H	M			L			M		H	
	CO4	H	H	M			L			M		H	L
	CO5	H	H	M			L			M		H	L
	CO6	H	H	M			L			M		H	L
3	Category	Engg Science (ES)											
4	Approval	47th Meeting of Academic Council											

U18HSEN201	**TECHNICAL ENGLISH**	**L**	**T**	**P**	**C**
	Total Contact Periods – 45	2	1	0	3
	Prerequisite– I semesterEnglish				
	Course Designed by – Department of English				
OBJECTIVES	To gain fundamental knowledge of English language and its usage in day to day life.				

UNITI LISTENING 9hours

Listening- Listening to talks mostly of a scientific/technical nature and completing information-gapexercises-Speaking–Askingforandgivingdirections-extendeddefinitions –listening todaily issue- -Vocabulary Development- technical vocabulary - Language Development –subject verb agreement – compound words.

UNITII READING 9 hours

Reading – reading longer technical texts- identifying the various transitions in a text- interpreting charts, graphs after reading the, practice in speed reading- vocabulary Development-vocabulary used in formal letters/emails and reports -Language Development personal passive voice, numerical adjectives.

UNITIII TECHNICALWRITING 9 hours

Writing after listening to classroom lectures- talk should be on engineering /technology– introduction to technical presentations- longer texts both general and technical, Describing a process, use of sequence words- Vocabulary Development- sequence words- Misspelled words.

UNITIV FORMALWRITING 9 hours

Writing- email etiquette- job application – cover letter –Resume preparation (via email and hard copy)- analytical essays and issue based essays–Vocabulary Development- finding suitable synonyms-paraphrasing-. Language Development- clauses- dependant, independent, if conditionals.

UNITV LANGUAGEDEVELOPMENT 9hours

Speaking –participating in a group discussion – role play, Writing– Writing reports- minutes of a meeting- accident and survey-Vocabulary Development- transitive, intransitive verbs, Language Development- reported speech.

TEXT BOOKS:

1. Fluency in English A Course book for Engineering and Technology. Orient Blackswan, Hyderabad:2016
2. Sudharshana.N.P and Saveetha. C. English for Technical Communication. Cambridge University Press: New Delhi,2016.

REFERENCES

1. Booth-L. Diana, Project Work, Oxford University Press, Oxford:2014.
2. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford:2007
3. Kumar, Suresh. E. Engineering English. Orient Blackswan:Hyderabad,2015
4. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges Cengage Learning, USA:2007

COURSE OUTCOMES (COs)	
CO1	The student will acquire basic proficiency in English
CO2	Reading and listening ability will improve.
CO3	Comprehension techniques will develop.
CO4	writing and speaking skills will be acquired
CO5	Overall communication skills will make them employable.

Mapping of Course Outcomes with Program outcomes (POs) (L/M/H indicates strength of correlation) H-High, M-Medium, L- Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1				**M**			**H**		**M**						
CO2				**M**			**H**		**M**						
CO3				**M**			**H**		**M**						

CO4				**M**			**H**		**M**			**H**			
CO5				**M**			**H**		**M**			**H**			
Category	Humanities and Social Studies (HS)														
Approval	47th Meeting of Academic Council														

U18BSMA201	**ENGINEERING MATHEMATICS – II**	**L**	**T**	**P**	**C**
	Total Contact Periods – 60	3	1	0	4
	Prerequisite – School Level Mathematics				
	Course Designed by – Department of Mathematics				
OBJECTIVES	➢ The objective of this course is to equip the students of Engineering and Technology with techniques in ordinary equations, vector calculus, complexvariables. ➢ Laplacetransformwithadvancedlevelofmathematicsand applications that would be essential to formulate problems in engineering environment.				

UNITI ORDINARY DIFFERENTIALEQUATIONS (9+3)hours

Higher order linear differential equations with constant coefficients – linear differential equations with variable coefficients– Euler's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients- Method of variation of parameters.

UNITII VECTORCALCULUS (9+3)hours

Scalar and vector point function - Gradient, Divergence and curl – Directional derivatives – Anglebetweentwosurfaces-IrrotationalandSolenoidalvectorfields–LineIntegral-Green's theorem – Gauss divergence theorem and Stokes' theorem – Simple applications involving cubes and rectangularparallelepipeds.

UNITIII ANALYTIC FUNCTIONS (9+3)hours

Functions of complex variable - Analytic functions – Necessary and sufficient conditions (withoutproof),CauchyRiemannEquationsinCartesianandpolarform–Harmonicfunctions – properties of analytic functions – Construction of analytic functions using Milne Thomson method –Conformal mapping : □ = □ + □, □□, 1/□ and Bilinear Transformation.

UNITIV COMPLEXINTEGRATION (9+3)hours

Cauchy integral theorem – Cauchy's integral formula – problems – Taylor's and Laurent's Series – classification of Singularities – Poles and Residues – method of finding residues - Cauchy's residue theorem and its applications to evaluate real integrals – contourintegration.

UNITV LAPLACETRANSFORMS (9+3)hours

Transforms of elementary functions – Basic properties – Shifting theorem- Transforms of derivatives and integrals – Initial and final value theorem – Laplace transform of Periodic Functions – Inverse Laplace transform – Convolution theorem – Periodic Functions – Applications of Laplace transform for solving linear ordinary differential equations up to second order with constant coefficient.

TEXT BOOKS

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Willie & Sons, 2006.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition,2000.

REFERENCE BOOKS

1. Venkataraman. M. K, Engineering Mathematics, National Publishing Company,2000.
2. Bali .N.P and Manish Goyal, A Text book of Engineering Mathematics, Eighth Edition, Laxmi Publications Pvt Ltd.,2011.
3. Veerarajan T, Engineering Mathematics, II edition, Tata McGraw Hill Publishers,2008.
4. George B. Thomas Jr., Maurice D. Weir, Joel R. Hass., Thomas' Calculus, 12thEdition, Addison-Wesley,Pearson.

COURSE OUTCOMES (COs)	
CO1	The mathematical tools for solution of differential equation that model physical process.
CO2	To evaluate the line, surface and volume integrals using Green's, Stoke's and Gauss Theorems and their verification.
CO3	To understand the analytic functions, conformal mapping and complex integration and their applications.
CO4	To evaluate real and complex integrals using the Cauchy's integral formula and Residue theorem.
CO5	To apply the concept of Laplace Transformation in analysis and solve differential equations.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	H				M				M						
CO2	H				M				M						
CO3	H				M				M						
CO4	H				M				M						
CO5	H				M				M			H			
Category	Basic Science (BS)														
Approval	47th Meeting of Academic Council														

U18BSPH202	**SEMICONDUCTOR PHYSICS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Higher Secondary School Physics				
	Course designed by – Department of Physics				

OBJECTIVES: To develop physics and engineering strategies of semiconductor materials and to discuss their functionalities in modern electronic and optoelectronic devices

UNIT 1 INTRODUCTION AND ELECTRONIC STATES OF SEMICONDUCTORS **9 hours**

Introduction to solid state materials - crystal structure - Reciprocal lattice - Brillouin zone and rules for band (k - space) representation. Dynamics of electrons in periodic potential:Kronig - penny and nearly free electron models - Real methods for band structure calculations; Band gaps in semiconductors - Holes and effective mass concept - Properties of conduction and valance bands

UNIT 2 CARRIERSANDDOPING **9 hours**

Fermi distribution and energy - Density of states - Valance and conduction band density of states - intrinsic carrier concentration – intrinsic Fermi level. Extrinsic semiconductors: n and p type doping - Densities of carriers in extrinsic semiconductors and their temperature dependence - extrinsic semiconductor Fermi energy level - Degenerate and non - degenerate semiconductors - Band gap engineering

UNIT 3ELECTRICAL TRANSSORT **9 hours**

Scattering Mechanism: electron - electron and electron – phonon scattering. Macroscopic transport: Carrier transport by Diffusion - Carrier transport by Drift: Low field, High fieldand very highfield.

UNIT 4OPTICALTRANSSORT **9 hours**

Electron - hole pair generation and recombination: band to band (direct and indirect band gap transitions) and intra band (impurity related) transitions, free - carrier & phonon transitions. Excitons: Origin, electronic levels and properties. Carrier transport - continuity equations. Optical constants: Kramers - Kronig relations.

UNIT 5 SEMICONDUCTOR AS DEVICES ANDRECENTADVANCES **9 hours**

Processing of Semiconductor devices (Brief), p - n Semiconductor as device and Semiconductor junctions - Homo and hetero Junctions. Active and passive optoelectronic devices: performance and response enhancement (photo processes)**.**

TEXT BOOK:

1) M.N. Avadhanulu and P.G. Kshirsagar, “A Textbook of Engineering Physics” S.Chand Publishers, 2014**(for UNITs 1 and2)**

2) G.Senthil Kumar, “Engineering Physics”, VRB publishers, Chennai, 2015 (for **UNIT**5)

REFERENCES BOOKS:

1) Kevin F Brennan, "The Physics of Semiconductors", Cambridge Univ.Press1999.
2) Peter Y Yu and Manuel Cardona, "Fundamentals of Semiconductors",Springer,1996.
3) Charles Kittel, "Introduction to Solid State Physics", 6th Edition, Willey,1991.
4) D.A. Neamen, "Semiconductor Physics and Devices", 3 rdEd.,TataMcGraw-Hill,2002.
5) Jasprit Singh, "Semiconductor Optoelectronics (Physics and Technology)", McGraw-Hill, 1995.
6) Online reference: Wikipedia,NPTEL

COURSE OUTCOMES (COs)	
CO1	Understand the difference between metals, semiconductors and insulators
CO2	Understand the importance of doping to charge carrier density
CO3	Understand the electrical transport in semiconductors
CO4	Understand the difference between direct and indirect semiconductors
CO5	Understand the concept of semiconductor optoelectronic devices.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	H							L	M						
CO2	H							L	M						
CO3	H							L	M						
CO4	H							L	M						

CO5	H							L	M			L			
Category	Basic Science (BS)														
Approval	47th Meeting of Academic Council														

U18BSCH201	**ENVIRONMENTAL SCIENCE**	**L**	**T**	**P**	**C**
	Total Contact Periods – 45	3	0	0	3
	Prerequisite – NIL				
	Course Designed by – Department of Chemistry				
OBJECTIVES	• To study the interrelationship between living organism and environment. • To study of the nature and concepts ofecosystem. • To learn about the integrated themes and biodiversity of an environment. • To study of pollution control and wastemanagement. • To appreciate the importance of environment by assessing its impact onthehumanworld;envisionthesurroundingenvironment,its functions and its value.				

UNITI NATURAL RESOURCES 9 hours

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people –Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems - Food resources: World food problems, changes caused by agriculture and overgrazing, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification - Equitable use of resources for sustainable lifestyles.

UNITII ECOSYSTEMS 9 hours

Introduction: concepts of an ecosystem. Structure and function of an ecosystem, producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids - Introduction, types, characteristic features, structure and function of the following ecosystem :- Forest ecosystem, Grassland ecosystem, Desertecosystem,Aquaticecosystems,(ponds,streams,lakes,rivers,oceans,estuaries)-Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation - Ethics : Issues and Possible Solutions, Climate change, global warming, acid rain, ozonelayer depletion.

UNITIII BIODIVERSITY ANDITS CONSERVATION 9hours

Introduction and Definition - genetic, species and ecosystems diversity, Biogeographically classification of India - Value biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - Biodiversity at global, national and local levels. India as a mega diversity nation, Hot-spots of biodiversity - Threats to biodiversity, habitat, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation biodiversity - In-situ and Ex-situ conservation of biodiversity.

UNITIV ENVIRONMENTALSOLLUTION 9hours

Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solidwaste

Management: Causes, effects and control measures of urban and industrial wastes - Role ofan individual in prevention of pollution - pollution case studies - Disaster Management: floods earthquake, cyclone andlandslides.

UNITV SOCIAL ISSUES ANDHUMANSOPULATION 9 hours

Social issues: Environmental Protection Act, Air (Prevention and Control of pollution) Act, Water(PreventionandControlofpollution)Act,WildlifeprotectionAct,ForestConservation Act, Public awareness – Fireworks and its impact on the Environment – Chemicals used in Fireworks – (Fuel –oxidizing Agent – Reducing Agent –Toxic Materials – Fuel –Binder-Regulator)–Harmfulnatureofingredients–chemicaleffectsonhealthduetoinhalingfumes. Human population: population growth, variation among nations, Populationexplosion-Family Welfareprograms,Environmentandhumanhealth,HumanRights,ValueEducation,HIVand AIDS, Women and Child Welfare, Role of Information Technology in Environment and Human health - CaseStudies.

TEXT BOOKS:

1. Gilbert M. Masters, Introduction to Environmental Engineering and Science‘, 2nd edition, Pearson Education2004.
2. Benny Joseph, Environmental Science and Engineering‘, Tata McGraw-Hill, New Delhi, 2006.
3. R.K. Trivedi, Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards‘, Vol. I and II, EnviroMedia.
4. Rajagopalan, R, Environmental Studies-From Crisis to Cure’, Oxford University Press 2005.
5. K.V.B. Raju and R.T. Ravichandran, “Basics of CivilEngineering”.

REFERENCES:

1. Cunningham, W.P. Cooper, T.H. Gorhani, Environmental Encyclopedia‘, Jaico Publ., House, Mumbai,2001.
2. Dharmendra S. Sengar, Environmental law‘, Prentice hall of India PVT LTD, New Delhi, 2007.

COURSE OUTCOMES (COs)	
CO1	Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving
CO2	Appreciate concepts and methods from ecological and physical sciences and their application in environmental problemsolving.
CO3	Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and naturalsystems
CO4	Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales
CO5	Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS**
CO1	H			M					M			L			
CO2	H			M					M			L			
CO3	H			H					L			L			

CO4	H			M					M			L			
CO5	H			H					M			H			
Category	Basic Science (BS)														
Approval	47th Meeting of Academic Council														

U18ESCS101	**PROBLEM SOLVING AND PYTHON PROGRAMMING**	**L**	**T**	**P**	**C**
	Total Contact Periods – 45	**3**	**0**	**0**	**3**
	Prerequisite – NIL				
	Course Designed by – Department of Computer Science & Engineering				
OBJECTIVES	To gain fundamental knowledge of algorithmic problem solving and python programming				

UNITI ALGORITHIMICPROBLEMSOLVING 9 periods

Introduction to components of a computer system - disks, memory, processor, operating system, compilers – Problems, Solutions, Idea of Algorithm –Representation of Algorithm. Building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart ,programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Problem Illustrations

UNITII DATA,EXPRESSIONS,STATEMENTS 9 Periods

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two Points.

UNITIII CONTROLFLOW, FUNCTIONS 9Periods

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrativeprograms:squareroot,gcd,exponentiation,sumanarrayofnumbers,linearsearch, binarysearch.

UNITIV LISTS,TUPLES,DICTIONARIES 9periods

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list, Processing list comprehension; Illustrative programs: selection sort, insertion sort, merge sort, histogram.

UNITV FILES,PACKAGES 9 Periods

Files and exception: text files, reading and writing files, errors and exceptions, handling exceptions, packages: NumPy, SciPy, Matplotlib, Scikit-learn, Scilab Interface.

TEXT BOOKS

1. Allen B. Downey, 'Think Python: How to Think Like a Computer Scientist', 2nd edition, Updated for Python3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)

2. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised and update dfor Python 3.2, Network Theory Ltd.,2011.

REFERENCES

1. JohnVGuttag,―IntroductiontoComputationandProgrammingUsingPython‘‘,Revised and expanded Edition, MIT Press ,2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, ―Introduction to Programming in Python:AnInter-disciplinaryApproach,PearsonIndiaEducationServicesPvt.Ltd.,2016.
3. Timothy A. Budd, ―Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd.„2015.
4. KennethA.Lambert,―FundamentalsofPython:FirstPrograms‖,CENGAGELearning, 2012.
5. Charles Dierbach, ―Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition,2013.
6. Paul Gries, Jennifer Campbell and Jason Montojo, ―Practical Programming: An Introduction to Computer Science using Python 3‖, Second edition, Pragmatic Programmers, LLC, 2013

COURSE OUTCOMES (COs)	
CO1	Develop algorithmic solutions to simple computational problems
CO2	Demonstrate programs using simple Python statements and expressions.
CO3	To gain knowledge regarding control flow and functions associated with python
CO4	UsePythondatastructures–lists,tuples&dictionariesforrepresentingcompound data
CO5	To gain knowledge on files, exception, modules and packages in Python for solving problems

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS**
CO1	H			M		L			M		H	M			
CO2	H			M		L			M		H	M			
CO3	H			M		L			M		H	M			
CO4	H			M		L			M		H	M			
CO5	H			M		L			M		H	M			
Category	Basic Science (BS)														
Approval	47th Meeting of Academic Council														

U18ESME101	**ENGINEERING GRAPHICS & DESIGN**	**L**	**T**	**P**	**C**
	Total Contact Periods – 75	1	0	4	3
	Prerequisite – +12 Level Maths and Physical Science				
	Course Designed by – Department of MechanicalEngineering				
OBJECTIVES	To Prepare students to design a system, component, or process to meet desired needs, using the techniques, skills, and modern engineering tools necessary for engineering practice				

UNITI TRADITIONAL ENGINEERING GRAPHICS

Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry;Drawing Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.

UNITII COMPUTERGRAPHICS

Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modelling; Solid Modelling; Introduction to Building Information Modelling (BIM)

***(*Except the basic essential concepts, most of the teaching part can happen concurrently in the laboratory)**

UNITIII INTRODUCTION TOENGINEERINGDRAWING (9+2Hrs)

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain, Diagonal and Vernier Scales; Draw simple annotation, dimensioning and scale. Construction of Conic sections; Cycloid, Epicycloid, Hypo cycloid and Involute of circle;

UNITIV ORTHOGRAPHIC PROJECTIONS (10+2 Hrs)

Principles of Orthographic Projections; Conventions; Projections of points and Orthographic projection of lines in first quadrant - Parallel to both the planes – Perpendicular to oneplane – Parallel to one plane and inclined to other plane – Inclined to both the planes;Projections of planes inclined to either HP or VP;

UNITV PROJECTIONS OF REGULAR SOLIDS& ISOMETRIC PROJECTIONS (10+3Hrs)

Projection of solids in first quadrant – Prism, Pyramid, Cone and Cylinder inclined to one plane; Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions - Isometric Views of Simple Solids; Conversion of Isometric Views to Orthographic Viewsand Vice-versa;

UNITVI SECTIONSOF SOLIDS AND DEVELOPMENT OF SURFACE (10+3Hrs)

Sectional view of Prism, Cylinder, Pyramid, Cone (simple position in first quadrant) with cutting planesperpendicular to one plane and parallel or inclined to another plane– True shape ofsections;DevelopmentoflateralsurfacesofRightRegularSolids-Prism,Pyramid,Cylinder andCone;

UNITVII BUILDINGDRAWING (9+2Hrs)

Introductiontobuildingdrawing;TypesofProjectionadoptedinBuildingDrawing;Scalesfor various types of Drawings,Symbols, Conventions and Abbreviations.Drawing of residential single and two storied buildingswith detail of Line plan, Foundation Plan, Ground floor Plan, First floor plan, Elevation andSections

UNITVIII OVERVIEW OFCOMPUTERGRAPHICS (12+3Hrs)

IntroductiontoCAD;Basiccommands;Coordinatesystems;Settingupof**UNIT**sanddrawing limits; ISO and ANSI standards for coordinate dimensioning and tolerance; Orthographic constraints, Snap to objects manually and automatically; Setup a drawing with proper scale – Dimensioning commands, Editing Dimensions and Dimension text; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawingcircles;Createbasicdrawingofobjectssuchaspolygonandgeneralmulti-linefigures;

Creating orthographic views of simple solids like prism, pyramid, cylinder, cone. Drawing sectional views of prism, pyramid, cylinder and cone; Preparation of fabrication drawing (Development of surfaces); Drawing front view, top viewand side view of objects from the given pictorial view; Creation of 3-D models of simple objects.

TEXT BOOKS

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar PublishingHouse
2. Shah, M.B. &Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMHPublication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
5. (Corresponding set of) CAD Software Theory and UserManuals

COURSE OUTCOMES (COs)	
CO1	Students will gain Exposure to engineering communication.
CO2	Students will learn standards of engineering graphics.
CO3	Students will get Exposure to basics of building construction
CO4	Students will get Exposure to computer-aided geometric design
CO5	Student will gain basic knowledge and Exposure to the visual aspects of Engineering Design.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	H			M					M						
CO2	H			M					H						
CO3	H			L					M						
CO4	H			M					L						
CO5	H			M					M						
Category	Basic Science (BS)														
Approval	47th Meeting of Academic Council														

U18ESCS1L1	**PROBLEM SOLVING AND PYTHON PROGRAMMINGLABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	0	0	3	1.5
	Prerequisite – **PROBLEM SOLVING AND PYTHON PROGRAMMING**				
	Course Designed by – Department of Computer Science & Engineering				
OBJECTIVES: To enhance the practical knowledge on writing programs using Python					

LIST OF EXPERIMENTS FOR PROBLEM SOLVING AND PYTHON PROGRAMMING LAB

1. Compute the GCD of twonumbers.
2. Find the square root of a number (Newton‘smethod)
3. ExSOnentiation (SOwer of anumber)
4. Find the maximum of a list ofnumbers

5. Linear search and Binarysearch
6. Selection sort, Insertionsort
7. Mergesort
8. First n primenumbers
9. Multiplymatrices
10. Find the most frequentwords in a text read from a file
11. Simulate elliptical orbits inPygame
12. Simulate bouncing ball usingPygame
13. Simulate matrix operations withScilab
14. Simulate fitting curve with NumPy andMatplotlib

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux and Scilab

COURSE OUTCOMES (COs)	
CO1	Write, test, and debug simple Python programs.
CO2	Implement Python programs with conditionals and loops
CO3	Develop Python programs step-wise by defining functions and calling them
CO4	Use Python lists, tuples, dictionaries for representing compound data
CO5	Read and write data from/to files in Python and to simulate using the packages Scilab,NumPy and Matplotlib

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	H		M						M			M			
CO2	H		M						M			M			
CO3	H		M						M			M			
CO4	H		M						M			M			
CO5	H		M						M			M			
Category	Engg Sciences (ES)														
Approval	47th Meeting of Academic Council														

U18BSMA304	**PROBABILITY AND QUEUING THEORY**	**L**	**T**	**P**	**C**
	Total Contact Periods- 60	**3**	**1**	**0**	**4**
	Prerequisite – Basic knowledge in probability and statistics				
	Course Designed by : Department of Mathematics				
OBJECTIVE	➢ TodevelopanalyticalcapabilityandtoimpartknowledgeinStatistical methodsandQueuingtheoryandtheirapplicationsinEngineeringand Technology. ➢ To develop the knowledge of Statistical methods and its applications so as to appreciate them for solving real worldproblems.				

UNITI RANDOM VARIABLES (9+3)

Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions.

UNITII TWO – DIMENSIONALRANDOMVARIABLES (9+3)

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables.

UNITIII RANDOMPROCESSES (9+3)

Classification – Stationary process – Markov process – Poisson process – Discrete parameter Markov chain – Chapman Kolmogorov equations – Limiting distributions.

UNITIV QUEUINGMODELS (9+3)

Markovian queues – Birth and Death processes – Single and multiple server queueingmodels – Little's formula – Queues with finite waiting rooms – Queues with impatient customers: Balking and reneging.

UNITV ADVANCED QUEUINGMODELS (9+3)

Finite source models – M/G/1 queue – PollaczekKhinchin formula – M/D/1 and M/EK/1 as special cases – Series queues – Open Jackson networks.

TEXT BOOKS:

1. Ibe. O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007. [Units I toIII]
2. Gross.D.andHarris.C.M.,"FundamentalsofQueueingTheory",WileyStudentedition, 2004. [UnitsIV&V]

REFERENCES:

1. Robertazzi, "Computer Networks and Systems: Queueing Theory and Performance Evaluation",Springer,3rdEdition,2006.
2. HamdyA.Taha. "Operations Research", Pearson Education, Asia, 8th Edition,2007.
3. Trivedi.K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", John Wiley and Sons, 2nd Edition,2002.
4. HweiHsu,"Schaum'sOutlineofTheoryandProblemsofProbability,RandomVariables and Random Processes", Tata McGraw Hill Edition, New Delhi,2004.
5. Yates.R.D.andGoodman.D.J.,"ProbabilityandStochasticProcesses",WileyIndiaPvt. Ltd., Bangalore, 2nd Edition,2012.

COURSE OUTCOMES (COs)	
CO1	Understand the notations various types of random variables and probability distributions.
CO2	Apply the concepts of two dimensional random variables.
CO3	Explain the concepts of random processes.
CO4	Describe the basic concepts of queuingmodels
CO5	Analyze the extended models in advanced queuing models.
CO6	Apply probabilistic theory for real time problems.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	3	2							2				3		
CO2		3				1						1	3		
CO3	3				1					2		2	3		
CO4				1					3	2		2	3		
CO5	3	2				1						3	3		
CO6	3	2		1	1	1			3	2		3	3		
Category	Basic Sciences (BS)														

Approval	47th Meeting of Academic Council				
U18ESIT302	**PRINCIPLES OF COMMUNICATION SYSTEMS**	**L**	**T**	**P**	**C**
	Total Contact Periods – 45	3	0	0	3
	Prerequisite –Wave optics and Basic Electrical and Electronics system				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To Introduce Different Methods Of Analog Communication And TheirSignificance
- To Introduce Digital Communication Methods For High Bit RateTransmission
- To Introduce The Concepts Of Source And Line Coding Techniques ForEnhancing Rating Of Transmission Of Minimizing The Errors InTransmission.
- To Introduce MAC Used In Communication Systems For Enhancing The Number Of Users.
- To Introduce Various Media For Digital Communication

UNITI ANALOGCOMMUNICATION 9

Signals – Analog and Digital, Modulation Techniques- AM – Frequency Spectrum – Vector Representation – Power Relations – Generation Of AM – DSB, DSB/SC, SSB, VSB AM Transmitter & Receiver; FM And PM Techniques – Frequency Spectrum – Power Relations : Generation Of FM NBFM& WBFM, Amstrong Method & Reactance Modulations.

UNITII DIGITAL COMMUNICATION 9

Concepts Of Sampling And Sampling Theorems, Pulse Modulations:- PAM, PWM, PPM, PTM, Quantization And Coding : DCM, DM, Slope Overload Error. ADM, DPCM, OOK Systems – ASK, FSK, PSK, BSK, QPSK, QAM, MSK, GMSK, Applications Of Data Communication.

UNITIII INFORMATION THEORY 9

Primary Communication – Entropy, Properties, BEC, Source Coding :Shannon Fano, Huffman Coding : Noiseless Coding Theorem, BW – SNR Trade Off Codes: NRZ, RZ, AMI, HDBP, ABQ, Efficiency Of Transmissions, Error Control Codes And Applications: Convolutions & Block Codes.

UNITIV SPREAD SPECTRUM AND MULTIPLEACCESS METHODS 9

FDMA, TDMA, CDMA, SDMA ,**Spread Spectrum and Multiple Access Methods for wireless system engineering**

UNITV OPTICAL FIBER , SATELLITE,POWERLINE-SCADA 9

Fibers – Types: Sources, Detectors Used, Digital Filters, Optical Link - Orbits Types Of Satellites Frequency Used Link Establishment, MA Techniques Used In Satellite Communication, Earth Station; Aperture Actuators Used In Satellite – Intelsat and Insat, Power Line Carrier Communications-SCADA.

TEXT BOOKS:

1. Taub & Schiling “Principles Of Communication Systems” Tata McGraw Hill2007.
2. J.Das “Principles of Digital Communication” New Age International,1986.

REFERENCES:

1. Kennedy And Davis “Electronic Communication Systems” Tata McGraw Hill, 4th Edition,1993.
2. Sklar“DigitalCommunicationFundamentalsAndApplications“PearsonEducation,2001.

3. Bary Le, Memuschmidt, Digital Communication, Kluwer Publication,2004.
4. B.P.Lathi "Modern Digital And Analog Communication Systems" Oxford University Press,1998.
5. Frenzel 4thedn Electronic Communication Systems.

COURSE OUTCOMES (COs)	
CO1	Understand thebasic working of communication systems
CO2	Apply Analog modulation techniques and their comparative analysis and applications suitability
CO3	Evaluate process of modulation and demodulation, characterization and performance parameters of transmission channels
CO4	Understand Analog to digital conversion and Digital data transmission, Multiplexing Techniques.
CO5	Summarize the multiple access techniques used in satellite communication
CO6	Outline the fibre optical system used in communication

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	3	2							2					2	
CO2		3				1						1		2	
CO3	3				1					2		2		2	
CO4				1					3	2		2		2	
CO5	3	2		3	3	2						3		2	
CO6	3	2		3	3	2								2	
Category	Engineering Sciences (ES)														
Approval	48th meeting of the Academic Council														

U18PCIT303	**DATABASE MANAGEMENT SYSTEMS**	**L**	**T**	**P**	**C**
	Total Contact Periods - 45	3	0	0	3
	Prerequisite – Computer fundamentals				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To learn the fundamentals of data models and to represent a database system usingER diagrams.
- To study SQL and relational databasedesign.
- To understand the internal storage structures using different file andindexing techniques which will help in physical DBdesign.
- To understand the fundamental concepts of transaction processing- concurrencycontrol techniques and recoveryprocedures.
- To have an introductory knowledge about the Storage and Query processing Techniques

UNITI RELATIONAL DATABASES 10

Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL

UNITII DATABASE DESIGN 8

Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping–FunctionalDependencies–Non-lossDecomposition–First,Second,ThirdNormal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth NormalForm

UNITIII TRANSACTIONS 9

Transaction Concepts – ACID Properties – Schedules – Serializability – ConcurrencyControl – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery – Save Points – Isolation Levels – SQL Facilities for Concurrency and Recovery.

UNITIV IMPLEMENTATION TECHNIQUES 9

RAID–FileOrganization–OrganizationofRecordsinFiles–IndexingandHashing–Ordered Indices–B+treeIndexFiles–BtreeIndexFiles–StaticHashing–DynamicHashing–Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics and CostEstimation.

UNITV ADVANCEDTOPICS 9

Distributed Databases: Architecture, Data Storage, Transaction Processing – Object-based Databases: Object Database Concepts, Object-Relational features, ODMG Object Model, ODL, OQL – XML Databases: XML Hierarchical Model, DTD, XML Schema, XQuery – Information Retrieval: IR Concepts, Retrieval Models, Queries in IR systems.

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, ―Database System Concepts‖, Sixth Edition, Tata McGraw Hill,2011.
2. Ramez Elmasri, Shamkant B. Navathe, ―Fundamentals of Database Systems‖, Sixth Edition, Pearson Education,2011.

REFERENCES:

1. C.J.Date, A.Kannan, S.Swamynathan, ―An Introduction to Database Systems‖, Eighth Edition, Pearson Education,2006.
2. RaghuRamakrishnan,―DatabaseManagementSystems‖,FourthEdition,McGraw-Hill College Publications,2015.
3. G.K.Gupta,"DatabaseManagementSystems‖,TataMcGrawHill,2011. 4.

COURSE OUTCOMES (COs)	
CO1	Analyze the modern and futuristic database applications based on size andcomplexity
CO2	Apply queries using normalization criteria and optimize queries
CO3	Understand the transactions concepts and concurrency
CO4	Explain the indexing strategies in different database systems
CO5	Discuss the key challenges of advanced database systems
CO6	Evaluate how advanced databases differ from traditional databases

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	3	2		3	1	3			3	3	2		3		
CO2	3	1		3	1	3			3	3	2		3		
CO3	2	1		3	1	3			3	3	2		3		
CO4	2	2		3	1	3			3	3	2		3		
CO5	2	2		3	3	3			3	3	2		3		
CO6	2	2		3	3	3			3	3	2		3		
Category	Professional Core (PC)														
Approval	48th meeting of the Academic Council														

U18PCIT304	**DATA STRUCTURES AND ALGORITHMS**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	3	0	0	3
	Prerequisite – Fundamentals of Programming Language				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To understand the concepts ofADTs
- To learn linear data structures – lists, stacks, andqueues
- To understand sorting, searching and hashingalgorithms
- To apply Tree and Graphstructures

UNITI LINEAR DATA STRUCTURES– LIST 12

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation —singly linked lists- circularly linked lists- doubly-linked lists – applications of lists –Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal).

UNITII LINEAR DATA STRUCTURES –STACKS, QUEUES 12

Stack ADT – Operations – Applications – Evaluating arithmetic expressions- Conversion of Infix to postfix expression – Queue ADT – Operations – Circular Queue – Priority Queue – deQueue –applications of queues.

UNITIII NON LINEAR DATA STRUCTURES–TREES 12

Tree ADT – tree traversals – Binary Tree ADT – expression trees – applications of trees – binary search tree ADT –Threaded Binary Trees- AVL Trees – B-Tree – B+ Tree – Heap – Applications of heap.

UNITIV NON LINEAR DATA STRUCTURES– GRAPHS 12

Definition – Representation of Graph – Types of graph – Breadth-first traversal – Depth-first traversal – Topological Sort – Bi-connectivity – Cut vertex – Euler circuits – Applications of graphs.

UNITV SEARCHING, SORTING ANDHASHINGTECHNIQUES 12

Searching- Linear Search – Binary Search. Sorting – Bubble sort – Selection sort – Insertion sort–Shellsort–Radixsort.Hashing-HashFunctions–SeparateChaining–OpenAddressing – Rehashing – Extendible Hashing.

TEXT BOOKS:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson

Education,1997.
2. Reema Thareja, “Data Structures Using C”, Second Edition , Oxford University Press, 2011

REFERENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, “Introduction to Algorithms”, Second Edition, Mcgraw Hill,2002.
2. Aho, Hopcroft and Ullman, “Data Structures and Algorithms”, PearsonEducation,1983.
3. Stephen G. Kochan, “Programming in C”, 3rd edition, PearsonEducation.
4. EllisHorowitz,SartajSahni,SusanAnderson-Freed,“FundamentalsofDataStructuresin C”, Second Edition, University Press,2008

COURSE OUTCOMES (COs)	
CO1	Understand linear data structures linked list and their applications.
CO2	Demonstrate the linear data structures such as stacks, queues and their applications.
CO3	Apply the non-linear data structures such as trees, graphsin real time applications.
CO4	Analyze the various searching techniques
CO5	Evaluate the various sorting algorithms and hashingtechnique
CO6	Describe the overview of hashing techniques

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	3	2		3		2				3				3	
CO2	2	2		3		2				3				3	
CO3	3	2		3		2				3		3		3	
CO4	3	2		3		2				3		3		3	
CO5	2	2		3		2				3		3		3	
CO6	2	2		3		2				3		3		3	
Category	Professional Core (PC)														
Approval	48th meeting of the Academic Council														

U18PCIT305	**OBJECT ORIENTED ANALYSIS AND DESIGN**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	3	0	0	3
	Prerequisite – Computer Fundamentals				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To learn the basics of OO analysis and designskills.
- To learn the UML designdiagrams.
- To learn to map design tocode.
- To be exposed to the various testingtechniques.

UNITI UML DIAGRAMS 9

Introduction to OOAD – Unified Process – UML diagrams – Use Case – Class Diagrams– Interaction Diagrams – State Diagrams – Activity Diagrams – Package, component and Deployment Diagrams.

UNITII DESIGNPATTERNS 9

GRASP: Designing objects with responsibilities – Creator – Information expert – Low Coupling – High Cohesion – Controller – Design Patterns – creational – factory method – structural – Bridge – Adapter – behavioural – Strategy – observer.

UNITIII CASE STUDY 9

Case study – the Next Gen POS system, Inception -Use case Modeling – Relating Use cases – include, extend and generalization – Elaboration – Domain Models – Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class Hierarchies – Aggregation and Composition.

UNITIV APPLYINGDESIGNPATTERNS 9

System sequence diagrams – Relationship between sequence diagrams and use cases Logical architecture and UML package diagram – Logical architecture refinement – UML class diagrams – UML interaction diagrams – Applying GoF design patterns.

UNITV CODINGANDTESTING 9

Mapping design to code – Testing: Issues in OO Testing – Class Testing – OO Integration Testing – GUI Testing – OO System Testing.

TEXT BOOK:

1. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", Third Edition, Pearson Education, 2005.

REFERENCES:

1. SimonBennett,SteveMcRobbandRayFarmer,"ObjectOrientedSystemsAnalysisand Design Using UML", Fourth Edition, Mc-Graw Hill Education, 2010.
2. Erich Gamma, and Richard Helm, Ralph Johnson, John Vlissides, "Design patterns: Elements of Reusable Object-Oriented Software", Addison-Wesley,1995.
3. Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling La**ova**nguage", Third edition, Addison Wesley,2003.
4. Paul C. Jorgensen, "Software Testing:- A Craftsman's Approach", Third Edition, Auerbach Publications, Taylor and Francis Group,2008

COURSE OUTCOMES (COs)	
CO1	Explain OOAD concepts and various UML diagrams
CO2	Understand the object-oriented approach to analyze and select the appropriate design patterns
CO3	Illustrate about domain models and conceptual classes
CO4	Use Unified modeling Language notations to apply effective and efficient system design patterns.
CO5	Formulate the problem and designing solutions for real time projects
CO6	Compare and contrast the various testing techniques

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	1	3		3	3	2			3					3	
CO2	1	3		3	3	2			3					3	

CO3	1	3		3	3	2			3					3	
CO4	1	3		3	3	2			3					3	
CO5	1	3		3	3	2			3	3	3	3		3	
CO6	1	3		3	3	2			3					3	
Category	Professional Core (PC)														
Apprl	48th meeting of the Academic Council														

U18PCIT306	**COMPUTER ARCHITECTURE**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	3	0	0	3
	Prerequisite – Computer Fundamentals				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To learn the basic structure and operations of acomputer.
- To learn the arithmetic and logic unit and implementation of fixed-point and floating point arithmeticunit.
- To learn the basics of pipelinedexecution.
- To understand parallelism and multi-coreprocessors.
- To understand the memory hierarchies, cache memories and virtualmemories.
- To learn the different ways of communication with I/Odevices.

UNITI BASIC STRUCTURE OF ACOMPUTER SYSTEM 9

Functional Units – Basic Operational Concepts – Performance – Instructions: Language ofthe Computer–Operations,Operands–Instructionrepresentation–Logicaloperations–decision making – MIPSAddressing.

UNITII ARITHMETIC FOR COMPUTERS 9

Addition and Subtraction – Multiplication – Division – Floating Point Representation – Floating Point Operations – Subword Parallelism

UNITIII PROCESSOR AND CONTROL UNIT 9

A Basic MIPS implementation – Building a Data path – Control Implementation Scheme – Pipelining – Pipelined data path and control – Handling Data Hazards & Control Hazards – Exceptions.

UNITIV PARALLELISIM 9

Parallel processing challenges – Flynn‘s classification – SISD, MIMD, SIMD, SPMD, and Vector Architectures – Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors – Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers and other Message-Passing Multiprocessors.

UNITV MEMORY &I/O SYSTEMS 9

MemoryHierarchy–memorytechnologies–cachememory–measuringandimprovingcache performance – virtual memory, TLB‘s – Accessing I/O Devices – Interrupts – Direct Memory Access – Bus structure – Bus operation – Arbitration – Interface circuits –USB.

TEXT BOOKS:

1. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier,2014.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, Computer Organization and Embedded Systems, Sixth Edition, Tata McGraw Hill,2012.

REFERENCES:

1. WilliamStallings,ComputerOrganizationandArchitecture–DesigningforPerformance, Eighth Edition, Pearson Education, 2010.
2. John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012.
3. John L. Hennessey and David A. Patterson, Computer Architecture – A Quantitative Approach‖, Morgan Kaufmann / Elsevier Publishers, Fifth Edition,2012.

COURSE OUTCOMES (COs)	
CO1	Understand the fundamental organization of computer system, operations and instructions.
CO2	Design arithmetic and logic unit in computer architecture.
CO3	Explain the concepts of pipelined execution and design control unit.
CO4	Understand parallel processing architectures and GPU.
CO5	Describethe variousmemory systems and its hierarchies.
CO6	Demonstrate the different ways of communication with I/O devices

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	3		3	3	2	3	1	3			3	1	3		
CO2	3		3	3	2	3	1	3			3	1	3		
CO3	3		2	3	2	3	1	3			3	1	3		
CO4	3		3	3	2	3	1	3			3	1	3		
CO5	2		3	3	2	3	1	3			3	3	3		
CO6	3		3	3	2	3	1	3			3	3	3		
Category	Professional Core (PC)														
Apprl	48th meeting of the Academic Council														

U18PCIT3L1	**DATABASE MANAGEMENT SYSTEMS LAB**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	0	0	3	1.5
	Prerequisite – Computer fundamentals				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To understand data definitions and data manipulationcommands
- To learn the use of nested and joinqueries
- To understand functions, procedures and procedural extensions of databases
- To be familiar with the use of a front endtool
- To understand design and implementation of typical databaseapplications

LIST OF EXERCISES:

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Controlstatements
2. Database Querying – Simple queries, Nested queries, Sub queries andJoins

3. Views, Sequences,Synonyms
4. Database Programming: Implicit and Explicit Cursors
5. Procedures andFunctions
6. Triggers
7. ExceptionHandling
8. Database Design using ER modeling, normalization and Implementation for any application
9. Database Connectivity with Front EndTools
10. Case Study using real life databaseapplications

COURSE OUTCOMES (COs)	
CO1	Construct data definitions and manipulation commands.
CO2	Design applications to test Nested and Join Queries
CO3	Implement simple applications that use the concept of Views
CO4	Design applications that require a Front-end Tool, ER Modelling
CO5	Analyze the use of Tables, Cursors, Views, Functions, Procedures and Triggers
CO6	Design and implement typical real time database applications

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	2	3		3		1	1		3	3	3	3		3	
CO2	2	3		3		2	3		3	3	3	3		3	
CO3	2	3		3		3	3		3	3	3	3		3	
CO4	2	3		3		3	3		3	3	3	3		3	
CO5	3	3		3		3	3		3	3	3	3		3	
CO6	3	3		3		3	3		3	3	3	3		3	
Category	Professional Core (PC)														
Apprl	48th meeting of the Academic Council														

U18PCIT3L2	**OBJECT ORIENTED PROGRAMMING LAB**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	0	0	3	1.5
	Prerequisite – Computer fundamentals				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To build software development skills using java programming for real-worldapplications.
- To understand and apply the concepts of classes, packages, interfaces, arraylist,exception handling and fileprocessing.
- To develop applications using generic programming and eventhandling.

LIST OF EXPERIMENTS

1. Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month

reading, type of EB connection (i.e domestic or commercial). Compute the bill amount using the followingtariff.

If the type of the EB connection is domestic, calculate the amount to be paid as follows:

- First 100 units – Rs. 1 per unit
- 101-200 units – Rs. 2.50 perunit
- 201 -500 units – Rs. 4 per unit
- 501 units – Rs. 6 perunit

If the type of the EB connection is commercial, calculate the amount to be paid as follows:

- First 100 units – Rs. 2 per unit
- 101-200 units – Rs. 4.50 perunit
- 201 -500 units – Rs. 6 per unit
- 501 units – Rs. 7 perunit

2. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa) , time converter (hours to minutes, seconds and vice versa) usingpackages.
3. Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, AssistantProfessor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.
4. Design a Java interface for ADT Stack. Implement this interface using array.Provide necessary exception handling in both theimplementations.
5. Write a program to perform string operations using ArrayList. Write functions for the following
   a. Append – add atend
   b. Insert – add at particularindex
   c. Search
   d. List all string starts with givenletter
6. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
7. Write a Java program to implement user defined exceptionhandling.
8. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file inbytes.
9. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value iseven, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of thenumber.
10. Write a java program to find the maximum value from the given type of elements using a genericfunction.
11. Design a calculator using event-driven programming paradigm of Java with the followingoptions.
    a) Decimalmanipulations
    b) Scientificmanipulations
12. Develop a mini project for any application using Javaconcepts.

COURSE OUTCOMES (COs)	
CO1	Construct Java programs for simple applications that make use of classes
CO2	Develop and implement Java programs for simple applications that make use of packages and interfaces.
CO3	Implement array list using Java
CO4	Design Java applicationsusing generic programming, exception handling and multithreading
CO5	Implement the concept of file processing in Java
CO6	Develop real time applications using Java concepts

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	1	2	3	4	5	6	7	8	9	10	11	12	PS 01	PS 02	PS 03
CO1	1	3		3	3	2			3	3	3	3		3	
CO2	1	3		3	3	2			3	3	3	3		3	
CO3	1	3		3	3	2			3	3	3	3		3	
CO4	1	3		3	3	2			3	3	3	3		3	
CO5	1	3		3	3	2			3	3	3	3		3	
CO6	1	3		3	3	2			3	3	3	3		3	
Category	Professional Core (PC)														
Apprl	48th meeting of the Academic Council														

U18PCIT3L3	DATA STRUCTURES LAB	L	T	P	C
	Total Contact Periods:45	0	0	3	1.5
	Prerequisite – Computer Fundamentals				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To implement linear and non-linear data structures
- To understand the different operations of searchtrees
- To implement graph traversalalgorithms
- To get familiarized to sorting and searchingalgorithm

LIST OF EXPERIMENTS

1. Array implementation of Stack and QueueADTs
2. Array implementation of ListADT
3. Linked list implementation of List, Stack and Queue ADTs
4. Applications of List, Stack and QueueADTs
5. Implementation of Binary Trees and operations of BinaryTrees
6. Implementation of Binary SearchTrees
7. Implementation of AVLTrees
8. Implementation of Heaps using PriorityQueues.
9. Graph representation and Traversal algorithms
10. Applications ofGraphs
11. Implementation of searching and sortingalgorithms
12. Hashing – any two collisiontechniques

COURSE OUTCOMES (Cos)

CO1	Apply the concepts of linear data structures such as list, stacks, queues and linked list.
CO2	Implement non-linear data structure operations
CO3	Construct functions to implement Graph and Tree Traversal algorithms
CO4	Design programs based on the concept of sorting and searching techniques
CO5	Design and apply structures with Hashing techniques
CO6	Identify the appropriate data structure for any given problem

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	1	2	3	4	5	6	7	8	9	10	11	12	PS 01	PS 02	PS 03
CO1	3	2		3		2				3				3	
CO2	2	2		3		2				3				3	
CO3	3	2		3		2				3		3		3	
CO4	3	2		3		2				3		3		3	
CO5	2	2		3		2				3		3		3	
CO6	2	3		3		2				3		3		3	
Category	Professional Core (PC)														
Approval	48th meeting of the Academic Council														

U18BSMA403	**DISCRETE MATHEMATICS**	**L**	**T**	**P**	**C**
	Total Contact Periods - 60	**3**	**1**	**0**	**4**
	Prerequisite – School Level Mathematics				
	Course Designed by:- Dept ofMathematics				
OBJECTIVES	Throughout the course, students will be expected to demonstrate their understanding of Discrete Mathematics by being able to do use mathematically correct terminology and notation, construct correct direct and indirect proofs, apply logical reasoning to solve a varietyof problems and introduce simple concepts in graph theory.				

UNITI MATHEMATICALLOGIC (9+3)

Propositions and logic operators –Truth table – Equivalence – Implications – Tautologies – Laws of logic – Proofs in Propositional calculus – Inference theory – Predicate calculus.

UNITII RELATION ANDFUNCTIONS (9+3)

Different types of relations: Binary Relation – Partial Ordering Relation – Equivalence Relation – Sum and Product of Functions – bijective functions – Inverse and Composite Function

UNITIII RECURRENCERELATIONS (9+3)

Recurrence relations – solving recurrence relation – Homogeneous and non–homogeneous recurrence relation – Generating Functions – Groups – Properties – cyclic groups and subgroups cosets – Lagrange's theorem.

UNITIV GRAPHTHEORY (9+3)

IntroductionofGraphs–Graphterminology–RepresentationofGraphs–Connectivity–Euler and Hamilton path – Euler and Hamilton cycles – the Travelling sales man problem – Graph Isomorphism

UNITV BOOLEANALGEBRA (9+3)

Boolean algebra – Partial order Relations on Boolean algebra – Boolean homomorphism – Disjunctive and conjunctive normal forms – Boolean functions.

TEXT BOOKS

1. Tremblay J.P and Manohar. R, "Discrete Mathematical Structures with Application to Computer Science", McGraw Hill Book Company, International Edition,1987
2. Kenneth H. Rosen, "Discrete Mathematics and its Applications", McGraw Hill Book Company1999.

REFERENCE BOOKS

1. RalphP.,Grimaldi,"DiscreteandCombinatorialMathematics",PearsonEducation,Fifth Edition, New Delhi.2008
2. Venkataraman M.K, Discrete Mathematics", The National Publishing Company2000.
3. T. Veerarajan, "Discrete Mathematics", Mc Graw Hill Publications,2006.

COURSE OUTCOMES (COs)	
CO1	DefineandanalyzethefundamentalMathematicalConceptssuchassetsrelations, andfunctions.
CO2	Learn the steps in proportional and Predicate logic.
CO3	Exposetotheconceptofrecurrencerelations,generatingfunctions,group,andcyclic groups,subgroups.
CO4	Define the terminologies of graph and develop the given problems as graph networks and solve with techniques of graph theory.
CO5	Understand the terminologies of Boolean algebra and mathematical induction,
CO6	EvaluateBooleanfunctionsandsimplifyexpressionsusingthepropertiesofBoolean algebra.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	3	2	3	1		3	1	1	1	3	1		3		
CO2	3	3		2	3	2		3	2		2	1	3		
CO3	3	2	1		2	2		2	2		2	1	3		
CO4	3	2	2		2	1	2		1	2	1		3		
CO5	3	2		2		2	2	1	2	1	2	1	3		
CO6	3	2	2	2	2	2	2	1	2	1	2	1	3		
Category	Basic Science (BS)														
Approval	48th meeting of the Academic Council														

	WEB PROGRAMMING	**L**	**T**	**P**	**C**
	Total Contact Periods:45	3	0	0	3

U18PCIT401	Prerequisite – Internet Programming
	Course Designed by:- Dept of Information Technology

OBJECTIVES

- To understand the concepts and architecture of the World WideWeb.
- To understand and practice mark uplanguages
- To understand and practice embedded dynamic scripting on client side Internet Programming
- To understand and practice web development techniques onclient-side

UNITI SCRIPTING 9

WebpageDesigningusingHTML-Scriptingbasics-Clientsideandserversidescripting.Java Script-Object, names, literals, operators and expressions- statements and features- events - windows - documents - frames - data types - built-in functions- Browser object model - Verifying forms.-HTML5- CSS3- HTML 5 canvas - Web site creation usingtools.

UNITII JAVA 9

Introduction to object oriented programming-Features of Java – Data types, variables and arrays – Operators – Control statements – Classes and Methods – Inheritance. Packages and Interfaces–ExceptionHandling–MultithreadedProgramming–Input/Output–Files–Utility Classes – StringHandling.

UNITIII JDBC 9

JDBCOverview–JDBCimplementation–Connectionclass–Statements-CatchingDatabase Results,handlingdatabaseQueries.Networking–InetAddressclass–URLclass-TCPsockets - UDP sockets, Java Beans–RMI.

UNITIV APPLETS 9

Javaapplets-Lifecycleofanapplet–Addingimagestoanapplet–Addingsoundtoanapplet.Passing parameters to an applet.Event Handling. Introducing AWT: Working with Windows GraphicsandText.UsingAWTControls,LayoutManagersandMenus.Servlet–lifecycleof a servlet.The Servlet API, Handling HTTP Request and Response, using Cookies, Session Tracking.Introduction toJSP.

UNITV XML ANDWEB SERVICES 9

Xml – Introduction-Form Navigation-XML Documents- XSL – XSLT- Web services-UDDI-WSDL-Java web services – Web resources.

TEXT BOOKS:

1. Harvey Deitel, Abbey Deitel, Internet and World Wide Web: How To Program 5th Edition.
2. Herbert Schildt, Java - The Complete Reference, 7th Edition. Tata McGraw- HillEdition.
3. Michael Morrison XML Unleashed Tech mediaSAMS.

REFERENCES:

1. John Pollock, Javascript - A Beginners Guide, 3rd Edition –- Tata McGraw-HillEdition.
2. Keyur Shah, Gateway to Java Programmer Sun Certification, Tata McGraw Hill,2002.
3. http://speckyboy.com/2015/01/12/free-**web**-design-**ebooks**-2014

COURSE OUTCOMES (COs)	
CO1	Acquire knowledge about functionalities of world wide web

CO2	Explore markup languages features and design interactive web pages using them
CO3	Experiment Client side validation using scripting languages
CO4	Implement Open source JavaScript library functions
CO5	Design front end web page and connect to the back end databases
CO6	Explain the functions of client and servers on Web.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	1	2	3	4	5	6	7	8	9	10	11	12	PS 01	PS 02	PS 03
CO1	1		3	2	2	2				2					3
CO2	1		3	2	2	2				2					3
CO3	1		3	2	2	2				2		2			3
CO4	1		3	2	2	2						2			3
CO5	1		3	2	2	2						2			3
CO6	1		3	2	2	2						2			
Category	Professional Core (PC)														
Approval	48th meeting of the Academic Council														

U18PCIT402	**OPERATING SYSTEM PRINCIPLES**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	3	0	0	3
	Prerequisite – Computer Organization and Architecture				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

To understand basic operating system controls the computing resources and provide services to the users. This course provides an introduction to the operating system functions, design and implementation.

UNITI OPERATINGSYSTEMSOVERVIEW 9

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.-ComputerSystemOrganization-OperatingSystemStructureandOperations-System Calls, System Programs, OS Generation and SystemBoot.

UNITII PROCESSMANAGEMENT 9

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.

UNITIII STORAGE MANAGEMENT 9

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.

UNITIV I/O SYSTEMS 9

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.

UNITV CASE STUDY 9

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", 9th Edition, John Wiley and Sons Inc., 2012.

REFERENCES:

1. William Stallings, "Operating Systems – Internals and Design Principles", 7th 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. DMDhamdhere,"OperatingSystems:AConcept-BasedApproach",SecondEdition,Tata McGraw-Hill Education,2007.
5. https://www.free-**ebooks**.net/**ebook**/The-Easy-Guide-to-**Operating-Systems**

COURSE OUTCOMES (COs)	
CO1	Recall the fundamental components of a computer operating system, Basics of operating system principles and System calls. Define process state and scheduler. List mass storage devices. Recall the concepts of storage allocation strategies, files system and Linux System.
CO2	Describe, discuss, and explain the policies for scheduling, deadlocks, memory management, synchronization, system calls, file systems and virtualization concepts.
CO3	Demonstrate and execute basic system calls, Schedulers, Memory management systems, Virtual Memory and Paging systems.
CO4	Examine and Experiment the performance of scheduling algorithm, memory management strategies and disk storage structures
CO5	Design and develop Linux multifunction server and Local network services
CO6	Develop Virtualization Concept in OS by setting Up Xen, VMware on Linux Host and Adding Guest OS

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	3	3	2	2						2			1		1
CO2		3	2	2						2			2		2
CO3		3	2	2						2			2		2
CO4		3	2	2						2			2	2	2
CO5	3				2							2	2		2
CO6	3		3		2	3		2				2	2		2
Category	Professional Core (PC)														

Approval	48th meeting of the Academic Council

U18PCIT403	SOFTWARE ENGINEERING METHODOLOGIES	L	T	P	C
	Total Contact Periods:45	3	0	0	3
	Prerequisite – Fundamentals of Computing and Programming				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To learn about generic models of software developmentprocess.
- TounderstandfundamentalconceptsofrequirementsengineeringandAnalysisModeling.
- To understand the different design techniques and theirimplementation.
- To learn various testing and maintenancemeasures.

UNITI SOFTWARE PROCESS ANDPROJECTMANAGEMENT 9

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models – Software Project Management: Estimation – LOC and FP Based Estimation, COCOMO Model – Project Scheduling – Scheduling, Earned Value Analysis - Risk Management.

UNITII REQUIREMENTS ANALYSISAND SPECIFICATION 9

Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management-Classical analysis: Structured system Analysis, Petri Nets- Data Dictionary.

UNITIII RE DESIGN 9

Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design – Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components.

UNITIV TESTINGAND IMPLEMENTATION 9

Software testing fundamentals-Internal and external views of Testing-white box testing -basis path testing-control structure testing-black box testing- Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing And Debugging – Software Implementation Techniques: Codingpractices-Refactoring.

UNITV PROJECT MANAGEMENT 9

Estimation – FP Based, LOC Based, Make/Buy Decision, COCOMO II - Planning – Project Plan, Planning Process, RFP Risk Management – Identification, Projection, RMMM - Scheduling and Tracking –Relationship between people and effort, Task Set & Network, Scheduling, EVA - Process and Project Metrics.

TEXT BOOKS:

1. Roger S. Pressman, “Software Engineering – A Practitioner‟s Approach”, Seventh Edition, Mc Graw-Hill International Edition, 2010.

REFERENCES:

1. Ian Sommerville, “Software Engineering”, 9th Edition, Pearson Education Asia,2011.
2. RajibMall,“FundamentalsofSoftwareEngineering”,ThirdEdition,PHILearningPrivate Limited,2009.
3. Pankaj Jalote, “Software Engineering, A Precise Approach”, Wiley India,2010.
4. Kelkar S.A., “Software Engineering”, Prentice Hall of India Pvt Ltd,2007.
5. Stephen R.Schach, “Software Engineering”, Tata McGraw-Hill Publishing Company Limited,2007.
6. http://www.onlineprogrammingbooks.com/**software-engineering**

COURSE OUTCOMES (COs)	
CO1	Explain the basic concept of Software engineering and Estimation models.
CO2	Understand the concepts of software requirements, analysis and specification.
CO3	Design various software models
CO4	Understand the basic concepts of testing and its implementation.
CO5	Implement and deploy the software.
CO6	Apply the project management in software engineering tasks.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	3	1							2	2	2	2	3		
CO2	3	1							2	2	2	2	3		
CO3	3	1							2	2	2	2	3		
CO4	3	1							2	2	2	2	3		
CO5	3	1							2	2	2	2	3		
CO6	3	1							2	2	2	2	3		
Category	Professional Core (PC)														
Approval	48th meeting of the Academic Council														

U18ESIT404	**DIGITAL SYSTEM DESIGN**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	3	0	0	3
	Prerequisite – Basic Electrical and Electronics Engg				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES:

- To introduce the concept of digital and binarysystems
- To design and analyze combinational logiccircuits.
- To design and analyze sequential logic circuits.
- Tounderstandthebasicsoftwaretoolsforthedesignandimplementationofdigitalcircuits andsystems.

UNITI BOOLEAN ALGEBRA ANDLOGICGATES 9

Review of Number Systems – Arithmetic Operations – Binary Codes – Boolean Algebra and Theorems – Boolean Functions – Simplification of Boolean Functions using Karnaugh Map and Tabulation Methods – Logic Gates – NAND and NOR Implementations.

UNITII COMBINATIONALLOGIC 9

Combinational Circuits – Analysis and Design Procedures – Circuits for Arithmetic Operations, Code Conversion – Decoders and Encoders – Multiplexers and Demultiplexers – Introduction to HDL– HDL Models of Combinational circuits.

UNITIII SYNCHRONOUS SEQUENTIAL LOGIC 9

Sequential Circuits – Latches and Flip Flops – Analysis and Design Procedures – State Reduction and State Assignment – Shift Registers – Counters – HDL for Sequential Logic Circuits.

UNITIV ASYNCHRONOUS SEQUENTIAL LOGIC 9

Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race-free State Assignment – Hazards.

UNITV MEMORY ANDPROGRAMMABLE LOGIC 9

RAMandROM–MemoryDecoding–ErrorDetectionandCorrection–ProgrammableLogic Array – Programmable Array Logic – Sequential Programmable Devices – Application Specific Integrated Circuits.

TEXT BOOK:

1 MorrisManoM.andMichaelD.Ciletti,"DigitalDesign",IVEdition,PearsonEducation, 2008.

REFERENCES:

1. John F. Wakerly, "Digital Design Principles and Practices", Fourth Edition, Pearson Education,2007.
2. Charles H. Roth Jr, "Fundamentals of Logic Design", Fifth Edition – Jaico Publishing House, Mumbai,2003.
3. Donald D. Givone, "Digital Principles and Design", Tata Mcgraw Hill,2003.
4. Kharate G. K., "Digital Electronics", Oxford University Press,2010.

COURSE OUTCOMES (COs)	
CO1	Understand the basic concepts of Boolean algebra and to simplify the Boolean expression using K-Map and Tabulation techniques.
CO2	Demonstrate Boolean simplification techniques and to design a combinational hardware circuit.
CO3	Design and analyze given digital circuit – Synchronous sequential.
CO4	Experiment and analyze given digital circuit – Asynchronous sequential.
CO5	Describe memory and programmable logics.
CO6	Implement Application Specific Integrated Circuits

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1		3	3						2	2					2
CO2		3	3						2	2					2
CO3	2	3	3						2	2					2
CO4	2	3	3						2	2					2
CO5	2	2	2						2	2					2
CO6	2	2	2						2	2					2

Category	Engineering Sciences (ES)
Approval	48th meeting of the Academic Council

U18PCIT405	**DATA COMMUNICATION AND COMPUTER NETWORKS**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	3	0	0	3
	Prerequisite – Computer Fundamentals				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- Togettheideaofchoosingtherequiredfunctionalityateachlayerforagivenapplication
- To trace the flow of information from one node to another node in thenetwork.
- To understanding of division of network functionalities in tolayers
- To understand the component required to build different types ofnetworks
- To identify the solution for the functionalities in eachlayer.

UNIT IAPPLICATION LAYER **9**

Network Architecture – Layers - HTTP – DNS – E-Mail (SMTP, MIME, POP3, IMAP, Web Mail), FTP, Telnet - SNMP.

UNIT IITRANSPORT LAYER **9**

User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Flow Control – Congestion Control – Queuing - Discipline Introduction to Quality of services (QOS).

UNIT IIINETWORKLAYER **9**

Circuit Switching - Packet Switching Virtual Circuit Switching – IP – ARP – DHCP – ICMP – Routing – RIP – OSPF – Subnetting – CIDR – Interdomain Routing – BGP – IPV6 Basic Features – Inter Domain Multicast – Congestion Avoidance in Network Layer.

UNIT IV DATALINKLAYER **9**

Channel access on links – SDMA – TDMA – FDMA – CDMA – Hybrid Multiple Access Techniques – Issues in the Data Link Layer – Framing - Error correction and detection – Link Level Flow Control – Medium Access – Ethernet – Token Ring – FDDI – Wireless LAN – Bridges and Switches.

UNIT VDATA COMMUNICATIONS **9**

Data Transmission – Transmission Media – Signal Encoding Techniques – Multiplexing – Spread Spectrum.

TEXT BOOKS:

1. James F. Kurose, Keith W. Ross, “Computer Networking, A Top-Down Approach Featuring the Internet”, Third Edition, Pearson Education,2006.
2. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Fifth Edition, Morgan Kaufmann Publishers Inc., 2011.
3. William Stallings, “Data and Computer Communications”, Eighth Edition, Pearson Education,2011.

REFERENCES:

1. Nader F. Mir, “Computer and Communication Networks”, First Edition, Pearson

Education,2007.
2. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach “, McGraw Hill Publisher, 2011.
3. Behrouz A. Forouzan, “Data communication and Networking”, Tata McGraw-Hill,2004.

COURSE OUTCOMES (COs)	
CO1	Understand basic concepts of computer network technology.
CO2	Explain Data Communications System and its components.
CO3	Classify the different types of network topologies and protocols.
CO4	Discuss the layers of the OSI model and TCP/IP and to explain the function(s) of each layer.
CO5	Understand the different types of network devices and their functions.
CO6	Apply signal Encoding techniques

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	2			3	2					2			3		
CO2		1		2						2			1		
CO3	2				3	3				2			3		
CO4	1	1	2	2						2			1		
CO5	1		3		1					2			2		
CO6		1								2			1		
Category	Professional Core (PC)														
Approval	48th meeting of the Academic Council														

U18PCIT4L1	**DATA COMMUNICATION AND COMPUTER NETWORKS LAB**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	0	0	3	1.5
	Prerequisite – TCP/IP Principles and Architectures				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- Toanalyzeacommunicationsystembyseparatingoutthedifferentfunctionsprovidedby thenetwork;
- To understand that there are fundamental limits to any communicationssystem;
- To understand the general principles behind multiplexing, addressing, routing, reliable transmission and other stateful protocols as well as specific examples ofeach;
- To understand what FEC is and how CRCs work;
- To compare communications systems in how they solve similarproblems;
- To have an informed view of both the internal workings of the Internet and of a number of common Internet applications andprotocols.

List of Experiments:

1. PC to PCCommunication
2. Parallel Communication using 8 bit parallelcable
3. Serial communication using RS 232CEthernet LANprotocol

4. To create scenario and study the performance of CSMA/CD protocol through simulation
   Token bus and token ring protocols
5. To create scenario and study the performance of token bus and token ring protocols throughsimulation
6. Wireless LAN protocols
7. To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CDprotocols.
8. Implementation and study of stop and waitprotocol
9. Implementation and study of Goback-N and selective repeatprotocols
10. Implementation of distance vector routingalgorithm
11. Implementation of Link state routingalgorithm
12. Implementation of Data encryption anddecryption
13. Transfer of files from PC to PC using Windows / Unix socketprocessing

References:

1. http://www.iconscope.net/**network-laboratory**-manual.pdf

COURSE OUTCOMES (COs)	
CO1	Use knowledge to implement client server applications.
CO2	Develop skills in UNIX socket programming.
CO3	Develop skills to use simulation tools.
CO4	Analyse the performance of network protocols and network traffic.
CO5	Analyse the performance of various network tools and network programming
CO6	Implement encryption and decryption techniques

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1			2	2					2	2				1	1
CO2			2	2					2	2				1	
CO3			2	2					2	2				2	L
CO4			2	2						2				1	
CO5			2	2						2				2	
CO6			2	2						2				1	
Category	Professional Core (PC)														
Approval	48th meeting of the Academic Council														

U18PCIT4L2	**WEB PROGRAMMING LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	0	0	3	1.5
	Prerequisite – Internet Programming				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To understand program basic functions in Javascript andDHTML
- To use Javascript and DHTML to create web pages with advancedinteractivity
- To use variables, conditionals, and loops in Javascript and DHTMLprograms
- To use Javascript to control browser frames, windows and to create functionalforms
- To use Cascading Style Sheets (CSS) to design web pages and to create web pages with specialized fonts and designelements

LIST OF EXPERIMENTS:

1. Write a html program for Creation of web site with forms, frames, links, tablesetc
2. Design a web site using HTML and DHTML. Use Basic text Formatting,Images,
3. Createascriptthatasks theuserforaname,thengreetstheuserwith"Hello"andtheuser name on thepage
4. Create a script that collects numbers from a page and then adds them up and prints them to a blank field on thepage.
5. Create a script that prompts the user for a number and then counts from 1 to that number displaying only the oddnumbers.
6. Create a script that will check the field in Assignment 1 for data and alert the user if it is blank. This script should run from abutton.
7. Using CSS for creating websites
8. CreatingsimpleapplicationtoaccessdatabaseusingJDBCFormattingHTMLwithCSS.
9. Program for manipulating Databases andSQL.
10. Program using PHP databasefunctions.
11. Writeawebapplicationthatfunctionsasasimplehandcalculator,butalsokeepsa"paper trail" of all your previouswork
12. Install Tomcat and use JSP and link it with any of the assignmentsabove
13. Reading and Writing the files using.Net
14. Write a program to implement web service for calculatorapplication
15. Implement RMI concept for building any remote method of yourchoice.

References:

1. http://docsfiles.com/**pdf_web_programming_lab**_manual.html

COURSE OUTCOMES (COs)	
CO1	Understand the basic concepts of the internet and insights of internet programming.
CO2	Demonstrate the important HTML tags for designing static pages.
CO3	Design web pages using Cascading Style Sheets.
CO4	Demonstrate HTML web pages accessing database using JDBC.
CO5	Select web application development software tools i.e. Ajax, PHP and XML etc.
CO6	Identify the environments currently available on the market to design web sites.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1		1	3	2	2					2					3
CO2		1	3	2	2					2					3

CO3		1	3	2	2				2	2					3
CO4		1	3	2	2				2	2					3
CO5		1	3	2	2				2	2		2			3
CO6		1	3	2	2				2	2		2			3
Category	Professional Core (PC)														
Approval	48th meeting of the Academic Council														

U18PCIT4L3	**OPERATING SYSTEM DESIGN LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	0	0	3	1.5
	Prerequisite – Operating System				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- Understand the basics of operating systems like kernel,shell, types and views of operatingsystems
- Describe the various CPU scheduling algorithms and removedeadlocks.
- Explain various memory management techniques and concept ofthrashing
- Use disk management and disk scheduling algorithms for better utilization of external memory.
- Recognize file system interface, protection and securitymechanisms.
- Explain the various features of distributed OS like Unix, Linux, windowsetc

LIST OF EXPERIMENTS:

1. Basics of UNIXcommands.
2. ShellProgramming.
3. Implement the following CPU schedulingalgorithms
   a) Round Robin b) SJF c) FCFS d)Priority
4. Implement all file allocation strategies
   a) Sequential b) Indexed c)Linked
5. ImplementSemaphores
6. Implement all File Organization Techniques

a) Single level directory b) Two level c) Hierarchical d)DAG

7. Implement Bankers Algorithm for Dead LockAvoidance
8. Implement an Algorithm for Dead Lock Detection
9. Implement e all page replacementalgorithms
   a) FIFO b) LRU c) LFU
10. Implement Shared memory andIPC
11. Implement Paging Technique of memorymanagement.
12. Implement Threading & SynchronizationApplications

Reference:

1.http://www.faadooengineers.com/threads/5366-**Operating-System-ebook**

COURSE OUTCOMES (COs)	
CO1	Demonstrate the basics of operating systems like kernel, shell, types and views of operating systems.
CO2	Implement the various CPU scheduling algorithms and remove deadlocks.
CO3	Analyse various memory management techniques and concept of thrashing

CO4	Explain disk management and disk scheduling algorithms for better utilization of external memory.
CO5	Evaluate file system interface
CO6	Evaluate protection and security Mechanisms

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	1	2	3	4	5	6	7	8	9	10	11	12	PS 01	PS 02	PS 03
CO1	2	2	2						2			2		2	
CO2	2	3	3						2			2		2	
CO3	2	3	3						2			2		2	
CO4	2	3	3									2		2	
CO5	2	3	3		2						2	2		2	
CO6	2	3	3		2						2	2		2	
Category	Professional Core (PC)														
Approval	48th meeting of the Academic Council														

U18PCIT501	**DATA MINING**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	3	0	0	3
	Prerequisite – Database Management System				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To understand data warehouse concepts, architecture, business analysis andtools
- To understand data pre-processing and data visualizationtechniques
- To study algorithms for finding hidden and interesting patterns indata
- To understand and apply various classification and clustering techniques usingtools.

UNITI DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINE ANALYTICALPROCESSING(OLAP) 9

Basic Concepts – Data Warehousing Components – Building a Data Warehouse – Database Architectures for Parallel Processing – Parallel DBMS Vendors – Multidimensional Data Model–DataWarehouseSchemasforDecisionSupport,ConceptHierarchies-Characteristics of OLAP Systems – Typical OLAP Operations, OLAP andOLTP.

UNITII DATA MINING–INTRODUCTION 9

Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques – Issues – applications- Data Objects and attribute types, Statistical description of data,DataPreprocessing–Cleaning,Integration,Reduction,Transformationanddiscretization , Data Visualization, Data similarity and dissimilarity measures.

UNITIII DATA MINING – FREQUENTPATTERNANALYSIS 9

Mining Frequent Patterns, Associations and Correlations – Mining Methods- Pattern Evaluation Method – Pattern Mining in Multilevel, Multi Dimensional Space – Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns

UNITIV CLASSIFICATION ANDCLUSTERING 9

DecisionTreeInduction–BayesianClassification–RuleBasedClassification–Classification by Back Propagation – Support Vector Machines — Lazy Learners – Model Evaluation and Selection-Techniques to improve Classification Accuracy. Clustering Techniques – Cluster analysis-PartitioningMethods–HierarchicalMethods–DensityBasedMethods–GridBased Methods – Evaluation of clustering – Clustering high dimensional data- Clustering with constraints, Outlier analysis-outlier detectionmethods.

UNITV WEKA TOOL 9

Datasets – Introduction, Iris plants database, Breast cancer database, Auto imports database – Introduction to WEKA, The Explorer – Getting started, Exploring the explorer, Learning algorithms, Clustering algorithms, Association–rule learners.

TEXT BOOK:

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

REFERENCES:

1. Alex Berson and Stephen J.Smith, ―Data Warehousing, Data Mining & OLAP‖, Tata McGraw – Hill Edition, 35th Reprint2016.
2. K.P.Soman,ShyamDiwakarandV.Ajay,―InsightintoDataMiningTheoryandPractice, Eastern Economy Edition, Prentice Hall of India,2006.
3. Ian H.Witten and Eibe Frank, ―Data Mining: Practical Machine Learning Tools and Techniques, Elsevier, SecondEdition.

COURSE OUTCOMES (COs)	
CO1	Explain the basic concepts of data warehouse, business analysis and OLAP system
CO2	Implement suitable pre-processing and visualization techniques for data analysis
CO3	Demonstrate the frequent pattern and association rule mining techniques for data analysis
CO4	Interpret appropriate classification and clustering techniques for data analysis
CO5	Understand the roles that data mining plays in various fields and manipulate different data mining techniques
CO6	Apply data mining algorithms to build analytical applications

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	1	1	2	3	3	2			3	3		2	3		
CO2	1	1	2	3	3	2			3	3		2	3		
CO3	1	1	2	3	3	2			3	3		2	3		
CO4	1	1	2	3	3	2			3	3		2	3		
CO5	1	1	2	3	3	2			3	3		2	3		
CO6	1	1	2	3	3	2			3	3		2	3		
Category	Professional Core (PC)														
Approval	48th meeting of the Academic Council														

U18PCIT502	MOBILE COMMUNICATION	L	T	P	C
	Total Contact Periods:45	3	0	0	3
	Prerequisite – Computer Networks				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To understand the basic concepts of mobilecomputing.
- To learn the basics of mobile telecommunication system.
- To be familiar with the network layer protocols and Ad-Hocnetworks.
- To know the basis of transport and application layerprotocols.
- To gain knowledge about different mobile platforms and applicationdevelopment.

UNITI INTRODUCTION 9

Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing – Spread spectrum -MAC Protocols – SDMA- TDMA- FDMA- CDMA

UNITII MOBILE TELECOMMUNICATION SYSTEM 9

Introduction to Cellular Systems – GSM – Services & Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security –GPRS-UMTS – Architecture – Handover – Security

UNITIII MOBILE NETWORKLAYER 9

Mobile IP – DHCP – AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols – DSR, AODV , Hybrid routing –ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks (VANET) –MANET Vs VANET – Security.

UNITIV MOBILE TRANSPORT ANDAPPLICATION LAYER 9

MobileTCP–WAP–Architecture–WDP–WTLS–WTP–WSP–WAE–WTAArchitecture – WML

UNITV MOBILE PLATFORMS AND APPLICATIONS 9

Mobile Device Operating Systems – Special Constraints & Requirements – Commercial MobileOperatingSystems–SoftwareDevelopmentKit:iOS,Android,BlackBerry,Windows Phone – MCommerce – Structure – Pros & Cons – Mobile Payment System – SecurityIssues

TEXT BOOKS:

1. Jochen Schiller, ―Mobile Communications‖, PHI, Second Edition,2003.
2. PrasantKumarPattnaik,RajibMall,―FundamentalsofMobileComputing‖,PHILearning Pvt.Ltd, New Delhi –2012

REFERENCES

1. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems",Thomson Asia Pvt Ltd, 2005.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, ―Principles of Mobile Computing‖, Springer,2003.
3. William.C.Y.Lee,―Mobile Cellular Telecommunications-Analog and Digital Systems‖, Second Edition,TataMcGraw Hill Edition,2006.
4. C.K.Toh,―AdHocMobileWirelessNetworks‖,FirstEdition,PearsonEducation,2002.

5. Android Developers :http://developer.android.com/index.html

COURSE OUTCOMES (COs)	
CO1	Eexplain the basics concepts of mobile telecommunication systems.
CO2	Describe generations of telecommunication systems in wireless network.
CO3	Examine the functionality of MAC, network layer and to Identify a routing protocol for a given Ad hoc network
CO4	Classify the functionality of Transport and Application layers
CO5	Sketch a mobile application using android/blackberry/ios/Windows SDK
CO6	Identify the limitations of 2G and 2.5G wireless mobile communication and use design of 3Gand beyond mobile communication systems

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	1	2	3	4	5	6	7	8	9	10	11	12	PS 01	PS 02	PS 03
CO1	2	2		3	3	1			3	1		2		2	
CO2	2	2		3	3	1			3	1		2		2	
CO3	2	2		3	3	1			3	1		2		2	
CO4	2	2		3	3	1			3	1		2		2	
CO5	2	2		3	3	1			3	1		2		2	
CO6	2	2		3	3	1			3	1		2		2	
Category	Professional Core (PC)														
Approval	48th meeting of the Academic Council														

U18PCIT503	PRINCIPLES OF ARTIFICIAL INTELLIGENCE	L	T	P	C
	Total Contact Periods:45	3	0	0	3
	Prerequisite – Computer fundamentals				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To understand the various characteristics of Intelligent agents
- To learn the different search strategies inAI
- To learn to represent knowledge in solving AIproblems
- To understand the different ways of designing softwareagents
- To know about the various applications ofAI.

UNITI INTRODUCTION 9

Introduction–Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents–Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

UNITII PROBLEMSOLVING METHODS 9

Problem solving Methods – Search Strategies- Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems – Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing – Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games

UNITIII KNOWLEDGE REPRESENTATION 9

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering-CategoriesandObjects–Events–MentalEventsandMentalObjects–ReasoningSystemsfor Categories – Reasoning with Default Information

UNITIV SOFTWARE AGENTS 9

Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.

UNITV APPLICATIONS 9

AIapplications–LanguageModels–InformationRetrieval-InformationExtraction–Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning –Moving

TEXT BOOKS:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition,2009.
2. I. Bratko, ―Prolog: Programming for Artificial Intelligence‖, Fourth edition, Addison-Wesley Educational Publishers Inc.,2011.

REFERENCES:

1. M.TimJones,―ArtificialIntelligence:ASystemsApproach(ComputerScience)‖,Jones and Bartlett Publishers, Inc.; First Edition, 2008
2. Nils J. Nilsson, ―The Quest for Artificial Intelligence‖, Cambridge University Press,2009.
3. WilliamF.ClocksinandChristopherS.Mellish,‖ProgramminginProlog:UsingtheISO Standard‖, Fifth Edition, Springer,2003.

COURSE OUTCOMES (COs)	
CO1	Classify the basic concepts of AI and Problem Solving Approach to Typical AI problems
CO2	Operate the apt agent strategy to solve a given problem
CO3	Design software agents to solve a problem
CO4	Explainapplications for NLP that use Artificial Intelligence
CO5	Describe the architecture for Intelligent Agents and agent communication
CO6	Demonstrate fundamental understanding of the history of artificial intelligence (AI) and itsfoundations.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	3	2		3	3			2	3	2	1	2		3	
CO2	3	2		3	3			2	3	2	1	2		3	
CO3	3	2		3	3			2	3	2	1	2		3	
CO4	3	2		3	3			2	3	2	1	2		3	
CO5	3	2		3	3			2	3	2	1	2		3	
CO6	3	2		3	3			2	3	2	1	2		3	

Category	Professional Core (PC)
Approval	48th meeting of the Academic Council

U18PCIT504	**THEORY OF COMPUTATION**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	3	0	0	3
	Prerequisite – Mathematics-set theory				
	Course Designed by:- Dr.A,Kumaravel, Dept of Information Technology				

OBJECTIVES

- To understand the languagehierarchy
- To construct automata for any given pattern and find its equivalent regularexpressions
- To design a context free grammar for any givenlanguage
- To understand Turing machines and theircapability
- To understand un decidable problems and NP classproblems.

UNITI AUTOMATAFUNDAMENTALS 9

Introduction to formal proof – Additional forms of Proof – Inductive Proofs –Finite Automata – Deterministic Finite Automata – Non-deterministic Finite Automata – Finite Automata with EpsilonTransitions

UNITII REGULAR EXPRESSIONSAND LANGUAGES 9

Regular Expressions – FA and Regular Expressions – Proving Languages not to be regular – Closure Properties of Regular Languages – Equivalence and Minimization of Automata.

UNITIII CONTEXT FREE GRAMMAR AND LANGUAGES 9

CFG – Parse Trees – Ambiguity in Grammars and Languages – Definition of the Pushdown Automata – Languages of a Pushdown Automata – Equivalence of Pushdown Automata and CFG, Deterministic Pushdown Automata.

UNITIV PROPERTIES OF CONTEXTFREE LANGUAGES 9

Normal Forms for CFG – Pumping Lemma for CFL – Closure Properties of CFL – Turing Machines – Programming Techniques for TM.

UNITV UNDECIDABILITY 9

Non Recursive Enumerable (RE) Language – Undecidable Problem with RE – Undecidable Problems about TM – Post‘s Correspondence Problem, The Class P and NP.

TEXT BOOK:

1. J.E.Hopcroft, R.Motwani and J.D Ullman, ―Introduction to Automata Theory, Languages and Computations‖, Second Edition, Pearson Education,2003.

REFERENCES:

1. H.R.Lewis and C.H.Papadimitriou, ―Elements of the theory of Computation, Second Edition, PHI,2003.
2. J.Martin, ―Introduction to Languages and the Theory of Computation, Third Edition, TMH, 2003.
3. Micheal Sipser, ―Introduction of the Theory and Computation, Thomson Brokecole,

1997

COURSE OUTCOMES (COs)	
CO1	Create automata, regular expression for any pattern.
CO2	Design Context free grammar for any construct.
CO3	Construct Turing machines for regular language and non regular languages.
CO4	Select the decidable problems NP Hard Problems
CO5	Identify the concepts of normal forms and Programming Techniques for TM
CO6	Demonstrate advanced knowledge of formal computation and its relationship to languages

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	1	2	3	4	5	6	7	8	9	10	11	12	PS 01	PS 02	PS 03
CO1	3	3	2	1	1			1	3	2	2	2	3		
CO2	3	3	2	1	1			1	3	2	2	2	3		
CO3	3	3	2	1	1			1	3	2	2	2	3		
CO4	3	3	2	1	1			1	3	2	2	2	3		
CO5	3	3	2	1	1			1	3	2	2	2	3		
CO6	3	3	2	1	1			1	3	2	2	2	3		
Category	Professional Core (PC)														
Approval	48th meeting of the Academic Council														

U18PCIT5L1	DATA MINING LAB	L	T	P	C
	Total Contact Periods:45	0	0	3	1.5
	Prerequisite – Database management system				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To be familiar with the algorithms of datamining,
- To be acquainted with the tools and techniques used for knowledge discoveryin databases.
- To be exposed to web mining and textmining
-

LIST OF EXPERIMENTS:

- Creation of a DataWarehouse.
- AprioriAlgorithm.
- FP-GrowthAlgorithm.
- K-MeansClustering.
- One Hierarchical ClusteringAlgorithm.
- BayesianClassification.
- DecisionTree.
- Support VectorMachines.
- Applications of Classification for WebMining.
- Case Study on Text Mining or Any CommercialApplication.

COURSE OUTCOMES (COs)	
CO1	Demonstrate data mining techniques and methods to large data sets.
CO2	Compare and contrast the various classifiers use Data Mining Tools
CO3	Select association rules, Classification algorithms
CO4	Implement K-Means Clustering, one hierarchical clustering algorithm
CO5	Operate case Study on text mining or any commercial application
CO6	Execute the knowledge retrieved through solving problems

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	1	2	3	4	5	6	7	8	9	10	11	12	PS 01	PS 02	PS 03
CO1	1	1	2	3	3	2			3	3		2		3	
CO2	1	1	2	3	3	2			3	3		2		3	
CO3	1	1	2	3	3	2			3	3		2		3	
CO4	1	1	2	3	3	2			3	3		2		3	
CO5	1	1	2	3	3	2			3	3		2		3	
CO6	1	1	2	3	3	2			3	3		2		3	
Category	Professional Core (PC)														
Approval	48th meeting of the Academic Council														

U18PCIT5L2	IT- WORKSHOP LAB	L	T	P	C
	Total Contact Periods:45	0	0	3	1.5
	Prerequisite – Matrix manipulation				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To be familiar with the MATLAB GUI and basic toolboxes
- To be exposed to vector and matrix operations
- To be familiar with arithmetic, logical and relational operations onmatrix

LIST OF EXPERIMENTS:

1. Introduction to SDK ofMATLAB
2. Basic Syntax and scalar arithmetic operations and calculations
3. Working withformulas
4. Arithmetic operations in matrixdata
5. Matrix operations (Inverse,Transpose)
6. Reading an imagefile
7. Reading from and writing to a textfile
8. Introduction totoolboxes
9. Data visualization andplotting
10. Relational operators indata
11. Logical operation indata
12. Loops inMATLAB
13. Computing Eigen value for amatrix
14. Random number generation – Monte carlomethods

REFERENCES:

1. Holly Moore, " MATLAB for Engineers" Third Edition – PearsonPublications
2. Stephen J. Chapman, "MATLAB Programming for Engineers" Fourth Edition –Thomson learning.

COURSE OUTCOMES (COs)	
CO1	Implement data handling in MATLAB environment and to solve simple matrix problems.
CO2	Operate built-in toolboxes and be familiar with arithmetic, logical and relational operations on matrix
CO3	Design to vector and matrix operations and be familiar with the MATLAB GUI and basic tool boxes
CO4	Recognize Knowledge in Data visualization and plotting
CO5	Report with Random number generation – Monte carlo methods
CO6	Formulate and control simple plot and user-interface graphics objects in MATLAB.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	2	2	1	3	3			1	3	1	1	2		3	
CO2	2	2	1	3	3			1	3	1	1	2		3	
CO3	2	2	1	3	3			1	3	1	1	2		3	
CO4	2	2	1	3	3			1	3	1	1	2		3	
CO5	2	2	1	3	3			1	3	1	1	2		3	
CO6	2	2	1	3	3			1	3	1	1	2		3	
Category	Professional Core (PC)														
Approval	48th meeting of the Academic Council														

U18PCIT601	**GRID AND CLOUD COMPUTING**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	3	0	0	3
	Prerequisite – Distributed System				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To identify the technical foundations of cloudsystemsarchitectures. Analyze the problems and solutions to cloud applicationproblems.
- To apply principles of best practice in cloud application design andmanagement.
- To identify and define technical challenges for cloud applications and assess their importance

UNITI INTRODUCTION 9

Evolution of Distributed computing: Scalable computing over the Internet – Technologies for networkbasedsystems–clustersofcooperativecomputers–GridcomputingInfrastructures– cloud computing – service oriented architecture – Introduction to Grid Architecture and standards –

Elements of Grid – Overview of GridArchitecture.

UNITII GRIDSERVICES 9

Introduction to Open Grid Services Architecture (OGSA) – Motivation – Functionality Requirements–Practical&DetailedviewofOGSA/OGSI–Dataintensivegridservicemodels – OGSAservices.

UNITIII VIRTUALIZATION 9

Cloud deployment models: public, private, hybrid, community – Categories of cloud computing:Everythingasaservice:Infrastructure,platform,software–ProsandConsofcloud computing – Implementation levels of virtualization – virtualization structure – virtualization ofCPU,MemoryandI/Odevices–virtualclustersandResourceManagement–Virtualization for data centerautomation.

UNITIV PROGRAMMINGMODEL 9

Open source grid middleware packages – Globus Toolkit (GT4) Architecture , Configuration – Usage of Globus – Main components and Programming model – Introduction to Hadoop Framework – Map reduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job – Design of Hadoop file system, HDFS concepts, command line and java interface, dataflow of File read & Filewrite.

UNITV SECURITY 9

Trust models for Grid security environment – Authentication and Authorization methods – Gridsecurityinfrastructure–CloudInfrastructuresecurity:network,hostandapplicationlevel – aspects of data security, provider data and its security, Identity and access management architecture,IAMpracticesinthecloud,SaaS,PaaS,IaaSavailabilityinthecloud,Keyprivacy issues in thecloud.

TEXT BOOKS:

1. Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, "Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet", First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.

REFERENCES:

1. Jason Venner, "Pro Hadoop- Build Scalable, Distributed Applications in the Cloud", A Press,2009
2. Tom White, "Hadoop The Definitive Guide", First Edition. O'Reilly,2009
3. Bart Jacob (Editor), "Introduction to Grid Computing", IBM Red Books, Vervante,2005
4. Ian Foster, Carl Kesselman, "The Grid: Blueprint for a New Computing Infrastructure", 2nd Edition, MorganKaufmann
5. Frederic Magoules and Jie Pan, "Introduction to Grid Computing" CRC Press,2009

COURSE OUTCOMES (COs)	
CO1	Implement grid computing techniques to solve large scale scientific problems.
CO2	Understand and apply the concept of virtualization.
CO3	Use the grid and cloud tool kits.
CO4	Apply the security models in the grid and the cloud environment.
CO5	Discuss about the basic concepts of Trust models for Grid security environment.
CO6	Describe the basic concepts of Trust models for Cloud Infrastructure security.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1			1	3	3	1				1		2			2
CO2			1	3	3	1				1		2			2
CO3			1	3	3	1				1		2			2
CO4			1	3	3	1				1					2
CO5			1	3	3	1				1					2
CO6			1	3	3	1				1					2
Category	Professional Core (PC)														
Approval	48th meeting of the Academic Council														

U18PCIT602	**HUMAN COMPUTER INTERACTION**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	3	0	0	3
	Prerequisite – Artificial Intelligence				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To design, implement and evaluate effective and usable graphical computerinterfaces.
- To describe and apply core theories, models and methodologies from the field ofHCI.
- To describe and discuss current research in the field ofHCI.
- To implement simple graphical user interfaces using the Java Swingtoolkit.
- To describe special considerations in designing user interfaces for olderadults.

UNITI FOUNDATIONS OFHCI 9

The Human: I/O Channels – Memory – Reasoning And Problem Solving; The Computer: Devices – Memory – Processing And Networks; Interaction: Models – Frameworks – Ergonomics – Styles – Elements – Interactivity- Paradigms.

UNITII DESIGN & SOFTWARE PROCESS 9

InteractiveDesignBasics –Process–Scenarios–Navigation–ScreenDesign–IterationAnd Prototyping. HCI In Software Process – Software Life Cycle – Usability Engineering – Prototyping In Practice – Design Rationale. Design Rules – Principles, Standards, Guidelines, Rules. Evaluation techniques – UniversalDesign.

UNITIII MODELSAND THEORIES 9

Cognitive Models –Socio-Organizational Issues And Stake Holder Requirements – Communication And Collaboration Models-Hypertext, Multimedia And WWW.

UNITIV MOBILEHCI 9

Mobile Ecosystem: Platforms, Application Frameworks- Types Of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements Of Mobile Design, Tools

UNITV WEB INTERFACE DESIGN 9

DesigningWebInterfaces–Drag&Drop,DirectSelection,ContextualTools,Overlays,Inlays And Virtual Pages, Process Flow - CaseStudies.

TEXT BOOK

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004 (UNIT I , II &III)
2. Brian Fling, "Mobile Design And Development", First Edition , O"Reilly Media Inc., 2009 (UNIT–IV)

COURSE OUTCOMES (COs)	
CO1	Apply effective dialog For Human Computer Interaction.
CO2	Implement HCI for common individuals and persons with disabilities.
CO3	Describe the importance of user feedback.
CO4	Explain the HCI implications for designing multimedia/ ecommerce/ e-learning web sites.
CO5	Design and develop appropriate user interface.
CO6	Develop context based user experience models.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	1	2	2										2		
CO2	1	2	2							3		3	2		
CO3	1	2	2							3		3	2		
CO4	1	2	2										2		
CO5	1	2	2										2		
CO6	1	2	2										2		
Category	Professional Core (PC)														
Approval	48th meeting of the Academic Council														

U18PCIT603	**DATA ANALYTICS**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	3	0	0	3
	Prerequisite – Data Mining Techniques				
	Course Designed by:- Dr.A.Kumarvel, Dept of Information Technology				

OBJECTIVES

- To designing the tables and graphs that will be used to display the results before any numerical analysis is started can help focus the statisticalwork.
- Tounderstandthecombinationofdepthsandtimestocomparebetweentreatments,and include in the tables or graphs, may be fixed by theobjectives.

UNITI INTRODUCTION TO BIGDATA 8

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, Statically Concepts: Sampling Distributions, Resampling, Statistical Inference, Prediction Error.

UNITII DATA ANALYSIS 12

Regression Modeling, Multivariate Analysis, Bayesian Modeling, Inference And Bayesian Networks, Support Vector And Kernel Methods, Analysis Of Time Series: Linear Systems Analysis, Nonlinear Dynamics – Rule Induction – Neural Networks: Learning And Generalization, Competitive Learning, Principal Component Analysis And Neural Networks; Fuzzy Logic: Extracting Fuzzy Models From Data, Fuzzy Decision Trees, Stochastic Search Methods.

UNITIII MININGDATA STREAMS 8

Introduction To Streams 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 – Real Time Sentiment Analysis, Stock Market Predictions.

UNITIV FREQUENT ITEMSETSANDCLUSTERING 9

MiningFrequentItemsets–MarketBasedModel–AprioriAlgorithm–HandlingLargeData Sets InMain Memory – Limited Pass Algorithm – Counting Frequent Item sets In A Stream – Clustering Techniques – Hierarchical – K- Means – Clustering High Dimensional Data – CLIQUE And PROCLUS – Frequent Pattern Based Clustering Methods – Clustering In Non-Euclidean Space – Clustering For Streams AndParallelism.

UNITV FRAMEWORKSAND VISUALIZATION 9

MapReduce–Hadoop,Hive,MapR–Sharding–NoSQLDatabases–S3–HadoopDistributed File Systems – Visualizations – Visual Data Analysis Techniques, Interaction Techniques; Systems and Applications

TEXT BOOKS:

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
2. Anand Rajaraman And Jeffrey David Ullman, Mining Of Massive Datasets,Cambridge University Press,2012.

REFERENCES:

1. Bill Franks, Taming The Big Data Tidal Wave: Finding Opportunities In Huge Data Streams With Advanced Analystics, John Wiley & Sons,2012.
2. GlennJ.Myatt,MakingSenseOfData,JohnWiley&Sons,2007PeteWarden,BigData Glossary, O‟Reilly,2011.
3. Jiawei Han, Micheline Kamber “Data Mining Concepts And Techniques”, Second Edition, Elsevier, Reprinted2008.

COURSE OUTCOMES (COs)	
CO1	Understand the concepts of Big Data framework.
CO2	Apply different ways of Data Analysis.
CO3	Apply stream data model.
CO4	Implement different data mining techniques.
CO5	Understand the technologies Map Reduce-Hadoop, MapR, Hive,NoSQL for big data analytics
CO6	Demonstrate visualization techniques.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1		2	2	3	3					2			3		
CO2		2	2	3	3					2			3		
CO3		2	2	3	3					2			3		
CO4		2	2	3	3							2	3		
CO5		2	2	3	3							2	3		
CO6		2	2	3	3							2	3		
Category	Professional Core (PC)														
Approval	48th meeting of the Academic Council														

U18PCIT6L1	**DATA ANALYTICS LAB**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	0	0	3	1.5
	Prerequisite – Data mining techniques				
	Course Designed by:- Dr.A.Kumarvel, Dept of Information Technology				

OBJECTIVES

- To learn the probability distributions and density estimations to perform analysis of various kinds ofdata.
- ToexplorethestatisticalanalysistechniquesusingPythonandRprogramminglanguages.

LIST OF EXPERIMENTS:

1. *Install, Configure and Run Hadoop AndHdfs*
2. Implement Word Count / Frequency Programs Using Mapreduce
3. Implement a Mr Program That Processes a Weather Dataset
4. Implement Linear and LogisticRegression
5. Implement Svm / Decision Tree ClassificationTechniques
6. Implement ClusteringTechniques
7. Visualize Data Using Any PlottingFramework
8. Implement an Application That Stores Big Data In Hbase / Mongodb / Pig UsingHadoop

REFERENCES:

1. Bill Franks, Taming The Big Data Tidal Wave: Finding Opportunities In Huge Data Streams With Advanced Analystics, John Wiley & Sons,2012.
2. GlennJ.Myatt,MakingSenseOfData,JohnWiley&Sons,2007PeteWarden,BigData Glossary, O‟Reilly,2011.

COURSE OUTCOMES (COs)	
CO1	Understand single node and multi-node Hadoop Clusters
CO2	Develop Map Reduce programs.
CO3	Implement different data modeling techniques.
CO4	Implement different data mining techniques.
CO5	Experiment the data using plotting framework.
CO6	Demonstrate and execute application tools-Hbase, Mongodb, PIG.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	2		2	3	3					2			3		
CO2	2		2	3	3					2			3		
CO3	2		2	3	3					2			3		
CO4	2		2	3	3							2	3		
CO5	2		2	3	3							2	3		
CO6	2		2	3	3							2	3		
Category	Professional Core (PC)														
Approval	48th meeting of the Academic Council														

U18PCIT6L2	**GRID AND CLOUD COMPUTING LAB**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	0	0	3	1.5
	Prerequisite – Distributed System				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To exposed tool kits for grid and cloudenvironment.
- To familiar with developing web services/applications in gridframework
- To learn the run virtual machines of differentconfiguration.
- To learn to usehadoop

LIST OF EXPERIMENTS:

1. Develop a new Web Service forCalculator.
2. Develop new OGSA-compliant Web Service.
3. Using Apache Axis develop a GridService.
4. Develop applications using Java or C/C++ GridAPIs
5. Develop secured applications using basic security mechanisms available in Globus Toolkit.
6. Develop a Grid portal, where user can submit a job and get the result. Implement it with and without GRAMconcept.

COURSE OUTCOMES (COs)	
CO1	Develop anew Web Service for Calculator.
CO2	Execute New OGSA-Compliant Web Service.
CO3	Use Apache Axis and develop a Grid Service.
CO4	Demonstrate Applications using Java Or C/C++ Grid APIs
CO5	Develop Secured Applications using Basic Security Mechanisms available In Globus Toolkit.
CO6	Implement a Grid Portal, where user can submit a job and get the result. Implement it with and without GRAM Concept.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**

CO1		2	1	3										1	2
CO2		2	1	3										2	1
CO3		2	1	3										1	2
CO4		2	1	3										1	1
CO5		2	1	3										2	2
CO6		2	1	3										1	2
Category	Professional Core (PC)														
Approval	48th meeting of the Academic Council														

U18EEIT6L3	**SOFT SKILL**	**L**	**T**	**P**	**C**
	Total Contact Periods:30	0	0	2	1
	Prerequisite – English				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To develop inter personal skills and be an effective goal oriented teamplayer.
- To develop professionals with idealistic, practical and moralvalues.
- To develop communication and problem solvingskills.
- To re-engineer attitude and understand its influence onbehavior.

UNITI SELFANALYSIS 4

SWOT Analysis, Who am I, Attributes, Importance of Self Confidence, Self Esteem.

UNITII CREATIVITY 8

Out of box thinking, Lateral Thinking

UNITIII ATTITUDE 6

Factors influencing Attitude, Challenges and lessons from Attitude, Etiquette

UNITIV MOTIVATION 4

Factors of motivation, self talk, Intrinsic & Extrinsic Motivators.

UNITV GOAL SETTING 8

Wish List, SMART Goals, Blue print for success, Short Term, Long Term, Life Time Goals, Time Management Value of time, Diagnosing Time Management, Weekly Planner to do list, Prioritizing work. Extempore

TEXT BOOK:

1. SOFT SKILLS, 2015, Career Development Centre, Green Pearl Publications.

REFERENCE

1. CoveySean,SevenHabitsofHighlyEffectiveTeens,NewYork,FiresidePublishers,1998.
2. Carnegie Dale, How to win Friends and Influence People, New York: Simon & Schuster, 1998.
3. Thomas A Harris, I am ok, You are ok , New York-Harper and Row, 1972 4. Daniel Coleman, Emotional Intelligence, Bantam Book,2006

COURSE OUTCOMES (COs)

CO1	Develop inter personal skills and be an effective goal oriented team player.
CO2	Communicate effectively through verbal/oral communication, creative thinking and improve the listening skills.
CO3	Write precise briefs or reports and technical documents.
CO4	Participate in group discussion / meetings / interviews and prepare & deliver presentations
CO5	Set goals to become an effective individual, self-motivation.
CO6	Gain the knowledge of team work; develop Inter-personal relationships, conflict management and leadership quality.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	1	2	3	4	5	6	7	8	9	10	11	12	PS 01	PS 02	PS 03
CO1						1		2	3	3	1	3		2	
CO2						1		2	3	3	1	3		2	
CO3						1		2	3	3	1	3		2	
CO4						1		2	3	3	1	3		2	
CO5						1		2	3	3	1	3		2	
CO6						1		2	3	3	1	3		2	
Category	(EE)														
Approval	48th meeting of the Academic Council														

18PCIT701	**WIRELESS NETWORKS**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	3	0	0	3
	Prerequisite – Computer Networks				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To Study about Wireless Networks, Protocol Stack andStandards.
- To Study about Fundamentals of 3G Services, Its Protocols andApplications.
- To Study about Evolution of 4G Networks, Its Architecture andApplications.

UNIT-I WIRELESSLAN 9

Introduction-WLAN Technologies: Infrared, UHF Narrowband, Spread Spectrum - IEEE802.11: System Architecture, Protocol Architecture, Physical Layer, MAC Layer, 802.11b,802.11a–HiperLAN:WATM,BRAN,HiperLAN2–Bluetooth:Architecture,Radio Layer, Baseband Layer, Link Manager Protocol, Security – IEEE802.16-WIMAX: Physical Layer, MAC, Spectrum Allocation ForWIMAX

UNIT II MOBILENETWORKLAYER 9

Introduction–MobileIP:IPPacketDelivery,AgentDiscovery,TunnelingAndEncapsulation, IPV6-Network Layer In The Internet- Mobile IP Session Initiation Protocol – Mobile Ad-Hoc Network: Routing, Destination Sequence Distance Vector, Dynamic SourceRouting

UNIT III MOBILETRANSPORT LAYER 9

TCP Enhancements For Wireless Protocols – Traditional TCP: Congestion Control, Fast Retransmit/Fast Recovery, Implications Of Mobility – Classical TCP Improvements: Indirect

TCP, Snooping TCP, Mobile TCP, Time Out Freezing, Selective Retransmission, Transaction Oriented TCP – TCP Over 3G Wireless Networks.

UNIT IV WIRELESS WIDEAREANETWORK 9

Overview Of UTMS Terrestrial Radio Access Network-UMTS Core Network Architecture: 3G-MSC, 3G-SGSN, 3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High Speed Downlink Packet Access (HSDPA)- LTE Network Architecture And Protocol.

UNIT V4GNETWORKS 9

Introduction – 4G Vision – 4G Features And Challenges – Applications Of 4G – 4G Technologies: Multicarrier Modulation, Smart Antenna Techniques, OFDM-MIMO Systems, Adaptive Modulation And Coding With Time Slot Scheduler, Cognitive Radio.

TEXT BOOKS:

1. Jochen Schiller, ”Mobile Communications”, Second Edition, Pearson Education 2012.(UnitI,II,III)
2. Vijay Garg , “Wireless Communications And Networking”, First Edition, Elsevier 2007.(UnitIV,V)

REFERENCES:

1. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, “3G Evolution HSPA And LTE For Mobile Broadband”, Second Edition, Academic Press,2008.
2. Anurag Kumar, D.Manjunath, Joy Kuri, “Wireless Networking”, First Edition, Elsevier 2011.
3. Simon Haykin , Michael Moher, David Koilpillai, “Modern Wireless Communications”, First Edition, Pearson Education 2013.

COURSE OUTCOMES (COs)	
CO1	Understand the various protocols and standards of wireless communications.
CO2	Describe about the different wireless WAN architectures.
CO3	Describe the protocols for mobile network layer and routing in mobile ad-hoc network.
CO4	Illustrate the TCP enhancementsin mobile transport layer for wireless protocols.
CO5	Demonstrate the latest 3G/4G And Wi-MAX networks and its architecture.
CO6	Explain the 4G technologies and its applications.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	1	2	3	4	5	6	7	8	9	10	11	12	PS 01	PS 02	PS 03
CO1	2	1	1	1	1					2					2
CO2	3	2	2	2	1					2					3
CO3	2	1	1	1	1					2					2
CO4	2	1	1	1	1					2					2
CO5	3	2	2	2	1					2					3
CO6	2	1	1	1	1					2					2

Category	Professional Core (PC)
Approval	48th meeting of the Academic Council

U18PEIT011	**COMPUTER VISION**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	3	0	0	3
	Prerequisite – Matrix Manipulations				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To review image processing techniques for computervision.
- To understand shape and region analysis.
- To understand Hough Transform and its applications to detect lines, circles,ellipses
- To understand three-dimensional image analysis techniques and motionanalysis
- To study some applications of computer visionalgorithms

UNIT I IMAGE PROCESSING FOUNDATIONS

Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture.

UNIT II SHAPES AND REGIONS

Binaryshapeanalysis–connectedness–objectlabelingandcounting–sizefiltering–distance functions–skeletonsandthinning–deformableshapeanalysis–boundarytrackingprocedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments.

UNITIII HOUGH TRANSFORM

Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Irislocation–holedetection–generalizedHoughTransform(GHT)–spatialmatchedfiltering – GHT for ellipse detection – object location – GHT for featurecollation.

UNITIV 3D VISION ANDMOTION

Methodsfor3Dvision–projectionschemes–shapefromshading–photometricstereo–shape from texture – shape from focus – active range finding – surface representations –point-based representation – volumetric representations – 3D object recognition – 3Dreconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion.

UNITV APPLICATIONS

Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance –foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locatingpedestrians.

REFERENCES:

1. D.L.Baggioetal.,―MasteringOpenCVwithPracticalComputerVisionProjects‖,Packt Publishing,2012.
2. E.R.Davies,―Computer&MachineVision‖,FourthEdition,AcademicPress,2012.
3. Jan Erik Solem, ―Programming Computer Vision with Python: Tools and algorithmsfor analyzing images‖, O'Reilly Media,2012.
4. Mark Nixon and Alberto S. Aquado, ―Feature Extraction & Image Processing for Computer Vision‖, Third Edition, Academic Press,2012.
5. R. Szeliski, ―Computer Vision: Algorithms and Applications‖, Springer2011.
6. Simon J. D. Prince, ―Computer Vision: Models, Learning, and Inference‖, Cambridge University Press,2012.

COURSE OUTCOMES (COs)	
CO1	Implement fundamental image processing techniques required for computer vision
CO2	Perform shape analysis, Implement boundary tracking techniques, Apply chain codes and other region descriptors
CO3	Apply Hough Transform for line, circle, and ellipse detections
CO4	Apply 3D vision techniques
CO5	Implement motion related techniques
CO6	Develop applications using computer vision techniques

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	3	2	1	1	2	3						3	3		
CO2	1	2	1	1	1							3	3		
CO3	3	2	2	3	3				2			2	3		
CO4	3	2	2	3	3				2		2	2	3		
CO5	3	2	3	3	3	3			2		2	3	3		

CO6	3	2	3	3	3	3			2		2	3	3		
Category	Professional Core (PC)														
Approval	49th meeting of the Academic Council														

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U18PEIT012	**ADHOC AND SENSOR NETWORK**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	3	0	0	3
	Prerequisite – Computer Network				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

The student should be made to:

- Understand the design issues in ad hoc and sensornetworks.
- Learn the different types of MACprotocols.
- Be familiar with different types of adhoc routingprotocols.
- Be exposed to the TCP issues in adhocnetworks.
- Learn the architecture and protocols of wireless sensornetworks.

UNITI INTRODUCTION 9

Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio propagation Mechanisms – Characteristics of the Wireless Channel -mobile ad hoc networks (MANETs) and wireless sensor networks (WSNs) :concepts and architectures. Applications of Ad Hoc and Sensor networks. Design Challenges in Ad hoc and Sensor Networks.

UNITII MAC PROTOCOLS FOR AD HOCWIRELESSNETWORKS 9

Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention based protocols- Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms – Multi channel MAC-IEEE 802.11

UNIT III ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESSNETWORKS 9

Issues in designing a routing and Transport Layer protocol for Ad hoc networks- proactive routing, reactive routing (on-demand), hybrid routing- Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks.

UNITIV WIRELESSSENSORNETWORKS(WSNS)ANDMACPROTOCOLS9

Singlenodearchitecture:hardwareandsoftwarecomponentsofasensornode-WSNNetwork architecture:typicalnetworkarchitectures-datarelayingandaggregationstrategies-MAClayer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC- IEEE802.15.4.

UNITV WSN ROUTING, LOCALIZATION&QOS 9

Issues in WSN routing – OLSR- Localization – Indoor and Sensor Network Localization-absolute and relative localization, triangulation-QOS in WSN-Energy Efficient Design-Synchronization-Transport Layer issues.

TEXT BOOK: 1. C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols ", Prentice Hall Professional Technical Reference, 2008.

COURSE OUTCOMES (COs)	
CO1	Describe the concept of network architectures and applications of adhoc and wireless sensor networks.
CO2	Learn the different types of MAC protocols for adhoc wireless networks.
CO3	Design routing protocols for adhoc wireless networks considering protocol design issues.
CO4	Explain the architecture and routing concepts in Wireless Sensor Networks.
CO5	Understand about MAC protocols for Wireless Sensor Networks.
CO6	Illustrate the issues of routing in Wireless Sensor Networks and evaluate the QoS related performance measurements.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	1	2	3	4	5	6	7	8	9	10	11	12	PS 01	PS 02	PS 03
CO1	3	2											3		
CO2	3	3	2	1									3		
CO3	3	3	2	1									3		
CO4	3	2											3		
CO5	3	3	2	1	1	3	1					2	3		
CO6	3	3	1	1	1	1	1					1	3		
Category	Professional Core (PC)														
Approval	49th meeting of the Academic Council														

U18PEIT013	OPTIMIZATION TECHNIQUES	L	T	P	C
	Total Contact Periods:45	3	0	0	3
	Prerequisite – Mathematics				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES
To Understand Ethical Issues, Environmental Impact And Acquire Management Skills

UNITI LINEAR PROGRAMMING 9
Introduction – Formulation of Linear Programming Model-Graphical Solution–Solving LPP Using Simplex Algorithm – Revised Simplex Method.

UNITII ADVANCES IN LPP 9
Duality Theory - Dual Simplex Method – Sensitivity Analysis–-Transportation Problems–Assignment Problems-Traveling Sales Man Problem -Data Envelopment Analysis

UNITIII NON LINEARPROGRAMMING 9
Classification of Non Linear Programming – Lagrange Multiplier Method – Karush – Kuhn Tucker Conditions–Reduced Gradient Algorithms–Quadratic Programming Method – Penalty and Barrier Method

UNITIV INTERIOR POINT METHODS 9
Karmarkar's Algorithm–Projection Scaling Method–Dual Affine Algorithm–Primal Affine Algorithm Barrier Algorithm.

UNITV DYNAMICPROGRAMMING 9

Formulation of Multi Stage Decision Problem–Characteristics–Concept Of Sub-Optimization And The Principle Of Optimality–Formulation Of Dynamic Programming–Backward And Forward Recursion– Computational Procedure–Conversion of final Value Problem In To Initial Value Problem.

TEXT BOOK

1. Hillier and Lieberman "Introduction To Operations Research", TMH, 2000. R.Panneerselvam, "Operations Research", PHI,2006
2. Hamdy ATaha, "Operations Research –An Introduction", Prentice Hall India,2003.

REFERENCES:

1. Philips, Ravindran and Solberg, "Operations Research", John Wiley,2002.
2. RonaldL.Rardin,"OptimizationInOperationResearch"PearsonEducationPvt.Ltd.New Delhi,2005.

COURSE OUTCOMES (COs)	
CO1	Understand the basic concepts of linear programming
CO2	Learn the advancements in linear programmingtechniques
CO3	Describe the different non-linear programming techniques
CO4	Apply interior point methods to solve linear and non-linear convex optimization problems
CO5	Formulate multistage decision problem and dynamic programming.
CO6	Apply optimization techniques for real time problems..

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	3	2	2	2					2			2		3	
CO2	3	2	2	2					2			1		3	
CO3	3	2	2	2					2			2		3	
CO4	3	2	2	2					2			2		3	
CO5	3	2	2	2					2			3		3	
CO6	3	2	2	2					2			2		3	
Category	Professional Core (PC)														
Approval	49th meeting of the Academic Council														

U18PEIT014	**VISUAL ANALYTICS**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	3	0	0	3
	Prerequisite – Data Mining Techniques				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

1. To understand how accurately represent voluminous complex data set in web and from other datasources
2. Todesignandusevariousmethodologiespresentindatavisualizationmethodologiesused for visualizing large datasets
3. To understand the process involved in data visualization and security aspects involved in datavisualization
4. Implement the process involved and security issues present in datavisualization

UNITI INTRODUCTION 9

Context of data visualization – Definition, Methodology, Visualization design objectives. Key Factors – Purpose- visualization function and tone- visualization design options – Datarepresentation- Data Presentation- Seven stages of data visualization- widgets- data visualization tools.

UNITII VISUALIZING DATAMETHODS 9

Mapping - Time series - Connections and correlations – Scatter plot maps - Trees,Hierarchies and Recursion - Networks and Graphs- Infographics

UNITIII VISUALIZING DATAPROCESS 9

Acquiring data - Where to Find Data - Tools for Acquiring Data from the Internet- Locating Files for Use with Processing- Loading Text Data- Dealing with Files and Folders- Listing Files in a Folder - Asynchronous Image Downloads- Advanced Web Techniques- Using a Database-Dealing with a Large Number of Files. Parsing data - Levels of Effort, Tools for Gathering Clues- Text Is Best- Text Markup Languages- Regular Expressions (regexps)-GrammarsandBNFNotation-CompressedData-VectorsandGeometry-BinaryDataFormats-Advanced Detective Work.

UNITIV INTERACTIVE DATA VISUALIZATION 9

Drawing with data – Scales – Axes – Updates- Transition and Motion – Interactivity - Layouts – Geo mapping – Exporting, Framework – T3- js-tablo.

UNITV SECURITY DATA VISUALIZATION 9

Port scan visualization - Vulnerability assessment and exploitation - Firewall log visualization - Intrusion detection log visualization -Attacking and defending visualization systems - Creating security visualizationsystem.

TEXT BOOK:

1. ScottMurray,“Interactivedatavisualizationfortheweb”,O‟ReillyMedia,Inc.,2013.
2. Ben Fry, “Visualizing Data”, O‟Reilly Media, Inc.,2007.

REFERENCES:

1. Greg Conti, “Security Data Visualization: Graphical Techniques for Network Analysis”, No Starch Press Inc,2007.

COURSE OUTCOMES (COs)	
CO1	Understand the purpose of visualization in general and visual analytics in particular
CO2	Describe the collection of visualization and analysis techniques
CO3	Explain the concepts and techniques for visualizing data process

CO4	Develop applications using interactive data visualization tools
CO5	The Students will be able to understand the techniques for Attacking and defending visualization systems
CO6	Identifying the vulnerabilities and attacks and thus create security visualization system.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	1	2	3	4	5	6	7	8	9	10	11	12	PS 01	PS 02	PS 03
CO1			1	2		1			2		1	3	2		
CO2	2	3	1	2		1			2	1		3	2		
CO3	2	3	1	2		1			2	1		3	2		
CO4	2	3	1	2		1			2	1		3	2		
CO5	2	3	1	2		1			2	2	1	3	2		
CO6	2	3	1	2		1			2	2	1		2		
Category	Professional Core (PC)														
Approval	49th meeting of the Academic Council														

U18PEIT015	**HEALTH INFORMATICS**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	3	0	0	3
	Prerequisite – Mastery of a high-level programming language such as C++ or Java				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES
To learn about the historical information of hospitality and recent trends in the Hospital information system.

UNIT-I BIOMEDICALINFORMATION SYSTEM 9
Historical Highlights of health care information system-Biomedical information system-problems and pitfalls-History and evolution of Electronic resources, Multimediacomponents

UNIT-II OVERVIEW OFCOMPUTER HARDWARE 9
Motherboard and its logic-Memory and I/O interfacing/memory and input output mapping-I/O peripherals and Add-on cards.

UNIT-III HOSPITALINFORMATION SYSTEM 9
Concept of HIS its position in hospital-introduction of a computerized HIS Automation of medical record-cost and Benefits of HIS-Modems and Networking in Hospitals.

UNIT-IV VISUAL PROGRAMMING ANDMULTIMEDIAINFORMATION 9
Visual Basic Principles and Programming-Design, Production and Testing of Multimedia based HIS.

UNIT-IV INTEGRATED MEDICALINFORMATIONSYSTEM 9
Integration of inter and intra hospital information system. Role of expert systems-web based Multimedia information system-Video-conferencing-PowerPoint Presentation.

TEXT BOOK:

1. R.D.Lele '"Computer in Medicine" Tata McGraw Hill, Newyork,1999.

REFERENCES:

1. S.K.Chauhan "PC Organisation", S.K.Kataria and Sons, Delhi2000.
2. Harold Sackamn "Bio Medical Information Technology", Academic Press,Newyork.

COURSE OUTCOMES (COs)	
CO1	Gain Knowledge about the historical highlights of health care and biomedical information system.
CO2	Describe the overview of computerhardware used in the health care Information system
CO3	Learn about the concept of hospital Information system and automating the medical records.
CO4	Develop skills in the concepts of visual programming.
CO5	Design and test the web based multimedia based health care information system
CO6	Acquire the skills for integrating inter and intra hospital information system.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	2		1	2		1			2	2	2	3	3		
CO2	2		1	2		1			2	2	2	3	3		
CO3	2		1	2		1			2	2	2	3	3		
CO4	2	3	1	2		1			2	2	2	3	3		
CO5	2	3	1	2		1			2	2	2	3	3		
CO6	2		1	2		1			2	2	2	3	3		
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT016	**SOFTWARE TESTING**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	3	0	0	3
	Prerequisite – Software Engineering				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

ToLearnthedesignoftestcasesandtobefamiliarwithtestmanagementandtestautomation techniques.

UNITI INTRODUCTION 9

TestingasanEngineeringActivity–TestingasaProcess–Testingaxioms–Basicdefinitions – SoftwareTestingPrinciples–TheTester"sRoleinaSoftwareDevelopmentOrganization– OriginsofDefects–Costofdefects–DefectClasses–TheDefectRepositoryandTestDesign – Defect Examples – Developer/Tester Support of Developing a Defect Repository – Defect Preventionstrategies.

UNIT II TESTCASEDESIGN 9

Test case Design Strategies – Using Black Bod Approach to Test Case Design – Random Testing – Requirements based testing – Boundary Value Analysis – Equivalence Class Partitioning – State-based testing – Cause-effect graphing – 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 – code complexity testing – Evaluating Test Adequacy Criteria.

UNITIII LEVELSOFTESTING 9

The need for Levers of Testing – Unit Test – Unit Test Planning – Designing the Unit Tests – TheTestHarness–RunningtheUnittestsandRecordingresults–Integrationtests–Designing Integration Tests – Integration Test Planning – Scenario testing – Defect bash elimination System Testing – Acceptance testing – Performance testing – Regression Testing – Internationalization testing – Ad-hoc testing – Alpha, Beta Tests – Testing OO systems – Usability and Accessibility testing – Configuration testing – Compatibility testing – Testing the documentation – Websitetesting.

UNITIV TESTMANAGEMENT 9

Peopleandorganizationalissuesintesting–Organizationstructuresfortestingteams–testing services – Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – test management – test process – Reporting Test Results – The role of three groupsin Test Planning and Policy Development – Introducing the test specialist – Skills needed by a test specialist – Building a Testing Group.

UNITV TEST AUTOMATION 9

Software test automation – skill 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.

TEXT BOOKS:

1. Srinivasan Desikan And Gopalaswamy Ramesh, "Software Testing – Principles And Practices", Pearson Education,2006.
2. Ron Patton, " Software Testing", Second Edition, Sams Publishing, Pearson Education, 2007.

REFERENCES:

1. Ilene Burnstein, " Practical Software Testing", Springer International Edition,2003.
2. Edward Kit," Software Testing In The Real World – Improving The Process", Pearson Education,1995.
3. Boris Beizer," Software Testing Techniques" – 2nd Edition, Van Nostrand Reinhold, New York,1990.
4. Aditya P. Mathur, "Foundations Of Software Testing _ Fundamental Algorithms And Techniques", Dorling Kindersley (India) Pvt. Ltd., Pearson Education,2008.

COURSE OUTCOMES (Cos)	
CO1	Design test cases suitable for a software development for different domains.
CO2	Apply different test case design strategies.
CO3	Execute various levels of testing.
CO4	Document the test design, test plan, test reports and project management.
CO5	Acquire the skills required for a test specialist.
CO6	Describe the concepts of software test automation, test metrics and measurements.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
Cos\ Pos	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	3		2						3		1		3		
CO2	3		2			1			3		1	1	3		
CO3	3		2		1				3	2	1	2	3		
CO4	3		2	1					3	2	1	2	3		
CO5	3		2			1			3	2	1	3	3		
CO6	3		2	1	1	1			3	2	1	3	3		
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT021	**HIGH SPEED NETWORKS**	**L**	**T**	**P**	**C**
	Total Contact Periods:45	3	0	0	3
	Prerequisite – Computer Networks				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- Students will be provided with an up-to-date survey of developments in High Speed Networks.
- Enable the students to know techniques involved to support real-time traffic and congestioncontrol.
- Students will be provided with different levels of quality of service (Q.S) to different applications.

UNIT1 HIGH SPEED NETWORKS 9

Frame Relay Networks - Asynchronous transfer mode - ATM Protocol Architecture, ATM logical Connection, ATM Cell - ATM Service Categories - AAL. High Speed LAN's: Fast Ethernet, Gigabit Ethernet, Fibre Channel - Wireless LAN's: applications, requirements - Architecture of 802.11

UNIT2 CONGESTION AND TRAFFICMANAGEMENT 9

Queuing Analysis - Queuing Models - Single Server Queues - Effects of Congestion - CongestionControl-TrafficManagement-CongestionControlinPacketSwitchingNetworks - Frame Relay CongestionControl.

UNIT3 TCP AND ATMCONGESTION CONTROL 9

TCP Flow control - TCP Congestion Control - Retransmission - Timer Management - ExponentialRTObackoff-KARN'sAlgorithm-Windowmanagement-PerformanceofTCP over ATM.Traffic and Congestion control in ATM - Requirements - Attributes - Traffic ManagementFramework,TrafficControl-ABRtrafficManagement-ABRratecontrol,RM cell formats, ABR Capacity allocations - GFR trafficmanagement.

UNIT4 INTEGRATED ANDDIFFERENTIATEDSERVICES 9

IntegratedServicesArchitecture-Approach,Components,Services-QueuingDiscipline,FQ, PS, BRFQ, GPS, WFQ - Random Early Detection, DifferentiatedServices.

UNIT5 PROTOCOLS FOR QOSSUPPORTRSVP 9

Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms - Multiprotocol Label Switching - Operations, Label Stacking, Protocol details - RTP - Protocol Architecture,

Data Transfer Protocol, RTCP.

TEXTBOOK

1. William Stallings, "High Speed Networks And Internet", Pearson Education, Second Edition, 2002. [Chapter - 4-6, 8, 10, 12, 13,17,18]
2. Warland & Pravin Varaiya, "High Performance Communication Networks", Jean Harcourt Asia Pvt. Ltd., II Edition,2001.

REFERENCE BOOKS

1. Irvan Pepelnjk, Jim Guichard and Jeff Apcar, "MPLS and VPN architecture", Cisco Press, Volume 1 and 2,2003

COURSE OUTCOMES (COs)	
CO1	Understand the basic concepts of asynchronous transfer mode and wireless LAN
CO2	Analyze the concept of congestion control and traffic management.
CO3	Study about TCP and ATM congestion control
CO4	Understand techniques involved to support real-time traffic and congestion control.
CO5	Understand different levels of Quality of Service (QoS) to different applications.
CO6	Implement protocols for QoS Support RSVP

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	2	3	1	2		1			2		1	3	3		
CO2	2	3	1	2		1			2	1		3	3		
CO3	2	3	1	2		1			2	1		3	3		
CO4	2	3	1	2		1			2	1		3	3		
CO5	2	3	1	2		1			2		1	3	3		
CO6	2	3	1	2		1			2	1	1	3	3		
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT022	**NATURAL LANGUAGE PROCESSING**	**L**	**T**	**P**	**C**
	Total Contact Periods - 45	3	0	0	3
	Prerequisite –NIL				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

This course is designed to introduce some of the problems and solutions of NLP, and their relation to linguistics and statistics.

UNIT-I INTRODUCTION 9

Introduction - The issues arid difficulties in natural language processing -Linguistics and computational linguistics - Language under- standing and generation - Understanding of spoken, written and textual information.

UNIT-II PARSINGANDGRAMMAR 9

Syntactic Parsing - English grammar - Structure of the sentence - words and organization of thelexicon-Contextfreeandcontextsensitivegrammar-Transformationalgrammar-Therole of syntax analysis in semantics ATN's - Definite clause grammar and WASPparsers.

UNIT-III INTERPRETATION 9

Semantic interpretation - The conceptual dependency model for semantic representation - Semantic network - Frames and scripts - Semantics in the lexicon.

UNIT-IV SEMANTICNETWORK 9

Discourses interpretation - The interconnections between pragmatics -Pragmatics in discourse analysis-Speechactsplan-basedTheoryofspeechacts-Semanticnetwork-Frameandscripts - Semantics in thelexicon.

UNIT-V CASESTUDY 9

Generation - Strategies for generation - Planning English referring expressions -KING, a Natural language generation systems.Typical systems - ELIZA - Baseball - GLJS - PARRY - LADDER - SOPGIE & POET current trends in NLP.

TEXTBOOK

1. James Alien Benjamin Cummings, "Natural language understanding", 2nd Edition 1995. Benjamin/Cummins PublishingCompany.
2. Natural Language Processing by Elakumar,2011

REFERENCE BOOK

1. Windgrad, "Language as a Cognitive Process; Syntax", Addison WesleyPublication.
2. F Popov, "Talking with Computer in Natural Language", Springer-Verlag,1986.

COURSE OUTCOMES (COs)	
CO1	Outline Natural Language Processing tasks in syntax, semantics, and pragmatics.
CO2	Explain Morphology and Part of Speech Tagging.
CO3	Describe how syntax parsing techniques can be used.
CO4	Explain the use of semantic analysis methods.
CO5	Relate a few applications of Natural Language Processing.
CO6	Simulate elementary case studies of NLP in Syntactical and Semantical Aspects

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1			1	2		1			2		1	2	2		
CO2	2	3	1	2		1			2	1		2	2		
CO3	2	3	1	2		1			2	1		2	2		1
CO4	2		1	2		1			2	1		2	2		1
CO5	2		1	2		1			2		1	2	2		1
CO6	2	1	1	2		1			2	1	1	2	2		1
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT023	SOCIAL NETWORK ANALYSIS	L	T	P	C
	Total Contact Periods - 45	3	0	0	3
	Prerequisite – Computer networks and data mining				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To understand the concept of semantic web and relatedapplications.
- To learn knowledge representation usingontology.
- To understand human behaviour in social web and relatedcommunities.
- To learn visualization of socialnetworks

UNITI INTRODUCTION 9

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis:Electronicdiscussionnetworks,Blogsandonlinecommunities-Web-basednetworks - Applications of Social Network Analysis.

UNIT II MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION 9

Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - OntologylanguagesfortheSemanticWeb:ResourceDescriptionFramework-WebOntology

Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations.

UNITIII EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS 9

Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methodsforcommunitydetectionandmining-Applicationsofcommunityminingalgorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks - Multi-Relational characterization of dynamic social networkcommunities.

UNITIV PREDICTING HUMAN BEHAVIOUR ANDPRIVACY ISSUES 9

Understanding and predicting human behaviour for social communities - User data management - Inference and Distribution - Enabling new human experiences - Realitymining - Context-Awareness-Privacyinonlinesocialnetworks-Trustinonlineenvironment-Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combiningtrustandreputation-Trustderivationbasedontrustcomparisons-Attackspectrum andcountermeasures.

UNITV VISUALIZATION AND APPLICATIONS OFSOCIALNETWORKS 9

Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover networks - Community welfare - Collaboration networks - Co-Citation networks.

TEXT BOOKS:

1. PeterMika,—SocialNetworksandtheSemanticWeb‖,FirstEdition,Springer2007.
2. BorkoFurht,—HandbookofSocialNetworkTechnologiesandApplications‖,1stEdition, Springer,2010.

REFERENCES:

1. Guandong Xu ,Yanchun Zhang and Lin Li, —Web Mining and Social Networking – Techniques and applications‖, First Edition, Springer,2011.
2. Dion Goh and Schubert Foo, —Social information Retrieval Systems: Emerging TechnologiesandApplicationsforSearchingtheWebEffectively‖,IGIGlobalSnippet, 2008.
3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, —Collaborative and Social InformationRetrievalandAccess:TechniquesforImproveduserModelling‖,IGIGlobal Snippet, 2009.
4. John G. Breslin, Alexander Passant and Stefan Decker, —The Social Semantic Web‖, Springer,2009.

COURSE OUTCOMES (COs)	
CO1	Develop semantic web related applications.
CO2	Represent knowledge using ontology.
CO3	Extract and mine communities in web social networks
CO4	Predict human behavior in social web and related communities
CO5	Analyze the security issues and privacy policies in Social networks
CO6	Visualize social networks in real time applications

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	2	3	2	2		1		2		1	1		3		
CO2	2	3	2	2		1		2		1			3		
CO3	2	3	2	2		1		2	2	1			3		
CO4	2	3	2	2		1		2	2	1		3	3		
CO5	2	3	2	2		1		2	2	1	1	3	3		
CO6	2	3	2	2		1		2	2	1	1	3	3		
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT024	**BUSINESS ANALYTICS**	**L**	**T**	**P**	**C**
	Total Contact Periods - 45	3	0	0	3
	Prerequisite – Data mining techniques				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

1. To understand the role of business analytics within anorganization.
2. To analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of anorganization.
3. Use advanced analytical tools to analyze complex problems underuncertainty.
4. Manage business processes using analytical and managementtools.

UNIT-I INTRODUCTION 9

Introduction to Business Analytics - Business View of Information TechnologyApplications - Key purpose of using IT in Business - Characteristics of Internet Ready IT Applications - Information Users and their Requirements- Types of digital data - Introduction to OLTP and OLAP.

UNIT-II BUSINESS INTELLIGENCE 9

Using Analytical Information for Decision Support - Definition and examples in business intelligence - Evolution of BI and Role of DSS- EIS- MIS and Digital Dashboards - BI Definition and Concepts - BI Component Framework - Purpose of BI - Business Intelligence Applications - BI Roles and Applications.

UNIT-III DATA MODELING 9

Basic Data Integration - Data Warehouse -p Data Integration Technologies - Data Quality - DataProfiling-MultidimensionalDataModelling-Inrtoduction-DataModellingTechniques - Fact table - Dimension table - typical dimensional Models - Dimensional Modelling Life Cycle – Measure- Metrics and Performance Management.

UNIT-IV STATISTICS ANDALGORITHMS 9

BasicofEnterpriseReporting-UnderstandingStatistics-RoleofStatisticsinAnalytics-Data, DataDescriptionandSummarization-StatisticalTests-UnderstandingHypothesisandt-test-Correlation Analysis - Regression - The F-Test - Time Series analysis - Application of Analytics-DataminingAlgorithms-AssociationRuleMining-k-MeanClustering-Decision Tree.

UNIT-V CASE STUDIES 9

Segmenting bank customer transaction histories - Association analysis of Web services data - Creatingasimplecreditriskmodelfromconsumerloandata-Predictinguniversityenrolment management

TEXT BOOKS:

1. Fundamentals of Business Analytics, R.N. Prasad, Seema Acharys, 2nd Edition, Wiley India Pvt Ltd.,2016.
2. Business Analytics, James R. Evans, 2nd Edition, Pearson Education Limited- 12-Jan-2016

REFERENCES:

1. Business Analytics an Application focus, Purba Halady Rao PHI Learning Pvt. Ltd - 2013
2. Business Analytics: Data Analysis & Decision Making - Standalone , S. Christian Albright , Wayne L. Winston- Cengage Learning, Business &Economics-31-Mar-2016
3. Competing on Analytics: Updated, with a New Introduction: The New Science of Winning, Thomas H. Davenport, Jeanne G. Harris - Harvard Business Review Press, 2017.

COURSE OUTCOMES (COs)	
CO1	Understand the concept and role of analytics in business.
CO2	Use business intelligence to formulate and solve business problems and to support managerial decision making.
CO3	Describe the data integration and data modeling techniques.
CO4	Learn the concept of enterprise reporting, statistical techniques and data mining algorithms in analytics,

CO5	Implement analytics in real time applications-bank management,general management, marketing,finance,operationsandsupplychainmanagement.
CO6	Apply analytic principles and techniques to a business problem

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	1	2	3	4	5	6	7	8	9	10	11	12	PS 01	PS 02	PS 03
CO1	2	3	2	2		1			2		1	3	3		
CO2	2	3	2	2					2	1		3	3		
CO3	2	3	2	2					2	1		3	3		
CO4	2	3	2	2					2	1		3	3		
CO5	2	3	2	2		1			2	1	2	3	3		
CO6	2	3	2	2		1			2	1	2	3	3		
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

18PEIT025	**MOBILE APPLICATION DEVELOPMENT**	**L**	**T**	**P**	**C**
	Total Contact Periods - 45	3	0	0	3
	Prerequisite – mobile communication				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To learn the characteristics of mobile applications.
- To learn about the intricacies of UI required by mobile applications.
- To study about the design aspects of mobile application.

UNITI INTRODUCTION 9

Mobile Applications – Characteristics and Benefits – Application Model – Infrastructure and Managing Resources – Mobile Software Engineering – Frameworks and Tools – Mobile devices Profiles.

UNITII USER INTERFACE 9

Generic UI Development – VUIs and Mobile Applications – Text to Speech techniques – Designing the right UI – Multimodal and Multichannel UI – Gesture based UIs – Screen Elements and Layouts – Voice XML – Java API.

UNITIII APPLICATION DESIGN 9

Memory Management – Design patterns for limited memory – Work flow for Application Development – Techniques for composing Applications – Dynamic Linking – Plug ins and rules of thumb for using DLLs – Concurrency and Resource Management – Look and feel.

UNITIV APPLICATION DEVELOPMENT 9

IntentsandServices–StoringandRetrievingdata–CommunicationviatheWeb–Notification and Alarms – Graphics and Multimedia – Telephony – Location based services – Packaging and Deployment – Security andHacking.

UNITV TOOLS 9

Google Android Platform – Eclipse Simulator – Android Application Architecture – Event based programming – Apple iPhone Platform – UI tool kit interfaces – Event handling and Graphics services – Layer Animation.

TEXT BOOKS:

1. Share Conder, Lauren Darcey, "Android Wireless Application Development" Pearson 3rd Edition.
2. Zigurd Mednieks, Laird Dornin, G, Blake Meike and Masumi Nakamura,―Programming Android‖, O"Reilly,2011.

REFERENCES:

1. Professional mobile Application Development paperback,2012 Jeff Mcherter (Author),Scott Gowell (Author), Wiley India PrivateLimited
2. RetoMeier,WroxWiley,―ProfessionalAndroid2ApplicationDevelopment‖,2010.
3. Alasdair Allan, ―iPhone Programming‖, O"Reilly,2010.

COURSE OUTCOMES (COs)	
CO1	Explain the features and challenges of mobile devices, native app development frameworks, hybrid app development frameworks
CO2	Learn the intricacies of user interfaces and implement the user interfaces for mobileapplications.
CO3	Design the mobile applications considering the resource constraints in mobile devices.
CO4	Design a secure mobile application based on user requirements
CO5	Select appropriate framework and tool for developing mobile applications based on the problem requirements
CO6	Design and develop mobile applications for societal and environmental problems

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	2	2	1		1	2			3				3		
CO2	2	2	1		1	2			3	2			3		
CO3	2	2	1		1	2			3	2	3	3	3		
CO4	2	2	1		1	2			3	2	3	3	3		
CO5	2	2	1		1	2			3	2	3	3	3		
CO6	2	2	1		1	2			3	2	3	3	3		
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT026	**WAVELET TRANSFORMS AND ITS APPLICATION**	**L**	**T**	**P**	**C**
	Total Contact Periods - 45	3	0	0	3
	Prerequisite – mobile communication				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

To in
troduce the fundamentals concepts of wavelet transforms.

- To study system design usingWavelets

- To learn the different wavelet families & theirapplications.

UNITI INTRODUCTION TOWAVELETS 9

Introduction to Multirate signal processing- Decimation and Interpolation, Quadrature Mirror Filters,Subbandcoding,LimitationsofFouriertransform,ShorttimeFouriertransformandits drawbacks, Continuous Wavelet transform, Time frequency representation, Wavelet System and its characteristics, Orthogonal and Orthonormal functions and functionspace

UNITII MULTIRESOLUTION CONCEPT AND DISCRETE WAVELET TRANSFORM 9

Multiresolution formulation of wavelet systems- signal spaces, scaling function, wavelet function and its properties, Multiresolution analysis, Haar scaling and wavelet function, Filter banks Analysis and Synthesis, 1D and 2D Discrete wavelet transform, Wavelet Packets, Tree structured filter bank, Multichannel filter bank, Undecimated wavelet transform.

UNITIII WAVELETSYSTEMDESIGN 9

Refinement relation for orthogonal wavelet systems, Restrictions on filter coefficients,Design ofDaubechiesorthogonalwaveletsystemcoefficients,DesignofCoifletandSymletwavelets.

UNITIV WAVELETFAMILIES 9

Continuous Wavelets- Properties of Mexican hat wavelet, Morlet, Gaussian and Meyer wavelets. Orthogonal wavelets- Properties of Haar wavelets, Daubechies wavelets, Symlets, Coiflets and Discrete Meyer wavelets.Properties of Biorthogonal wavelets, Applications of wavelet families.

UNITV WAVELET APPLICATIONS 9

Denoising of Signals and Images, Image enhancement, Edge detection, Image Fusion, Image compression,Waveletbasedfeatureextraction,Analysisofphonocardiogramsignals,Analysis of EEG signals, Speech enhancement for hearingaids

REFERENCES:

1. C.Sidney Burrus, Ramesh Gopinath & Haito Guo, _Introduction to wavelets and wavelet transform,,, Prentice Hall,1998.
2. G.Strang and T.Nguyen, _Wavelet and filter banks,,, Wesley and CambridgePress.
3. M.Vetterli and J. Kovacevic, _Wavelets and sub band coding,,, Prentice Hall,1995.
4. Metin Akay, _Time frequency and wavelets in biomedical signal processing,,, Wiley-IEEE Press, October1997.
5. P.P.Vaidyanathan, _Multi rate systems and filter banks,,, Prentice Hall 1993 4. Raguveer m Rao & Ajith S. Bopardikar, _Wavelet transforms – Introduction to theory and applications,,, Addison Wesley,1998
6. S.Mallet, _A Wavelet tour of signal processing,,, Academic Press1998

COURSE OUTCOMES (COs)	
CO1	Understand the basic concepts of wavelet and its types
CO2	Analyze multi resolution concepts and discrete wavelet transform.
CO3	Design the different wavelet system.

CO4	Describe the properties and applications of wavelet families.
CO5	Analysis of phonocardiogram signals, EEG signals, Speech enhancement for hearing aids and de-noising technique.
CO6	Implement wavelet applications in real time.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	1	2	3	4	5	6	7	8	9	10	11	12	PS 01	PS 02	PS 03
CO1			1	2		1			2		1	3	3		
CO2	2	3							2	1		3	3		
CO3	2	3							2	1		3	3		
CO4	2	3	1	2					2	1		3	3		
CO5	2	3	1	2		1			2		1	3	3		
CO6	2	3	1	2		1			2	1	1	3	3		
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

18PEIT031	**CYBERFORENSICS**	**L**	**T**	**P**	**C**
	Total Contact Periods - 45	3	0	0	3
	Prerequisite –Computer Networks				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To learn computer forensics
- To become familiar with forensics tools
- To learn to analyze and validate forensics data

UNITI INTRODUCTION TO COMPUTER FORENSICS 9

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 II EVIDENCE COLLECTION ANDFORENSICSTOOLS 9

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

UNIT III ANALYSISAND VALIDATION 9

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

UNIT IVETHICALHACKING 9

Introduction to Ethical Hacking - Footprinting and Reconnaissance - Scanning Networks - Enumeration - System Hacking - Malware Threats - Sniffing

UNIT V ETHICAL HACKINGIN WEB 9

Social Engineering - Denial of Service - Session Hijacking - Hacking Web servers - Hacking WebApplications–SQLInjection-HackingWirelessNetworks-HackingMobilePlatforms.

TEXT BOOKS:

1. Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, ―Computer Forensics and Investigations‖, Cengage Learning, India Edition,2016.
2. CEH official Certfied Ethical Hacking Review Guide, Wiley India Edition,2015.

REFERENCES

1. John R.Vacca, ―Computer Forensics‖, Cengage Learning,2005
2. MarjieT.Britz,―ComputerForensicsandCyberCrime‖:AnIntroduction‖,3rdEdition, Prentice Hall,2013.
3. AnkitFadia ― Ethical Hacking|Second Edition,MacmillanIndiaLtd, 2006

COURSE OUTCOMES (COs)	
CO1	Explain computer forensics and its techniques
CO2	Learn about evidence collection and applying forensic tools for crime investigations.
CO3	Analyze and validate forensics data.
CO4	Explore the fundamentals of ethical hacking
CO5	Execute penetration technique using standard hacking tools in an ethical manner
CO6	Learn about reconnaissance, protocols, windows hacking, hacking web technologies, wireless networks and mobile platforms

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	2		1		2				2				2		
CO2	2	2	1	2	2	2		2	2			3	2		
CO3	2	2	1	2	2	2		2	2			3	2		
CO4	2		1		2				2				2		
CO5	2	2	1	2	2	2		2	2			3	2		
CO6	2	2	1	2	2	2			2			3	2		
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT033	**APPLICATIONS OF DATAMINING**	**L**	**T**	**P**	**C**
	Total Contact Periods - 45	3	0	0	3
	Prerequisite – Data Warehousing and Data mining Techniques				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To learn how to prepare, process, understand, analyze and present thedata.
- To analyze the problem and Implement differenttechniques.
- To Evaluate and Refine them for analyze theproblem.
- To implement data mining tools such as R/Weka

UNIT-I INTRODUCTION 9

Introduction to Data and Big Data -Data Types and Data Qualities - Sampling, Sample Sets and Data Population - Statistical Inference and Introduction to Supervised and Unsupervised Learning method - Data Mining Goals - Stages of the Data Mining Process - Data Mining Techniques - Introduction to Data Mining Tools - R and WEKA

UNIT-II DATA MININGKNOWLEDGEREPRESENTATION 9

Task relevant data- Background knowledge -Interestingness measure-Representing input data and output knowledge - Data Visualization- Basic concepts - Visualization techniques - Experiments with Weka/R using visualization- Attribute-oriented analysis -Attribute generalization-Attributerelevance-Classcomparison-Statisticalmeasures-Experimentswith Weka / R using filters andstatistics

UNIT-III CLASSIFICATION 9

Basic learning/mining tasks - Inferring rudimentary rules: 1R algorithm - Covering rules - Introduction to Decision Trees -Rule Based Classifier - Experiments with Weka/R using decision trees, rules -The predictiontask - Statistical (Bayesian) classification - Bayesian networks -Instance-based methods (nearest neighbor)-Linear models -Experiments with Weka/R usingPrediction

UNIT-IV CLUSTERINGANALYSIS 9

Clustering Analysis - Basic issues in clustering - conceptual clustering system: Cluster/2 - Partitioning methods: k-means, expectation maximization (EM) - Hierarchical methods: distance-based agglomerative and divisible clustering - Conceptual clustering: Cobweb - Experiments with Weka/R using k-means, EM, Cobweb -Association rules - Generating item sets and rules efficiently-Correlation analysis -Experiments with Weka/R - miningassociation rules

UNIT-V CASESTUDY 9

Training and testing - Estimating classifier accuracy (holdout, cross-validation, leave-one-out) - Combining multiple models (bagging, boosting, stacking) - Experiments with Weka/R for training and testing- Mining Real data - Preprocessing data -Applying various data mining techniques to create a comprehensive and accurate model of the data -Text mining: extracting attributes (keywords), structural approaches (parsing, softparsing).

TEXT BOOKS:

1. Data Mining: Concepts and Techniques, 3rd ed. by Jiawei Han, Micheline Kamber and Jian Pei, Elsevier, eBook ISBN: 9780123814807, June2011
2. Sumathi, S., Sivanandam, S.N. , Introduction to Data Mining and its Applications, ISBN 978-3-540-34351-6
3. Bater Makhabel , Learning Data Mining with R, Packt Publishing Ltd, 31 Jan2015

REFERENCES:

1. Kevin Patrick Murphy, Machine Learning: a Probabilistic Perspective, 2012 http://www.cs.ubc.ca/~murphyk/MLbook/
2. P.-N. Tan, M. Steinbach and V. Kumar, Introduction to Data Mining, Wiley,2005
3. Yanchang Zhao , Yonghua Cen ,Data Mining Applications with R, 30 Dec2013
4. http://web.engr.illinois.edu/~hanj/bk3/
5. Kenneth C.Brancik ―Insider Computer Fraud‖ Auerbach Publications Taylor& FrancisGroup–2008.

COURSE OUTCOMES (COs)	
CO1	Understand different data mining tasks and the functionalities of Weka/R tools.

CO2	Explain knowledge representation and metrics.
CO3	Understand and implement the different Classification techniques.
CO4	Demonstrate and implement unsupervised learning techniques.
CO5	Understand ensemble models.
CO6	Demonstrate case studies for analyzing the performance of the data models.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	3	3	3	3	2					2	2	2		3	
CO2	3		2	3	3					2		2		3	
CO3		1	3				`			2	2	2		3	
CO4	3	2		2	3					2	2	2		3	
CO5	2	2	2		2					2		2		3	
CO6		1	2	3	3					2	2	2		3	
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT032	**VIRTUAL AND AUGMENTED REALITY**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – CISB110(C/C++), CISB210(Data Structure), COIS712/ CISB355(CG)				
	Course Designed by:- Dept of Information Technology				

OOBJECTIVES

- To learn Virtual reality; multiple modal interaction, visual-auditory-haptic, interaction inmersion
- To learn imagination, visual computation and environmental modeling; geometric behavior and physically basedsimulation
- To understand the management of large scale environment, VR development tools, augmented reality, mixed reality, digitalentertainment.

UNIT- 1 Introduction ofVirtualReality **9**

Fundamental Concept and Components of Virtual Reality Primary Features and Present Development on Virtual Reality

UNIT- II Multiple Modals of Input and Output Interface inVirtual Reality **9**

Input -- Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc. Output -- Visual / Auditory / Haptic Devices

UNIT- III Visual Computation inVirtual Reality **9**

Fundamentals of Computer Graphics Software and Hardware Technology on Stereoscopic DisplayAdvancedTechniquesinCG:ManagementofLargeScaleEnvironments&RealTime Rendering

UNIT- IV Environment Modeling inVirtualReality **9**

Geometric Modeling, Behavior Simulation, Physically Based Simulation Interactive Techniques in Virtual Reality: Body Track, Hand Gesture, 3D Manus, Object

UNIT- V Grasp Introduction of AugmentedReality (AR) 9

System Structure of Augmented Reality Key Technology in AR Development Tools and Frameworks in Virtual Reality: Frameworks of Software Development Tools in VR. X3D Standard; Vega, MultiGen, Virtools etc

TEXT BOOK

1. Bush, V. (1945) As We May Think, TheAtlantic.
2. Feiner, S.K. (2002) Augmented Reality: A New Way of Seeing, Scientific American, 286(4), pp.34-41.
3. Billinghurst, M., Poupyrev, I., Kato, H., May, R. (2000) Mixing Realities in Shared Space: An Augmented Reality Interface for Collaborative Computing, Proc. of theIEEE Int'l Conf. on Multimedia and Expo (ICME), pp. 1641-1644.
4. UchiyamaH.,SaitoH.(2011)RandomDotMarkers,Proc.of IEEEVR2011,pp.35-38.

COURSE OUTCOMES (COs)	
CO1	Understand the basic concept and framework of virtualreality.
CO2	Describe the multiple modals of input and output interface in virtual reality.
CO3	Explain the fundamentals of computer graphics.
CO4	Applydisplay advanced techniques in computer graphics.
CO5	Explore about the environment modeling in virtual reality.
CO6	Learn about the fundamentals of Augmented Reality and implement software development tools in Virtual Reality

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1			1	2		1			2		1	3		3	
CO2	2	3	1	2		1			2	1		3		3	
CO3	2	3	1	2		1			2	1		3		3	
CO4	2		1	2		1			2	1		3		3	
CO5	2		1	2		1			2		1	3		3	
CO6	2	3	1	2		1			2	1	1	3		3	
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT034	**MACHINE LEARNING TECHNIQUES**	**L**	**T**	**P**	**C**
	Total Contact Periods - 45	3	0	0	3
	Prerequisite – Artificial Intelligence and Expert System.				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To understand the concepts of machinelearning
- To appreciate supervised and unsupervised learning and theirapplications
- To understand the theoretical and practical aspects of Probabilistic GraphicalModels.
- To understand probabilistic graphicalmodels.
- To understand sample complexityanalysis.

UNITI INTRODUCTION 9

Machine Learning - Machine Learning Foundations –Overview – Design of a Learning system - TypesofmachinelearningApplicationsMathematicalfoundationsofmachinelearning-

random variables and probabilities - Probability Theory – Probability distributions -Decision Theory- Bayes Decision Theory - Information Theory.

UNITII SUPERVISED LEARNING 9

LinearModelsforRegression-LinearModelsforClassification–NaïveBayes-Discriminant Functions -Probabilistic Generative Models -Probabilistic Discriminative Models - Bayesian Logistic Regression. Decision Trees - Classification Trees- egression Trees - Pruning. Neural Networks -Feed-forward Network Functions - Back- propagation. Support vector machines - Ensemble methods- Bagging-Boosting.

UNITIII UNSUPERVISED LEARNING 9

Clustering- K-means - EM Algorithm- Mixtures of Gaussians. The Curse of Dimensionality - Dimensionality Reduction - Factor analysis - Principal Component Analysis - Probabilistic PCA- Independent components analysis.

UNITIV PROBABILISTIC GRAPHICALMODELS 9

Graphical Models - Undirected graphical models - Markov Random Fields - Directed Graphical Models -Bayesian Networks - Conditional independence properties - Inference – Learning- Generalization - Hidden Markov Models - Conditional random fields(CRFs)

UNITV ADVANCED LEARNING 9

Sampling – Basic sampling methods – Monte Carlo - Reinforcement Learning – K - Armed Bandit - Elements - Model-Based Learning- Value Iteration- Policy Iteration. Temporal Difference Learning- Exploration Strategies- Deterministic and Non-deterministic Rewards and Actions Computational Learning Theory - Mistake bound analysis, sample complexity analysis- VC dimension. Occam learning- accuracy and confidence boosting

TEXT BOOK

1. Christopher Bishop, “Pattern Recognition and Machine Learning” Springer,2007.
2. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press,2012.
3. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Third Edition,2014.

REFERENCES:

1. Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer, Second Edition,2011.

COURSE OUTCOMES (COs)	
CO1	Understand the fundamentals and concept of Machine learning.
CO2	Apply probabilistic techniques for real time application in uncertain environment.
CO3	Explain the concepts of supervised and unsupervised learning techniques.
CO4	Designandimplementprobabilistic graphical models in real time applications.
CO5	Use machine learning tools to implement typical clustering algorithms for different types of applications.
CO6	Explore the different advanced learning techniques.
Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low	

COs\ POs	1	2	3	4	5	6	7	8	9	10	11	12	PS 01	PS 02	PS 03
CO1			1	2		1			2		1	3	3		
CO2	2	3	1	2		1			2	1		3	3		
CO3	2	3	1	2		1			2	1		3	3		
CO4	2	3	1	2		1			2	1	2	3	3		
CO5	2	3	1	2		1			2	1	2	3	3		
CO6	2	3	1	2		1			2	1	2	3	3		
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT035	**BIO-INSPIRED COMPUTING**	**L**	**T**	**P**	**C**
	Total Contact Periods - 45	3	0	0	3
	Prerequisite – Artificial Intelligence				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- Learn evolutionary theory andalgorithms
- Understand Cellular Automata and artificiallife
- Learn artificial neural systems and related learningalgorithms

UNITI EVOLUTIONARY ANDCELLULARSYSTEMS 9

Foundations of evolutionary theory – Genotype – artificial evolution – genetic representations – initial population – fitness functions – selection and reproduction – genetic operators – evolutionary measures – evolutionary algorithms – evolutionary electronics – evolutionary algorithm case study Cellular systems – cellular automata – modeling with cellular systems – other cellular systems – computation with cellular systems – artificial life – analysis and synthesis of cellular systems

UNITII NEURAL SYSTEMS 9

Biologicalnervoussystems–artificialneuralnetworks–neuronmodels–architecture–signal encoding – synaptic plasticity – unsupervised learning – supervised learning – reinforcement learning – evolution of neural networks – hybrid neural systems – casestudy

UNITIII DEVELOPMENTAL AND IMMUNESYSTEMS 9

Rewriting systems – synthesis of developmental systems – evolutionary rewriting systems – evolutionary developmental programs Biological immune systems – lessons for artificial immune systems – algorithms and applications – shape space – negative selection algorithm – clonal selection algorithm - examples

UNITIV BEHAVIORAL SYSTEMS 9

Behavior is cognitive science – behavior in AI – behavior based robotics – biological inspiration for robots – robots as biological models – robot learning – evolution of behavioral systems – learning in behavioral systems – co-evolution of body and control – towards self reproduction – simulation and reality

UNITV COLLECTIVE SYSTEMS 9

Biological self-organization – Particle Swarm Optimization (PSO) – ant colony optimization (ACO) – swarm robotics – co-evolutionary dynamics – artificial evolution of competing systems – artificial evolution of cooperation – case study

TEXT BOOK:

1. D. Floreano and C. Mattiussi, "Bio-Inspired Artificial Intelligence", MIT Press,2008.
2. F. Neumann and C. Witt, “Bioinspired Computation in combinatorial optimization: Algorithms and their computational complexity”, Springer,2010.
3. A. E. Elben and J. E. Smith, “Introduction to Evolutionary Computing”, Springer,2010.

REFERENCES:

1. D. E. Goldberg, “Genetic algorithms in search, optimization, and machine learning”, Addison- Wesley,1989.
2. Simon O. Haykin, “Neural Networks and Learning Machines”, Third Edition, Prentice Hall,2008.

COURSE OUTCOMES (COs)	
CO1	Implement and apply evolutionary algorithms.
CO2	Explain cellular automata and artificial life.
CO3	Implement and apply neural systems.
CO4	Explain developmental and artificial immune systems.
CO5	Describebehavioralsystemsandtoimplementin collective intelligencesystems.
CO6	Design bio inspired solutions for real world problems.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1			1	2		1			2		1	3	2		
CO2	2	3	1	2		1			2	1		3	2		
CO3	2	3	1	2		1			2	1		3	2		
CO4	2		1	2		1			2	1		3	2		
CO5	2		1	2		1			2	1	1	3	2		
CO6	2	3	1	2		1			2	1	1	3	2		
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT036	**SOFTWARE CONFIGURATION MANAGEMENT**	**L**	**T**	**P**	**C**
	Total Contact Periods - 45	3	0	0	3
	Prerequisite – software Engineering				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To Introduce the basic concepts of software configurationmanagement
- To learn the importance of SCM in softwaredevelopment
- TounderstandthedifferentSCMphasesandactivities,branching,releasemanagement, configuration managementroles.

UNIT1 INTRODUCTION 9

Introduction to software configuration Management, SCM and Process Improvement, Measurements and Metrics – Benefits of SCM – Configuration Identification – Configuration Change control – Implementing SCM in the Organization – Project Management in CM Environment- Software Scope- Project Estimation – Risk Management Strategies.

UNITII THE DoD CMPROCESS MODEL 9

CM Benefits, Risks, CM Life-Cycle Management and Planning- Relation to system engineering process – Implementing the CM process – measuring and Evaluating the CM process.

UNITIII CONFIGURATION IDENTIFICATION 9

Product structure – configuration items – configuration documentation – specification types – software requirement analysis and design – software architecture and design – software integration and qualification – configuration base line concept.

UNITIV CONFIGURATION CONTROL 9

The process of configuration control – Configuration status accounting – Typical CSA information over the acquisition program – Life cycle - Configuration status accounting process Evaluation.

UNITV CONFIGURATION VERIFICATIONAND AUDITING 9

Configuration identification – the effective documentation of the system – Methods and standards – Generating documentation – configuration verification and Audit – Concepts and principles – configuration verification – configuration audit – application of audits.

TEXT BOOK:

1. Software Configuration Management, Jessica Keyes , Auerbach Publication ,2004

REFERENCES:

1. Enterprise Software Configuration Management Solutions for Distributed and System z, Paolo Cravino, David Lawrence, Antonio Alonso, López Brandt Onorato Zhenhua (Eric) Shen, January 2009

COURSE OUTCOMES (COs)	
CO1	Understand the concepts and principles of softwareconfiguration management.
CO2	Explain about configuration Management and planning.
CO3	Define the relation between software configuration management and the software development.
CO4	Select configuration items at appropriate levels of the product structure
CO5	Describe the configuration management activities like control, status accounting, auditing and verification.
CO6	Implementtechnical Software Configuration Management System in real time.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	3		2						3		1		3		
CO2	3		2			1			3		1	1	3		
CO3	3		2		1				3	2	1	2	3		
CO4	3		2	1					3	2	1	2	3		
CO5	3		2	1		1			3		1	3	3		
CO6	3		2	1	1	1			3	2	1	3	3		
Category	Professional Electives(PE)														

Approval	49th meeting of the Academic Council

U18PEIT041	CLOUD COMPUTING AND SECURITY	L	T	P	C
	Total Contact Periods - 45	3	0	0	3
	Prerequisite – software Engineering				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To understand the concept of cloudcomputing.
- To appreciate the evolution of cloud from the existingtechnologies.
- To have knowledge on the various issues in cloudcomputing.
- To be familiar with the lead players incloud.
- To appreciate the emergence of cloud as the next generation computingparadigm.

UNITI INTRODUCTION 9

Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.

UNITII CLOUD ENABLINGTECHNOLOGIES 10

Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish-SubscribeModel–BasicsofVirtualization–TypesofVirtualization–ImplementationLevels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization ofCPU – Memory – I/O Devices –Virtualization Support and DisasterRecovery.

UNITIII CLOUD ARCHITECTURE, SERVICESAND STORAGE 8

Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds – laaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.

UNITIV RESOURCE MANAGEMENT AND SECURITYIN CLOUD 10

Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.

UNITV CLOUD TECHNOLOGIES ANDADVANCEMENTS 8

Hadoop – MapReduce – Virtual Box — Google App Engine – Programming Environment for Google App Engine — Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.

TEXT BOOKS:

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. Rittinghouse, John W., and James F. Ransome, ―Cloud Computing: Implementation, Management and Security, CRC Press,2017.

REFERENCES:

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, ―Mastering Cloud

Computing, Tata Mcgraw Hill,2013.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing – A Practical Approach, Tata Mcgraw Hill, 2009.
3. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), O'Reilly, 2009.

COURSE OUTCOMES (COs)	
CO1	Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
CO2	Learn the key and enabling technologies that help in the development ofcloud.
CO3	Developtheabilitytounderstandandusethearchitectureofcomputeandstorageclo ud, service and deliverymodels.
CO4	Explain the core issues of cloud computing such as resource management andsecurity.
CO5	Be able to install and use current cloud technologies.
CO6	Evaluate and choose the appropriate technologies, algorithms and approaches for implementation and use ofcloud.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1			1	2		1			2		1	3	2		
CO2	2	3	1	2		1			2	1		3	2		
CO3	2	3	1	2		1			2	1		3	2		
CO4	2		1	2		1			2	1		3	2		
CO5	2		1	2		1			2	1	1	3	2		
CO6	2	3	1	2		1			2	1	1	3	2		
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT042	**MULTI AGENT SYSTEMS**	**L**	**T**	**P**	**C**
	Total Contact Periods - 45	3	0	0	3
	Prerequisite – Artificial Intelligence				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- Taxonomy of agent architectures, formal languages for multi-agent systems specification,languagesandschemesforknowledgerepresentation,formallanguages

and models for modeling of agent and environment behavior, agent communication languages and associated semantic models.

- Basic inter-agent interaction patterns and coordination of cooperative and antagonistic agents. Coordination techniques: organizational structure, contracting, multi-agent planning andnegotiation.
- Application of multi-agent systems in computer and robot vision, decision support systems, electronic commerce, robotics, and simulation ofsocieties.

UNIT-I INTRODUCTION 9

Intelligent Agents-Deductive reasoning Agents – Agents as theorem provers- Agent Oriented Programming - Concurrent Metate M- Practical Reasoning Agents

UNIT-II TYPESOFAGENTS 9

Reactive and Hybrid Agents - Brook‘s and Subsumption Architecture –The Limitations of Reactive Agents - Hybrid Agents. Communication - Speech Acts - Agent Communication Languages, Working Together - Cooperative Distributed Problem Solving - Task Sharing and Result Sharing Coordination – Multi agent Planning and Synchronization

UNIT-III MULTI-AGENTINTERACTIONS 9

Making group decisions- Co-operative games - Allocating scarce resources

UNIT-IV BARGAINING 9

Bargaining for resource division, task allocation and resource allocation - Arguing – Abstract, deductive, dialogue and implemented argumentation systems –Applications – Agents for different domains

UNIT-V JADE 9

Agent Oriented Language - The JADE Platform – Programming with JADE – BasicFeatures

REFERENCES:

1. Michael Wooldridge, ―An Introduction to MultiAgent Systems‖, II edition, JohnWiley & Sons, Ltd.2009.
2. Fabio Bellifemine, Giovanni Caire, Dominic Greenwood, Developing Multi agent Systems with JADE, John Wiley and Sons Ltd,2007.
3. Gerhard Weiss, ―Multi Agent Systems: A Modern Approach to Distributed Artificial Intelligence‖, The MIT press,2000.

COURSE OUTCOMES (COs)	
CO1	Understand the notions of the intelligent agent and multi
CO2	Describe Reactive and Hybrid Agents
CO3	Identify the basic application areas of intelligent agents
CO4	Apply bargaining and augmentative techniques.
CO5	Explore the basics of the agent oriented languages.
CO6	Design multi agent systems for real time problems.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**

CO1			1	2		1			2		1	3	3	1	1
CO2	2	3	1	2		1			2	1		3	3	1	1
CO3	2	3	1	2		1			2	1		3	3	1	1
CO4	2		1	2		1			2	1		3	3	1	1
CO5	2		1	2		1			2		1	3	3	1	1
CO6	2		1	2		1			2	1	1	3	3		
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT043	**MINING SOCIAL MEDIA**	**L**	**T**	**P**	**C**
	Total Contact Periods - 45	3	0	0	3
	Prerequisite – Data Mining Techniques				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To use different tools for collecting, analyzing, and exploring social media data for research and developmentpurposes.
- Toprocessthecollecteddata,primarilystructuredusingmethodsinvolvingcorrelation, regression, and classification to derive insights about the sources and people who generated thatdata.
- To apply best practices in SearchEngine

UNIT-I INTRODUCTION 9

What is Social Media Mining - New Challenges fir Mining - Essentials - Graph Essentials- Graph Basics -Graph Representation p- Types of Graph - Connctivity in Graphs - Special Graphs - Graph Algorithms.

UNIT-II NETWORKMEASURES 9

Network Measures - Entity - Transitivity and Reciprocity - Balance and Status - Network Models - Properties of Real-World Networks - Random Graphs - Small-World Models - Preferential Attached Models - Data Mining Essentials - Data Pre-processing - Data mining Algorithms - Supervised Learning - Unsupervised Learning.

UNIT-III COMMUNITY ANDINTERACTIONS 9

Community Analysis - Community Detection - Community Evolution - Community Evaluation - Information Diffusion in Social Media - Herd Behavior - Information Cascades - Diffusion of innovations - Epidemics.

UNIT-IV APPLICATIONS 9

Inference and Homophily - Measuring Assortativity - Influence - Homophily- Distinguishing Influence and Homophily - Recommendation in Social Media -Challenges - Classical Recommendation Algorithms - Recommendation Using Social Context - Evaluating Recommendation- Behavior Analytics Individual Behavior - collective Behavior.

UNIT-V CASE STUDY 9

Gathering social media data - Building social media networks - Analyzing network effects- Simulating network dispersion

TEXT BOOK

1. Social Media Mining: An Introduction, Reza Zafarinin, Mohammad Ali Abbasi, Huan Lui - April 2014.

REFERENCES:

1. Mining Text Data , Charu C. Aggarwal, ChengXiang Zhai, Springer2012.
2. Mastering Social Media Mining with Python, Macro Bonzanini, Packt publications July 2016.

COURSE OUTCOMES (COs)	
CO1	Utilize various Application Programming Interface (API) services to collect data from different social media sources such as YouTube, Twitter, and Flickr.
CO2	Process the collected data, primarily structured using methods involving correlation, regression, and classification to derive insights about the sources and people who generated that data.
CO3	Perform social network analysis to identify important socialactors,subgroups(i.e.,clusters),andnetworkpropertiesinsocialmediasites such as Twitter, Facebook, and YouTube.
CO4	Apply best practices in Search Engine.
CO5	Design ethical principles to the use of web and social media data.
CO6	Build social networks

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	3		2					2	3		1		3		
CO2	3		2			1		2	3		1	1	3		
CO3	3		2		1			2	3	2	1	2	3		
CO4	3		2	1				2	3	2	1	2	3		
CO5	3		2			1		2	3		1	3	3		
CO6	3		2	1	1	1		2	3	2	1	3			
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT044	**DIGITAL AND MEDICAL IMAGE PROCESSING**	**L**	**T**	**P**	**C**
	Total Contact Periods - 45	3	0	0	3
	Prerequisite – Image processing				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- The aim of the course is to show how to extract, model, and analyze information from medicaldataandapplicationinordertohelpdiagnosis,treatmentandmonitoringof diseases through computer science.

UNIT-I DIGITALIMAGEFUNDAMENTAL 9

Elementsofdigitalimageprocessingsystems,ElementsofVisualperception,Imageformation model, Image sampling and quantization, aliasing, zooming and shrinking of digital images. Monochrome Vision Model, Colour Vision Model. Image transforms –DiscreteFourier transform, Properties of Fourier transform, Fast Fourier transform and inverse fast Fourier transform.

UNIT-II IMAGEFUNDAMENTALS 9

Imagesamplingandquantization,MatrixandSingularValuerepresentationofdiscreteimages. Image pre-processing, point operation, Histogram 121odeling, spatial operations, transform operations.

UNIT-III IMAGEENHANCEMENT 9

Enhancement by point processing –Simple intensity transformation –Histogram processing – Image subtraction –Image averaging.Spatial filtering –Smoothing filters, sharpening filters. Enhancements in frequency domain-Low pass filtering –High pass filtering.

UNIT-IV IMAGEANALYSIS,CLASSIFICATIONANDRECONSTRUCTIONOF ACT ANDMRIIMAGES 9

Image analysis, Spatial feature extraction, edge detection, Image segmentation. Image reconstruction from projections, Random transform, filter back projection algorithm, reconstruction of CT images, Imaging methods in MF images, fourier reconstruction ofMRI.

UNIT-V TRANSMISSION OFMEDICALIMAGES 9

Medical Image, data compression of transmission, transform coding, pixelCoding, predictive coding, Interference coding.

TEXT BOOKS:

1. Kavyan Najarian and Robert Splerstor ”Biomedical Signals and Image Processing”, CRC – Taylor and Francisn, New York, 1991.
2. John L. Semmlow, “Biosignal and Biomedical Image Processing Matlab Based applications” Marcel Dekker Inc., New York,2004.

COURSE OUTCOMES (Cos)	
CO1	Acquire a fundamental knowledge of digital image processing with Fourier transforms.
CO2	Learn about the image sampling, Modeling and quantization techniques.
CO3	Explain the image enhancement, its process and types of filters used in image processing.
CO4	Apply image analysis, classification and reconstruction techniques in images.
CO5	Acquire the skills in the transmission of medical images.
CO6	Design real time applications for processing medical images.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1			1	2		1			2		1	3	3		
CO2	2	3	1	2		1			2	1		3	3		

CO3	2	3	1	2		1			2	1		3	3		
CO4	2		1	2		1			2	1		3	3		
CO5	2		1	2		1			2		1	3	3		
CO6	2	3	1	2		1			2	1	1	3	3		
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT045	**MULTIMEDIA COMPRESSION TECHNIQUES**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite –NIL				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

The student should be made to:

- Understand error–controlcoding.
- Understand encoding and decoding of digital datastreams.
- Be familiar with the methods for the generation of these codes and their decoding techniques.
- Be aware of compression and decompressiontechniques.
- Learn the concepts of multimediacommunication.

UNIT I MULTIMEDIA COMPONENTS

Introduction - Multimedia skills - Multimedia components and their characteristics - Text, sound, images, graphics, animation, video, hardware.

UNIT II AUDIO AND VIDEO COMPRESSION

Audio compression–DPCM-Adaptive PCM –adaptive predictive coding-linear Predictive coding-code excited LPC-perpetual coding Video compression –principles-H.261-H.263-MPEG 1, 2, and 4.

UNIT III TEXT AND IMAGE COMPRESSION

Compression principles-source encoders and destination encoders-lossless and lossy compression- entropy encoding –source encoding -text compression – static Huffman coding dynamic coding – arithmetic coding –Lempel Ziv-Welsh Compression-image compression.

UNIT IV VOIP TECHNOLOGY

Basics of IP transport, VoIP challenges, H.323/ SIP –Network Architecture, Protocols, Call establishment and release, VoIP and SS7, Quality of Service- CODEC Methods- VOIP applicability.

UNIT V MULTIMEDIA NETWORKING

Multimedia networking -Applications-streamed stored and audio-making the best Effort service- protocols for real time interactive Applications-distributing multimedia-beyond best effortservice-secludingandpolicingMechanisms-integratedservices-differentiatedServices-RSVP.

TEXT BOOKS:

1. Fred Halshall “Multimedia Communication - Applications, Networks, Protocols and Standards”, Pearson Education,2007.
2. Tay Vaughan, “Multideai: Making it Work”, 7 th Edition, TMH 200898.

3. Kurose and W.Ross" Computer Networking "a Top down Approach, Pearson Education 2005.

REFERENCES:

1. Marcus Goncalves "Voice over IP Networks", Mc Graw Hill1999.
2. KR. Rao,Z S Bojkovic, D A Milovanovic, "Multimedia Communication Systems: Techniques, Standards, and Networks", Pearson Education2007.
3. R.Steimnetz,K.Nahrstedt,"MultimediaComputing,CommunicationsandApplications", Pearson Education Ranjan Parekh, "Principles of Multimedia", TMH2007.

COURSE OUTCOMES (COs)	
CO1	Explore the basic components of multimedia.
CO2	Analyze audio and video compression techniques.
CO3	Apply text and image compression techniques.
CO4	Evaluate the basic concepts of Voice Over Internet Protocol.
CO5	Understand the concepts of multimedia networking and its applications.
CO6	Design interactive real time multimedia applications.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1			1	2		1			2		1	3	2		
CO2	2	3	1	2		1			2	1		3	2		
CO3	2	3	1	2		1			2	1		3	2		
CO4	2		1	2		1			2	1		3	2		
CO5	2		1	2		1			2		1	3	2		
CO6	2	3	1	2		1			2	1	1	3	2		
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT046	**AGILE METHODOLIGY**	**L**	**T**	**P**	**C**
	Total Contact Periods - 45	3	0	0	3
	Prerequisite –Nil				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- Toprovidestudentswithatheoreticalaswellaspracticalunderstandingofagilesoftware
- Todeveloppracticesandhowsmallteamscanapplythemtocreatehigh-qualitysoftware.

UNITI AGILE METHODOLOGY 9

TheoriesforAgileManagement–AgileSoftwareDevelopment–TraditionalModelvs.Agile Model – Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams – Agility in Design-Testing

– Agile Documentations – Agile Drivers- Capabilities andValues

UNIT IIAGILE PROCESSES 9

Lean Production – SCRUM, Crystal, Feature Driven Development- Adaptive Software Development–ExtremeProgramming:MethodOverview–Lifecycle–WorkProducts-Roles andPractices.

UNITIII AGILITY AND KNOWLEDGE MANAGEMENT 9

Agile Information Systems – Agile Decision Making – Earl_S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment , Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role ofStory-Cards – Story-Card Maturity Model(SMM).

UNITIV AGILITY ANDREQUIREMENTS ENGINEERING 9

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of REUsing Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment- Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile RequirementsGeneration.

UNITV AGILITY ANDQUALITY ASSURANCE 9

AgileProductDevelopment–AgileMetrics–FeatureDrivenDevelopment(FDD)–Financial and Production Metrics in FDD – Agile Approach to Quality Assurance – Test Driven Development – Agile Approach in Global SoftwareDevelopment.

TEXT BOOKS:

1. DavidJ.AndersonandEliSchragenheim,―AgileManagementforSoftwareEngineering: Applying the Theory of Constraints for Business Results, Prentice Hall,2003.
2. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer,2009.

REFERENCES:

1. Craig Larman, ―Agile and Iterative Development: A Managers Guide, Addison-Wesley, 2004.
2. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and Management, Butterworth-Heinemann,2007.

COURSE OUTCOMES (COs)	
CO1	Understand the fundamentals of agile methodology.
CO2	Explore the various agile processes for software development.
CO3	Demonstrateknowledge management in Agile methodology.
CO4	DescribethebenefitsandpitfallsofworkinginanAgileteam and to understand Agile development, deployment andtesting.
CO5	Apply agile approach to quality assurance.
CO6	Design applications using Agile approach in Global Software Development
Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low	

COs\ POs	1	2	3	4	5	6	7	8	9	10	11	12	PS 01	PS 02	PS 03
CO1	3		2					2	3		1				2
CO2	3		2			1		2	3		1	1			2
CO3	3		2		1			2	3	2	1	2			2
CO4	3		2	1				2	3	2	1	2			2
CO5	3		2			1		2	3		1	3			2
CO6	3		2	1	1	1		2	3	2	1	3			2
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT051	**INTERNET OF THINGS**	**L**	**T**	**P**	**C**
	Total Contact Periods - 45	3	0	0	3
	Prerequisite – Computer Architecture				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To understand Smart Objects and IoT Architectures
- To learn about various IOT-relatedprotocols
- To build simple IoT Systems using Arduino and RaspberryPi.
- To understand data analytics and cloud in the context ofIoT

UNITI FUNDAMENTALSOFIoT 9

Evolution of Internet of Things - Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack -– Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting SmartObjects

UNITII IoT PROTOCOLS 9

IoTAccessTechnologies:PhysicalandMAClayers,topologyandSecurityofIEEE802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP andMQTT

UNITIII DESIGN ANDDEVELOPMENT 9

Design Methodology - Embedded computing logic - Microcontroller, System on Chips - IoT systembuildingblocks-Arduino-Boarddetails,IDEprogramming-RaspberryPi-Interfaces and Raspberry Pi with PythonProgramming.

UNITIV DATA ANALYTICS ANDSUPPORTINGSERVICES 9

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning – No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics and Network Analytics – Xively Cloud for IoT, Python WebApplication Framework – Django – AWS for IoT – System Management withNETCONF-YANG

UNITV CASE STUDIES/INDUSTRIAL APPLICATIONS 9

Cisco IoT system - IBM Watson IoT platform – Manufacturing - Converged Plantwide

Ethernet Model (CPwE) – Power Utility Industry – GridBlocks Reference Model - Smart and ConnectedCities:Layeredarchitecture,SmartLighting,SmartParkingArchitectureandSmart TrafficControl

TEXTBOOK:

1.DavidHanes,GonzaloSalgueiro,PatrickGrossetete,RobBartonandJeromeHenry,—IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press,2017

REFERENCES:

1. Arshdeep Bahga, Vijay Madisetti, —Internet of Things – A hands-on approach‖, Universities Press,2015
2. Olivier Hersent, David Boswarthick, Omar Elloumi , —The Internet of Things – Key applications and Protocols‖, Wiley, 2012 (for Unit2).
3. Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier,2014.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things‖, Springer,2011.
5. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media,2011.

COURSE OUTCOMES (COs)	
CO1	Explain the concept of IoT.
CO2	Analyze various protocols for IoT.
CO3	Design a PoC of an IoT system using Rasperry Pi/Arduino
CO4	Apply data analytics and use cloud offerings related to IoT.
CO5	Analyze applications of IoT in real time scenario
CO6	Implement Industrial IoT applications

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1			1	2		1			2		1	3	3	1	1
CO2	2	3	1	2		1			2	1		3	3	1	1
CO3	2	3	1	2		1			2	1		3	3	1	1
CO4	2		1	2		1			2	1		3	3	1	1
CO5	2		1	2		1			2		1	3	3	1	1
CO6	2	3	1	2		1			2	1	1	3	3		
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

	ARTIFICIAL INTELLIGENT GAME	**L**	**T**	**P**	**C**
	Total Contact Periods – 45	3	0	0	3
U18PEIT052	Prerequisite – Artificial Intelligence				

	Course Designed by:- Dept of Information Technology

OBJECTIVES

- Study The Concepts Of ArtificialIntelligence.
- Learn The Methods Of Solving Problems Using ArtificialIntelligence.
- Introduce The Concepts Of Expert Systems And MachineLearning.

UNITI INTRODUCTION 9

Introduction–Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents– Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

UNITII PROBLEMSOLVING METHODS 9

Problem solving Methods – Search Strategies- Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems – Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing – Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games

UNITIII KNOWLEDGE REPRESENTATION 9

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering-CategoriesandObjects–Events–MentalEventsandMentalObjects–ReasoningSystemsfor Categories – Reasoning with Default Information

UNITIV SOFTWARE AGENTS 9

Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems

UNITV APPLICATIONS 9

AIapplications–LanguageModels–InformationRetrieval-InformationExtraction–Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning –Moving

TEXT BOOK

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition,2009.
2. I. Bratko, Prolog: Programming for Artificial Intelligence‖, Fourth edition, Addison-Wesley Educational Publishers Inc.,2011.

REFERENCES:

1. M.TimJones,―ArtificialIntelligence:ASystemsApproach(ComputerScience)‖,Jones and Bartlett Publishers, Inc.; First Edition, 2008
2. Nils J. Nilsson, ―The Quest for Artificial Intelligence‖, Cambridge University Press,2009.
3. WilliamF.ClocksinandChristopherS.Mellish,‖ProgramminginProlog:UsingtheISO Standard‖, Fifth Edition, Springer,2003.
4. Gerhard Weiss, ―Multi Agent Systems‖, Second Edition, MIT Press,2013.
5. David L. Poole and Alan K. Mackworth, ―Artificial Intelligence: Foundations of Computational Agents‖, Cambridge University Press,2010.

COURSE OUTCOMES (COs)	
CO1	Identify problems that are amenable to solution by Artificial Intelligence methods.
CO2	Select appropriate Artificial Intelligencemethods to solve a given problem.

CO3	Formalize agiven problem in the language/framework of different Artificial Intelligence methods.
CO4	Represent knowledge, design intelligent agents and apply the suitable Artificial Intelligence algorithms for problem solving and reasoning.
CO5	Designandcarryoutanempiricalevaluationofdifferent Artificial Intelligence algorithms
CO6	Learn the concepts of problem solving, reasoning, planning, natural language understanding, computer vision and machine learning and design real time Artificial Intelligence applications

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	1	2	3	4	5	6	7	8	9	10	11	12	PS 01	PS 02	PS 03
CO1			1	2		1			2		1	3	3		
CO2	2	3	1	2		1			2	1		3	3		
CO3	2	3	1	2		1			2	1		3	3		
CO4	2		1	2		1			2	1		3	3		
CO5	2		1	2		1			2		1	3	3		
CO6	2	3	1	2		1			2	1	1	3	3		

Category	Professional Electives(PE)
Approval	49th meeting of the Academic Council

U18PEIT053	**INFERENTIAL STATISTICS**	**L**	**T**	**P**	**C**
	Total Contact Periods - 45	3	0	0	3
	Prerequisite – Data mining				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES
To enable students to analyze and interpret data, collected data from a variety of types of research designs, within a linear model framework.

UNIT1 INTERVAL ESTIMATION 10

Concepts of confidence interval and confidence coefficient - confidence interval for mean - difference between means - variance and ratio of variances under normality. Large sample confidence interval for proportions and correlation coefficients

UNITII TESTINGOFHYPOTHESIS 9

Definition of Most Powerful (MP) - Uniformly Most Powerful(UMP) - Neyman Pearson Lemma - Monotone Likelihood Ratio Property - Statement of the theorem -UMP tests for testing one sided hypothesis for distribution with MLR property.

UNITIII LIKELIHOOD RATIOTEST 9

Likelihood Ratio test- LRT for single mean for normal case (large and small samples)- for equality of two means for unknown but equal variances. LRT for single variance and equality of two variances

UNITIV NON PARAMETRICTESTS 9

Need for non parametric tests- Sign test for one sample and two samples- Wilcoxon signed rank test- Median test- Wald Wolfowitz run test- Mann Whitney U test- Run test for randomness-testforindependencebasedonSpearman'srankcorrelationcoefficient(smalland large samples)- Chi square test- goodness of fit- independence of attributes in contingency table - and equality of many proportions. Kruskal Wallis Test for equality of severalmeans.

UNITV SEQUENTIAL PROBABILITY RATIO TEST 8

Need for sequential test- Wald's SPRT- Sequential test for the mean of Normal population when variance is known and for the proportion- Derivation of expressions for OC and ASN functions in Bernoulli and Normal distributions.

TEXT BOOK

1. InferentialStatistics,S.RoychowdhuryD.Bhattacharya,U.N.DHUR&SonsPrivateLtd, 2012

REFERENCES

1. Probability and Statistical Inference Theory & Practices, S. Roychowdhury D. Bhattacharya, U.N.DHUR & Sons Private Ltd .2015
2. Statistics and Data Analysis, A. Abebe, J.Daniel, J.W.McKean,

COURSE OUTCOMES (COs)	
CO1	Understand the analysis of Variance (ANOVA) or Analysis of Covariance (ANCOVA)
CO2	Analyze and interpret data collected from factorial designs.
CO3	Use the multiple linear regression (MLR) procedures to compute partial and semi-partial correlation analyses and interpret the results
CO4	Infer data from a prediction study using one criterion variable and multiple predictor variables.
CO5	Interpret ANOVA, ANCOVA, and MLR results reported in published reports of research.
CO6	Evaluate the reliability and validity of a measuring (or survey) instrument.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	3	2	2						3		1			2	
CO2	3	2	2			1			3		1	1		2	
CO3	3	2	2		1				3	2	1	2		2	
CO4	3	2	2	1					3	2	1	2		2	
CO5	3	2	2			1			3		1	3		2	
CO6	3	2	2			1			3		1	3		2	
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT054	DEEP LEARNING	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Neural networks				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

This course covers the basics of machine learning, neural networks and deep learning. Model for deep learning technique and the various optimization and generalization mechanisms are included. Major topics in deep learning and dimensionality reduction techniques are covered.

UNITI INTRODUCTION 9

Introductiontomachinelearning-Linearmodels(SVMsandPerceptrons,logisticregression)-IntrotoNeuralNets:Whatashallownetworkcomputes-Traininganetwork:lossfunctions,

back propagation and stochastic gradient descent- Neural networks as universal function approximates

UNITII DEEPNETWORKS 9

History of Deep Learning- A Probabilistic Theory of Deep Learning- Backpropagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks Convolutional Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning

UNITIII DIMENTIONALITY REDUCTION 9

Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyperparameter optimization

UNITIV OPTIMIZATION ANDGENERALIZATION 9

Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience

UNITV CASE STUDY ANDAPPLICATIONS 9

Imagenet- Detection-Audio WaveNet-Natural Language Processing Word2Vec - Joint DetectionBioInformatics-FaceRecognition-SceneUnderstanding-GatheringImageCaptions

REFERENCES:

1. Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View, 2015.
2. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers,2013.
3. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press,2016.
4. Michael Nielsen, Neural Networks and Deep Learning, Determination Press,2015.

COURSE OUTCOMES (COs)	
CO1	Explain the mathematical, statistical and computational challenges of building neural networks
CO2	Understand the concepts of Machine Learning
CO3	Explore the concepts of deep learning

CO4	Apply dimensionality reduction techniques in deep learning applications
CO5	Describe the optimization and generalization for deep networks
CO6	Design real time applications using deep learning techniques

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	1	2	3	4	5	6	7	8	9	10	11	12	PS 01	PS 02	PS 03
CO1			1	2		1			2		1	3	3		
CO2	2	3	1	2		1			2	1		3	3		
CO3	2	3	1	2		1			2	1		3	3		
CO4	2		1	2		1			2	1		3	3		
CO5	2		1	2		1			2		1	3	3		
CO6	2		1	2		1			2		1	3	3		
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT055	**SOFTWARE QUALITY**	**L**	**T**	**P**	**C**
	Total Contact Periods - 45	3	0	0	3
	Prerequisite – Software Engineering				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To develop a broad understanding of SQA processes from planning untilexecution
- To have detailed knowledge of techniques in an appropriate engineering and managementcontext.

UNITI **9**

Introduction to software quality – Software modeling – Scope of the software quality program – Establishingqualitygoals–Purpose,qualityofgoals–SQAplanningsoftware–Productivity anddocumentation.

UNITII **9**

Software quality assurance plan – Purpose and Scope, Software quality assurance Management – Organization – Quality tasks – Responsibilities –Documentation.

UNITIII **9**

Standards,Practices,ConventionsandMetrics,ReviewsandAudits–Management-Technical review–Softwareinspectionprocess–Walkthroughprocess–Auditprocess–Testprocesses – ISO, cmm compatibility – Problem reporting and correctiveaction.

UNITIV **9**

Tools, Techniques and methodologies, Code control, Media control - Supplier control - Records collection - Maintenance and retention - Training and risk management.

UNITV **9**

ISO 9000 model - CMM model- Comparisons- ISO 9000 weaknesses- CMM weaknesses-

SPICE – Software process improvement and capability determination.

TEXT BOOK

1. Mordechai Ben – Meachem and Garry S.Marliss, "Software Quality – Producing Practical, Consistent Software", International Thompson Computer Press, 1997.

REFERENCES

1. Watt. S. Humphrey, "Managing Software Process", Addison – Wesley,1998.
2. Philip.B.Crosby,"QualityisFree:TheArtofmakingqualitycertain",MassMarket,1992.

COURSE OUTCOMES (COs)	
CO1	Understand the quality management processes
CO2	Describe the various activities of quality assurance, quality planning and quality control
CO3	Define the importance of standards in the quality
CO4	Discuss the needs for software processassessment and improvement
CO5	Explore the different software quality factors models
CO6	Apply tools, techniques and methodologies to ensure software quality

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1			1	2		1			2		1	3	3	3	3
CO2	2	3	1	2		1			2	1		3	3	3	3
CO3	2	3	1	2		1			2	1		3	3	3	3
CO4	2		1	2		1			2	1		3	3	3	3
CO5	2		1	2		1			2		1	3	3	3	3
CO6	2		1	2		1			2		1	3	3	3	3
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT056	**SOFTWARE ARCHITECTURE**	**L**	**T**	**P**	**C**
	Total Contact Periods – 45	3	0	0	3
	Prerequisite –Nil				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- To develop Computer Science, Software Engineering or Computer Engineering student
- Tounderstandtheemergingfieldofsoftwarearchitecturemeanstothefieldofsoftware development.

UNIT I **9**

Introduction – Software Architecture – Engineering Discipline for Software – Status of

Software Architecture Architectural Styles – Pipes and Filters – Data Abstraction and Object Oriented Organization – Event Based Implicit Invocation – Layered Systems – Repositories – Interpreters – Process Control – Other Architectures – Hetero Generous Architecture – Case Studies.

UNITII **9**

Shared Information Systems – Database Integration – Integration in Software Development Environments – Integration in the Design of Build – Architectural Structures for Shared Information Systems – Conclusions.

UNITIII **9**

Architectural Design Guidance – Guidance for User-Interface Architectures – The Quantified Design Phase.

UNITIV **9**

Formal Model and Specification – The Value of Architectural Formalism – Formalizing the Architecture of a Specific System – Formalizing an Architectural Style – Formalizing and Architectural Design Space – Theory of Software Architecture – Notation Linguistic Issues – Requirement for Architecture – Description Languages – First Class Connectors – Adding Implicit Invocation to Traditional Programming Languages.

UNITV **9**

Tools for Architectural Design – Unicon – Exploiting Style in Architectural Design Environments – Beyond Definition / Use.

TEXT BOOK

1. Mary Shaw and David Garlan , "Software Architecture : Perspectives on an Emerging Discipline" ,Prentice – Hall of India, New Delhi, 2000.

REFERENCE

1. Bass, Lan, Clements, Paul and Kazman, Rick, "Software Architecture in Practice, Addison Wesley, 1998.

COURSE OUTCOMES (Cos)	
CO1	Understand the Software Architectural perspective and how it differs from lower-level design.
CO2	Describe the integration in Software Development process.
CO3	Apply the architectural structures for shared information systems.
CO4	Develop architectural approaches from basic requirements.
CO5	Define the architectural frameworks within product line development.
CO6	Apply tools for software architectural designs.

Mapping of Course Outcomes with Program outcomes (Pos)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	3		2						3		1		3		
CO2	3		2			1			3		1	1	3		
CO3	3		2		1				3	2	1	2	3		

CO4	3		2	1					3	2	1	2	3		
CO5	3		2			1			3		1	3	3		
CO6	3		2			1			3		1	3	3		
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT061	**QUANTUM COMPUTING**	**L**	**T**	**P**	**C**
	Total Contact Periods – 45	3	0	0	3
	Prerequisite –Nil				
	Course Designed by:- Dept of Information Technology				
OBJECTIVES	Students will be well versed in Quantum computation and algorithms, Basic quantum mechanics, quantum cryptographic protocols, quantum teleportation, polynomial-time factoring, quantum error correction, and a new graphical calculus for reasoning about quantum systems				

UNITI FOUNDATION 9

Overview of traditional computing – Church-Turing thesis – circuit model of computation – reversible computation – quantum physics – quantum physics and computation – Dirac notation and Hilbert Spaces – dual vectors – operators – the spectral theorem – functions of operators – tensor products – Schmidt decomposition theorem.

UNITII QUBITS AND QUANTUM MODELOFCOMPUTATION 9

State of a quantum system – time evolution of a closed system – composite systems – measurement – mixed states and general quantum operations – quantum circuit model – quantum gates – universal sets of quantum gates – unitary transformations – quantumcircuits.

UNITIII QUANTUM ALGORITHMS– I 9

Superdense coding – quantum teleportation – applications of teleportation – probabilistic versus quantum algorithms – phase kick-back – the Deutsch algorithm – the Deutsch-Jozsa algorithm – Simon's algorithm – Quantum phase estimation and quantum FourierTransform.

UNITIV QUANTUM ALGORITHMS– II 9

Order-finding problem – eigen value estimation approach to order finding – Shor's algorithm for order finding – finding discrete logarithms – hidden subgroups – Grover's quantum search algorithm – amplitude amplification – quantum amplitude estimation – quantum counting – searching without knowing the successprobability.

UNITV QUANTUM COMPUTATIONAL COMPLEXITY AND ERROR CORRECTION 9

Computational complexity – black-box model – lower bounds for searching – general black-box lower bounds – polynomial method – block sensitivity – adversary methods – classical error correction – classical three-bit code – fault tolerance – quantum error correction – three- and nine-qubit quantum codes – fault-tolerant quantum computation.

TEXTBOOK:

1. P. Kaye, R. Laflamme, and M. Mosca, “An introduction to Quantum Computing”, Oxford University Press, 1999.

REFERENCE:

1. V. Sahni, “Quantum Computing”, Tata McGraw-Hill Publishing Company, 2007.

COURSE OUTCOMES (COs)	
CO1	Translatefluentlybetweenthemajormathematicalrepresentations.
CO2	Implement basic quantum algorithms.
CO3	Understand quantum decoherence in systems for computation.
CO4	Apply eigenvalue estimation approach to order finding.
CO5	Describe the quantum error correction techniques.
CO6	Designing fault tolerant quantum computing systems

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	3	3		2		3			1				2		
CO2					3		2	3	2	3		2	2		
CO3	1	1		1		2					3		2		
CO4	3	3		2	2	3	2	2	2			1	2		
CO5	3			2	2	2	2	1		2	2		2		
CO6	3			2	2	2	2	1		2	2		2		
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT062	**REAL TIME SYSTEMS**	**L**	**T**	**P**	**C**
	Total Contact Periods – 45	3	0	0	3
	Prerequisite – Database Management System				
	Course Designed by:- Dept of Information Technology				
OBJECTIVES	The main objective of this course is to cover the principles and design methods of real-time computer systems. It covers the interfacing techniques and microprocessor system realization. The principles of real-time operating systems and real-time software system				

UNITI INTRODUCTION 9

Issues in Real Time Computing, Structure of a Real Time System. Task Classes, Performance Measures for Real Time Systems, Estimating Program Run times. Task Assignment and Scheduling –Classical Uniprocessor scheduling algorithms, UniProcessor. Scheduling of IRIS Tasks, Task Assignment,Mode Changes, and Fault Tolerant Scheduling.

UNITII PROGRAMMING LANGUAGESANDTOOLS 9

Programming Language and Tools – Desired Language characteristics, Data Typing, Control structures, Facilitating Hierarchical Decomposition, Packages, Runtime (Exception) Error handling, Overloading andGenerics, Multitasking, Low Level programming, Taskscheduling, Timing Specifications, Programming Environments, Run-timeSupport.

UNITIII REALTIME DATABASES 9

Basic Definition, Real time Vs General Purpose Databases, Main Memory Databases,136ransact ion priorities, Transaction Aborts, Concurrency Control Issues, Disk Scheduling Algorithms,

Twophase Approach to improve Predictability, Maintaining Serialization Consistency, Data bases for Hard Real Time systems.

UNITIV COMMUNICATION 9

Real-Time Communication – Communications Media, Network Topologies Protocols, Fault Tolerant Routing. Fault Tolerance Techniques – Fault Types, Fault Detection. Fault Error containment Redundancy, Data Diversity, Reversal Checks, Integrated Failure handling.

UNITV EVALUATIONTECHNIQUES 9

Reliability Evaluation Techniques – Obtaining Parameter Values, Reliability Models for Hardware Redundancy, Software Error models. Clock Synchronization – Clock, A Nonfault-Tolerant Synchronization Algorithm, Impact of Faults, Fault Tolerant Synchronization in Hardware, Fault Tolerant Synchronization in Software

TEXT BOOK:

1. C.M. Krishna, Kang G. Shin, "Real-Time Systems", McGraw-Hill International Editions, 1997.

REFERENCES:

1. Stuart Bennett, "Real Time Computer Control-An Introduction",Second edition Prentice Hall PTR, 1994.
2. Peter D. Lawrence, "Real time Micro Computer System Design – An Introduction",McGr aw Hill,1988.
3. S.T. Allworth and R.N. Zobel, "Introduction to real time software design", Macmillan, II Edition, 1987.
4. R.J.ABuhur,D.L.Bailey,"AnIntroductiontoReal-TimeSystems",Prentice-HallInternational, 1999.
5. Philip.A.Laplante "Real Time System Design and Analysis" PHI , III Edition, April2004.

COURSE OUTCOMES (Cos)	
CO1	Understand the basics concepts of real-time systems.
CO2	Generate a high-level analysis document based on requirements specifications.
CO3	Describe the basic multi-task scheduling algorithms for periodic, aperiodic.
CO4	Apply fault tolerant routing for the real time communication and communications media.
CO5	Implement reliability evaluation techniques to identify software error models.
CO6	Design real time systems by interacting with the environment.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	3	3		2		1						3	2		
CO2	3	3			3		1	3	2	3			2		
CO3	3	3	1			2					3		2		
CO4	3	3		2	2	3	1	2	2			2	2		

CO5	3	3		2	2	2	2			2	2		2		
CO6	3	3		2	2	2	2			2	2		2		
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT063	**COMPUTER GRAPHICS**	**L**	**T**	**P**	**C**
	Total Contact Hours: 45	3	0	0	3
	Prerequisite: Computer Architecture				
	Course Designed by:- Dept of Information Technology				

OBJECTIVES

- Be familiar with both the theoretical and practical aspects of computing withimages.
- Have described the foundation of image formation, measurement, andanalysis.
- Understand the geometric relationships between 2D images and the 3Dworld.

UNITI INTRODUCTION 9

Survey of computer graphics, Overview of graphics systems – Video display devices, Raster scansystems,Randomscansystems,GraphicsmonitorsandWorkstations,Inputdevices,Hard copy Devices, Graphics Software; Output primitives – points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms; Pixel addressing and object geometry, filled areaprimitives.

UNITII TWODIMENSIONALGRAPHICS 9

Two dimensional geometric transformations – Matrix representations and homogeneous coordinates,compositetransformations;Twodimensionalviewing–viewingpipeline,viewing coordinate reference frame; widow-to-viewport coordinate transformation, Two dimensional viewing functions; clipping operations – point, line, and polygon clipping algorithms.

UNITIII THREEDIMENSIONALGRAPHICS 9

Three dimensional concepts; Three dimensional object representations – Polygon surfaces- Polygon tables- Plane equations – Polygon meshes; Curved Lines and surfaces, Quadratic surfaces;Blobbyobjects;Splinerepresentations–Beziercurvesandsurfaces–B-Splinecurves andsurfaces.

TRANSFORMATION AND VIEWING: Three dimensional geometric and modeling transformations – Translation, Rotation, Scaling, composite transformations; Three dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods.

UNITIV ILLUMINATION ANDCOLOURMODELS 9

Light sources – basic illumination models – halftone patterns and dithering techniques; Properties of light – Standard primaries and chromaticity diagram; Intuitive colour concepts – RGB colour model – YIQ colour model – CMY colour model – HSV colour model – HLS colour model; Colour selection.

UNITV ANIMATIONS & REALISMANIMATIONGRAPHICS 9

Design of Animation sequences – animation function – raster animation – key frame systems – motion specification –morphing – tweening. COMPUTER GRAPHICS REALISM: Tiling the plane – Recursively defined curves – Koch curves – C curves – Dragons – space filling curves – fractals – Grammar based models – fractals – turtle graphics – raytracing.

TEXT BOOKS:

1. John F. Hughes, Andries Van Dam, Morgan Mc Guire ,David F. Sklar , James D. Foley, Steven K. Feiner and Kurt Akeley ,"Computer Graphics: Principles and Practice", , 3rd Edition, Addison- Wesley Professional,2013. (UNIT I, II, III,IV).
2. Donald Hearn and Pauline Baker M, "Computer Graphics", Prentice Hall, New Delhi, 2007 (UNITV).

REFERENCES:

1. Donald Hearn and M. Pauline Baker, Warren Carithers,"Computer Graphics With Open GL", 4th Edition, Pearson Education,2010.
2. Jeffrey McConnell, "Computer Graphics: Theory into Practice", Jones and Bartlett Publishers, 2006.
3. Hill F S Jr., "Computer Graphics", Maxwell Macmillan" ,1990.
4. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, KelvinSung, and AK Peters, Fundamental of Computer Graphics, CRC Press, 2010.
5. William M. Newman and Robert F.Sproull, "Principles of Interactive Computer Graphics", Mc GrawHill1978.

COURSE OUTCOMES (Cos)	
CO1	Equip with the practical skills necessary to build computer vision applications.
CO2	Describe the object, scene recognition and categorization from images.
CO3	Describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition.
CO4	Explore the different illumination and color models.
CO5	Implement motion related techniques.
CO6	Develop applications using computer vision techniques.

Mapping of Course Outcomes with Program outcomes (Pos)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	3	3		2								2	3		
CO2					3		2		2	3			3		
CO3						2					3	2	3		
CO4	3	2		2	2	3	2		2				3		
CO5	3			2	2	2	2			2	2	3	3		
CO6	3			2	2	2	2			2	2	3	3		
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT064	**BUSINESSINTELLIGENCE**	**L**	**T**	**P**	**C**

	Total Contact Hours: 45	3	0	0	3
	Prerequisite: Database Management System				
	Course Designed by:- Dept of Information Technology				

OBJECTIVE

The objective of this course is to explore business intelligence and data mining, using powerful yet user friendly tools, with exposure to real world business applications.

UNITI BUSINESS INTELLIGENCE 9

EffectiveAndTimelyDecisions–Data,InformationAndKnowledge–RoleOfMathematical Models – Business Intelligence Architectures: Cycle of A Business Intelligence Analysis – Enabling Factors In Business Intelligence Projects – Development of a Business Intelligence System – Ethics And BusinessIntelligence.

UNITII KNOWLEDGE DELIVERY 9

The Business Intelligence User Types, Standard Reports, Interactive Analysis and Ad Hoc Querying, Parameterized Reports And Self-Service Reporting, Dimensional Analysis, Alerts/Notifications, Visualization: Charts, Graphs, Widgets, Scorecards And Dashboards, Geographic Visualization, Integrated Analytics, Considerations: Optimizing The Presentation For The Right Message.

UNITIII EFFICIENCY 9

Efficiency Measures – The CCR Model: Definition Of Target Objectives- Peer Groups – Identification Of Good Operating Practices; Cross Efficiency Analysis – Virtual Inputs And Outputs – Other Models. Pattern Matching – Cluster Analysis, Outlier Analysis.

UNITIV BUSINESS INTELLIGENCEAPPLICATIONS 9

Marketing Models – Logistic And Production Models – Case Studies.

UNITV FUTURE OFBUSINESS INTELLIGENCE 9

Future of Business Intelligence – Emerging Technologies, Machine Learning, Predicting The Future, BI Search & Text Analytics – Advanced Visualization – Rich Report, Future Beyond Technology.

TEXT BOOK:

1. Efraim Turban, Ramesh Sharda, Dursun Delen, "Decision Support And Business Intelligence Systems", 9th Edition, Pearson 2013.

REFERENCES:

1. LarissaT.Moss,S.Atre,"BusinessIntelligenceRoadmap:TheCompleteProjectLifecycle Of Decision Making", Addison Wesley,2003.
2. Carlo Vercellis, "Business Intelligence: Data Mining And Optimization For Decision Making", Wiley Publications,2009.
3. David Loshin Morgan, Kaufman, "Business Intelligence: The Savvy Manager"S Guide", Second Edition,2012.
4 Cindi Howson, "Successful Business Intelligence: Secrets To Making BI A Killer App", McGraw-Hill,2007.
5. Ralph Kimball , Margy Ross , Warren Thornthwaite, Joy Mundy, Bob Becker, "The Data Warehouse Lifecycle Toolkit", Wiley Publication Inc.,2007.

COURSE OUTCOMES (COs)	
CO1	Understand the basics Business Intelligence.

CO2	Learn Standard Reports, Interactive Analysis and Ad Hoc Querying.
CO3	Understand Efficiency Measures and CCR Model.
CO4	Understand business Intelligence applications.
CO5	Design Business Intelligence Applications for real time cases.
CO6	Predict the future of Business Intelligence and explore the emerging technologies

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	1	2	3	4	5	6	7	8	9	10	11	12	PS 01	PS 02	PS 03
CO1	3	3		2	3	3						1	2		
CO2							2	3	2	3			2		
CO3						2					3	2	2		
CO4	3	2		2	2		2	2	2				2		
CO5	3			2	2	2	2			2	2	3	2		
CO6	3	2		2	2	2	2			2	2	3	2		
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT065	**INFORMATION THEORY AND CODING**	**L**	**T**	**P**	**C**
	Total Contact Periods – 45	3	0	0	3
	Prerequisite – Multimedia Systems				
	Course Designed by:- Dept of Information Technology				
OBJECTIVES	• Understand Error–ControlCoding.				
	• Understand encoding and decoding of digital datastreams. • Be Familiar with the methods for the generation of these codes and their decodingtechniques. • Be aware of compression and decompressiontechniques. • Learn the Concepts of MultimediaCommunication.				

UNITI INFORMATION ENTROPYFUNDAMENTALS 9

Uncertainty, Information And Entropy – Source Coding Theorem – Huffman Coding – Shannon Fano Coding – Discrete Memory Less Channels – Channel Capacity – Channel Coding Theorem – Channel Capacity Theorem.

UNITII DATA ANDVOICE CODING 9

DifferentialPulseCodeModulation–AdaptiveDifferentialPulseCodeModulation–Adaptive SubbandCoding–DeltaModulation–AdaptiveDeltaModulation–CodingOfSpeechSignal At Low Bit Rates (Vocoders,LPC).

UNITIII ERROR CONTROL CODING 9

LinearBlockCodes–SyndromeDecoding–MinimumDistanceConsideration–CyclicCodes – GeneratorPolynomial–ParityCheckPolynomial–EncoderForCyclicCodes–Calculation Of Syndrome – ConvolutionalCodes.

UNITIV COMPRESSION TECHNIQUES 9

Principles – Text Compression – Static Huffman Coding – Dynamic Huffman Coding – ArithmeticCoding–ImageCompression–GraphicsInterchangeFormat–TaggedImageFile Format – Digitized Documents – Introduction to JPEG Standards.

UNITV AUDIO AND VIDEOCODING 9

Linear Predictive Coding – Code Excited LPC – Perceptual Coding, MPEG Audio Coders – Dolby Audio Coders – Video Compression – Principles – Introduction To H.261 & MPEG VideoStandards.

TEXTBOOKS:

1. Simon Haykin, "Communication Systems", 4th Edition, John Wiley And Sons,2001.
2. Fred Halsall, "Multimedia Communications, Applications Networks Protocols And Standards", Pearson Education, Asia 2002; Chapters:3,4,5.

REFERENCES:

1. Mark Nelson, "Data Compression Book", BPB Publication1992.
2. Watkinson J, "Compression InVideo And Audio", Focal Press, London,1995.

COURSE OUTCOMES (COs)	
CO1	Understand the fundamentals of Information Entropy and channel capacity for various channels
CO2	Compare various data and voice source coding techniques
CO3	Inspect error detection and describe the different error control coding techniques
CO4	Apply the differentcompression techniques for real time applications.
CO5	Describe the concepts of Audio and video coding techniques.
CO6	Implement the different coding techniques to design applications in multimedia communication systems.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

COs\ POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	3	2	1	1								2	2	2	
CO2	3	1	1	1							2		2	2	
CO3	3	2	2	2									2	2	
CO4	3	2	2	2					2		2	2	2	2	
CO5	3	2	2	2					2			2	2	2	
CO6	3	2	2	2					2			2			
Category	Professional Electives(PE)														
Approval	49th meeting of the Academic Council														

U18PEIT066	**MULTI AGENT INTELLIGENT SYSTEMS**	**L**	**T**	**P**	**C**
	Total Contact Periods – 45	3	0	0	3
	Prerequisite – Artificial Intelligence				

	Course Designed by:- Dept of Information Technology
OBJECTIVES	The purpose of this course is to impart concepts of ArtificialIntelligence and different agents.

UNITI INTRODUCTION 9

Definitions - Foundations - History - Intelligent Agents-Problem Solving-Searching - Heuristics -Constraint Satisfaction Problems - Game playing.

UNITII KNOWLEDGE REPRESENTATION AND REASONING 9

Logical Agents-First order logic-First Order Inference-Unification-Chaining- Resolution Strategies Knowledge Representation-Objects-Actions-Events.

UNITIII PLANNINGAGENTS 9

Planning Problem-State Space Search-Partial Order Planning-Graphs-Nondeterministic Domains Conditional Planning-Continuous Planning-Multi Agent Planning.

UNITIV AGENTS AND UNCERTAINITY 9

Acting under uncertainty – Probability Notation-Bayes Rule and use - Bayesian Networks-Other Approaches-Time and Uncertainty-Temporal Models- Utility Theory - Decision Network – Complex Decisions.

UNITV HIGHER LEVEL AGENTS 9

Knowledge in Learning-Relevance Information-Statistical Learning Methods-Reinforcement Learning Communication-Formal Grammar-Augmented Grammars- Future of AI.

TEXTBOOKS:

1. Stuart Russell and Peter Norvig, “Artificial Intelligence - A Modern Approach”, 2nd Edition, Prentice Hall,2002.
2. Michael Wooldridge, “An Introduction to Multi Agent System”, John Wiley,2002.

REFERENCE BOOKS:

1. Patrick Henry Winston, Artificial Intelligence, 3rd Edition, AW,1999.
2. Nils.J.Nilsson, Principles of Artificial Intelligence, Narosa Publishing House,1992.

COURSE OUTCOMES (COs)	
CO1	Describe the modern view of AI as the study of agents that receive percepts from the Environment and perform actions.
CO2	Demonstrate awareness of informed search and exploration Methods.
CO3	Explain about AItechniques for knowledge representation and planning.
CO4	Apply probabilistic/statistical approaches to act in uncertain environment.
CO5	Understand the different learning approaches and make the machine to perform human-like tasks.
CO6	Prepare for future by integrating Artificial Intelligence in real time.

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Cos\ Pos	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PS 01**	**PS 02**	**PS 03**
CO1	3	3	2	2					3	2		2	3		
CO2	2	3	2	2					2	2		2	3		
CO3	2	3	2	2				2	2	2			3		
CO4	3	3	2	2					2	2		2	3		
CO5	2	3	2	2				2	2	2	2	2	3	2	
CO6	3	3	2	2					2	2	2	2	3	2	

Category	Core Elective(CE)
Approval	49th meeting of the Academic Council