ANNA UNIVERSITY, CHENNAI
UNIVERSITY DEPARTMENTS
B.TECH. INFORMATION TECHNOLOGY
REGULATIONS – 2015
CHOICE BASED CREDIT SYSTEM

PROGRAM EDUCATIONAL OBJECTIVES:

Bachelor of Technology in Information Technology curriculum is designed to prepare the graduates having attitude and knowledge to:

1. Have successful professional and technical career in Information Technology
2. Have core competence in basic engineering and mathematics to formulate, analyze, and solve hardware / software engineering problems.
3. Train student community with good knowledge in core areas of Information Technology and related engineering so as to analyze, design, and synthesize data and technical concepts to produce novel solutions for the real life problems.
4. To inculcate in students to maintain high professionalism and ethical standards, effective oral and communication skills, to work as part of teams on multidisciplinary projects and diverse professional environment.
5. Practice and inspire high ethical values and technical standards

PROGRAM OUTCOMES:

a) An ability to apply knowledge of mathematics, including discrete mathematics, probability, statistics, science, computer science and engineering, electronic engineering and electrical engineering as it applies to computer hardware and software.
b) An ability to design and conduct experiments, as well as to organize, analyze and interpret data to produce meaningful conclusions and recommendations.
c) Ability to understand and apply programming principles in real time applications and also in the field of communication systems to provide better Information Technology based solution.
d) An ability to work individually or as a member with responsibility to function on multi-disciplinary teams.
e) Ability to understand and apply computational platforms and software tools for Information Technology applications
f) Ability to understand ethical and professional responsibilities
g) Ability to review, comprehend and report technological development in Information Technology
h) An ability to recognize the importance of professional development by pursuing postgraduate studies or face competitive examinations that offer challenging and rewarding careers in computing.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES:

A broad relation between the programme objective and the outcomes is given in the following table.

	PROGRAMME OUTCOMES							
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**
1					√	√	√	
2	√	√	√	√	√			
3			√	√	√			
4					√	√	√	
5			√	√		√		

			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
YEAR 1	SEM 1	Foundational English							√	√
		Mathematics I	√						√	
		Engineering Physics				√				
		Engineering Chemistry				√				
		Computing Techniques			√		√			
		Basic Sciences Laboratory		√						
		Computer Practices Laboratory		√	√					
	SEM 2	Technical English							√	√
		Mathematics - II	√						√	
		Physics for Electronics and Information Science				√				
		Data Structures			√		√			
		Engineering Graphics				√				
		Information Technology Essentials			√		√			
		Information Technology Essentials and Data Structures Laboratory		√	√					
		Engineering Practices Laboratory		√						
YEAR 2	SEM 3	Probability and Queueing Theory	√							√
		Environmental Science and Engineering				√		√		
		Digital Principles and Design	√		√					
		Database Systems			√		√			
		Object Oriented Programming and Advanced Data Structures			√		√			
		Digital Communication	√		√					
		Digital and Database Systems Laboratory	√	√						
		Object Oriented Programming and Advanced Data Structures Laboratory	√	√						

	SEM 4	Discrete Mathematics	√							√
		Algorithmics			√		√			
		Operating Systems			√		√			
		Software Engineering			√		√			√
		Computer Architecture			√		√			
		Web Technology			√		√			
		Web Technology Laboratory		√	√					
		Operating Systems Laboratory		√	√					
YEAR 3	SEM 5	Embedded Systems	√		√					
		Unix Internals			√		√			
		Computer Networks			√		√			
		Compiler Engineering			√		√			
		Professional Elective - I								
		Open Elective - I *								
		Computer Networks Laboratory		√	√					
		Embedded Systems Laboratory		√	√					
		Socially Relevant Project #	√	√		√		√	√	
	SEM 6	Integrated Programming			√		√			
		Information Security			√		√			
		Parallel and Distributed Systems			√		√			
		Mobile Computing			√		√			
		Open Elective - II *								
		Professional Elective - II								
		Integrated Programming Laboratory		√	√					
		Information Security and Mobile Computing Laboratory		√	√					
		Creative and Innovative Project #		√	√	√		√		
YEAR 4	SEM 7	Computer Graphics and Multimedia			√		√			
		Data Analytics			√		√			
		Principles of Human Computer Interaction			√		√			
		Knowledge Engineering and Intelligent Systems			√		√			

		Professional Elective - III								
		Professional Elective - IV								
		Graphics and Multimedia Laboratory		√	√					
		Mini Project		√	√					
	SEM 8	Professional Elective - V								
		Professional Elective - VI								
		Professional Elective -VII								
		Project Work	√	√	√	√			√	

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CURRICULA AND SYLLABI FOR I TO VIII SEMESTERS

SEMESTER I

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS7151	Foundational English	HS	4	4	0	0	4
2.	MA7151	Mathematics I	BS	4	4	0	0	4
3.	PH7151	Engineering Physics	BS	3	3	0	0	3
4.	CY7151	Engineering Chemistry	BS	3	3	0	0	3
5.	GE7151	Computing Techniques	ES	3	3	0	0	3
PRACTICALS								
6.	BS7161	Basic Sciences Laboratory	BS	4	0	0	4	2
7.	GE7161	Computer Practices Laboratory	ES	4	0	0	4	2
			TOTAL	**25**	**17**	**0**	**8**	**21**

SEMESTER II

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS7251	Technical English	HS	4	4	0	0	4
2.	MA7251	Mathematics - II	BS	4	4	0	0	4
3.	PH7255	Physics for Electronics and Information Science	BS	3	3	0	0	3
4.	IT7202	Data Structures	PC	3	3	0	0	3
5.	GE7152	Engineering Graphics	ES	5	3	2	0	4
6.	IT7201	Information Technology Essentials	PC	3	3	0	0	3
PRACTICALS								
7.	IT7211	Information Technology Essentials and Data Structures Laboratory	PC	4	0	0	4	2
8.	GE7162	Engineering Practices Laboratory	ES	4	0	0	4	2
			TOTAL	**30**	**20**	**2**	**8**	**25**

SEMESTER III

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	GE7251	Environmental Science and Engineering	BS	3	3	0	0	3
2.	IT7301	Database Systems	PC	3	3	0	0	3
3.	IT7302	Digital Communication	ES	3	3	0	0	3
4.	IT7303	Object Oriented Programming and Advanced Data Structures	PC	3	3	0	0	3
5.	IT7351	Digital Principles and Design	ES	3	3	0	0	3
6.	MA7355	Probability and Queueing Theory	BS	4	4	0	0	4
PRACTICALS								
7.	IT7311	Digital and Database Systems Laboratory	PC	4	0	0	4	2
8.	IT7312	Object Oriented Programming and Advanced Data Structures Laboratory	PC	4	0	0	4	2
			TOTAL	**27**	**19**	**0**	**8**	**23**

SEMESTER IV

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	CS7351	Software Engineering	PC	3	3	0	0	3
2.	CS7451	Computer Architecture	PC	4	4	0	0	4
3.	CS7452	Operating Systems	PC	3	3	0	0	3
4.	IT7401	Algorithmics	PC	3	3	0	0	3
5.	IT7402	Web Technology	PC	3	3	0	0	3
6.	MA7451	Discrete Mathematics	BS	4	4	0	0	4
PRACTICALS								
7.	IT7411	Operating Systems Laboratory	PC	4	0	0	4	2
8.	IT7412	Web Technology Laboratory	PC	4	0	0	4	2
			TOTAL	**28**	**20**	**0**	**8**	**24**

SEMESTER V

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	IT7501	Compiler Engineering	PC	3	3	0	0	3
2.	IT7502	Computer Networks	PC	3	3	0	0	3
3.	IT7503	Embedded Systems	PC	3	3	0	0	3
4.	IT7551	Unix Internals	PC	3	3	0	0	3
5.		Professional Elective - I	PE	3	3	0	0	3
6.		Open Elective - I *	OE	3	3	0	0	3
PRACTICALS								
7.	IT7511	Computer Networks Laboratory	PC	4	0	0	4	2
8.	IT7512	Embedded Systems Laboratory	PC	4	0	0	4	2
9.	IT7513	Socially Relevant Project #	EEC	2	0	0	2	1
			TOTAL	**28**	**18**	**0**	**10**	**23**

SEMESTER VI

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	IT7601	Information Security	PC	3	3	0	0	3
2.	IT7602	Integrated Programming	PC	3	3	0	0	3
3.	IT7603	Mobile Computing	PC	3	3	0	0	3
4.	IT7604	Parallel and Distributed Systems	PC	3	3	0	0	3
5.		Open Elective - II *	OE	3	3	0	0	3
6.		Professional Elective - II	PE	3	3	0	0	3
PRACTICALS								
7.	IT7611	Creative and Innovative Project #	EEC	4	0	0	4	2
8.	IT7612	Information Security and Mobile Computing Laboratory	PC	4	0	0	4	2
9.	IT7613	Integrated Programming Laboratory	PC	4	0	0	4	2
			TOTAL	**30**	**18**	**0**	**12**	**24**

SEMESTER VII

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	IT7701	Computer Graphics and Multimedia	PC	3	3	0	0	3
2.	IT7702	Data Analytics	PC	3	3	0	0	3
3.	IT7703	Knowledge Engineering and Intelligent Systems	PC	3	3	0	0	3
4.	IT7704	Principles of Human Computer Interaction	PC	3	3	0	0	3
5.		Professional Elective - III	PE	3	3	0	0	3
6.		Professional Elective - IV	PE	3	3	0	0	3
PRACTICALS								
7.	IT7711	Graphics and Multimedia Laboratory	PC	4	0	0	4	2
8.	IT7712	Mini Project	PC	4	0	0	4	2
			TOTAL	**26**	**18**	**0**	**8**	**22**

SEMESTER VIII

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Professional Elective - V	PE	3	3	0	0	3
2.		Professional Elective - VI	PE	3	3	0	0	3
3.		Professional Elective -VII	PE	3	3	0	0	3
PRACTICALS								
4.	IT7811	Project Work	EEC	20	0	0	20	10
			TOTAL	**29**	**9**	**0**	**20**	**19**

TOTAL NO. OF CREDITS:181

*** Course from the curriculum of other UG programmes**

 # The Contact periods will not appear in the slot time table

HUMANITIES AND SOCIAL SCIENCES (HS)

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	HS7151	Foundational English	HS	4	4	0	0	4
2.	HS7251	Technical English	HS	4	4	0	0	4

BASIC SCIENCES (BS)

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MA7151	Mathematics I	BS	4	4	0	0	4
2.	PH7151	Engineering Physics	BS	3	3	0	0	3
3.	CY7151	Engineering Chemistry	BS	3	3	0	0	3
4.	BS7161	Basic Sciences Laboratory	BS	4	0	0	4	2
5.	MA7251	Mathematics - II	BS	4	4	0	0	4
6.	PH7255	Physics for Electronics and Information Science	BS	3	3	0	0	3
7.	MA7355	Probability and Queueing Theory	BS	4	4	0	0	4
8.	GE7251	Environmental Science and Engineering	BS	3	3	0	0	3
9.	MA7451	Discrete Mathematics	BS	4	4	0	0	4

ENGINEERING SCIENCES (ES)

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	GE7151	Computing Techniques	ES	3	3	0	0	3
2.	GE7161	Computer Practices Laboratory	ES	4	0	0	4	2
3.	GE7152	Engineering Graphics	ES	5	3	2	0	4
4.	GE7162	Engineering Practices Laboratory	ES	4	0	0	4	2
5.	IT7351	Digital Principles and Design	ES	3	3	0	0	3
6.	IT7302	Digital Communication	ES	3	3	0	0	3

PROFESSIONAL CORE (PC)

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	IT7202	Data Structures	PC	3	3	0	0	3
2.	IT7201	Information Technology Essentials	PC	3	3	0	0	3
3.	IT7211	Information Technology Essentials and Data Structures Laboratory	PC	4	0	0	4	2
4.	IT7301	Database Systems	PC	3	3	0	0	3
5.	IT7303	Object Oriented Programming and Advanced Data Structures	PC	3	3	0	0	3
6.	IT7311	Digital and Database Systems Laboratory	PC	4	0	0	4	2
7.	IT7312	Object Oriented Programming and Advanced Data Structures Laboratory	PC	4	0	0	4	2
8.	IT7401	Algorithmics	PC	3	3	0	0	3
9.	CS7452	Operating Systems	PC	3	3	0	0	3
10.	CS7351	Software Engineering	PC	3	3	0	0	3
11.	CS7451	Computer Architecture	PC	4	4	0	0	4
12.	IT7502	Computer Networks	PC	3	3	0	0	3

13.	IT7511	Computer Networks Laboratory	PC	4	0	0	4	2
14.	IT7411	Operating Systems Laboratory	PC	4	0	0	4	2
15.	IT7503	Embedded Systems	PC	3	3	0	0	3
16.	IT7551	Unix Internals	PC	3	3	0	0	3
17.	IT7402	Web Technology	PC	3	3	0	0	3
18.	IT7501	Compiler Engineering	PC	3	3	0	0	3
19.	IT7412	Web Technology Laboratory	PC	4	0	0	4	2
20.	IT7512	Embedded Systems Laboratory	PC	4	0	0	4	2
21.	IT7602	Integrated Programming	PC	3	3	0	0	3
22.	IT7601	Information Security	PC	3	3	0	0	3
23.	IT7604	Parallel and Distributed Computing	PC	3	3	0	0	3
24.	IT7603	Mobile Computing	PC	3	3	0	0	3
25.	IT7613	Integrated Programming Laboratory	PC	4	0	0	4	2
26.	IT7612	Information Security and Mobile Laboratory	PC	4	0	0	4	2
27.	IT7701	Computer Graphics and Multimedia	PC	3	3	0	0	3
28.	IT7702	Data Analytics	PC	3	3	0	0	3
29.	IT7704	Principles of Human Computer Interaction	PC	3	3	0	0	3
30.	IT7703	Knowledge Engineering and Intelligent Systems	PC	3	3	0	0	3
31.	IT7711	Graphics and Multimedia Laboratory	PC	4	0	0	4	2
32.	IT7712	Mini Project	PC	4	0	0	4	2

PROFESSIONAL ELECTIVES (PE)

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	CS7072	Graph Theory	PE	3	3	0	0	3
2.	CS7074	Soft Computing	PE	3	3	0	0	3
3.	CS7551	Digital Signal Processing	PE	3	3	0	0	3
4.	GE7071	Disaster Management	PE	3	3	0	0	3
5.	GE7072	Foundation Skills in Integrated Product Development	PE	3	3	0	0	3
6.	GE7074	Human Rights	PE	3	3	0	0	3
7.	GE7652	Total Quality Management	PE	3	3	0	0	3
8.	IT7001	Advanced Database Technology	PE	3	3	0	0	3
9.	IT7002	Advanced Networks	PE	3	3	0	0	3
10.	IT7003	Agent Based Intelligent Systems	PE	3	3	0	0	3
11.	IT7004	C# and .Net Programming	PE	3	3	0	0	3
12.	IT7005	Cloud Computing	PE	3	3	0	0	3
13.	IT7006	Computational Linguistics	PE	3	3	0	0	3
14.	IT7007	Computer Forensics	PE	3	3	0	0	3
15.	IT7008	E-learning Techniques	PE	3	3	0	0	3
16.	IT7009	Game Programming	PE	3	3	0	0	3
17.	IT7010	Heterogeneous Computing	PE	3	3	0	0	3
18.	IT7011	Intellectual Property Rights	PE	3	3	0	0	3
19.	IT7012	Internet of Things	PE	3	3	0	0	3
20.	IT7013	Mobile Application Development	PE	3	3	0	0	3
21.	IT7014	Network Programming and Management	PE	3	3	0	0	3
22.	IT7015	Pattern Recognition	PE	3	3	0	0	3
23.	IT7016	Programming with Open Source Software	PE	3	3	0	0	3
24.	IT7017	Semantic Web	PE	3	3	0	0	3

25.	IT7018	Service Oriented Architecture	PE	3	3	0	0	3
26.	IT7019	Social Network Analysis	PE	3	3	0	0	3
27.	IT7020	Software Project Management	PE	3	3	0	0	3
28.	IT7021	Software Testing	PE	3	3	0	0	3
29.	IT7022	Visualization Techniques	PE	3	3	0	0	3
30.	IT7023	Wireless Sensor and Mesh Networks	PE	3	3	0	0	3
31.	IT7071	Digital Image Processing	PE	3	3	0	0	3
32.	IT7072	TCP/IP Design and Implementation	PE	3	3	0	0	3
33.	MA7359	Algebra and Number Theory	PE	4	4	0	0	4
34.	MA7354	Numerical Methods	PE	4	4	0	0	4

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	IT7513	Socially Relevant Project	EEC	2	0	0	2	1
2.	IT7611	Creative and Innovative Project	EEC	4	0	0	4	2
3.	IT7811	Project Work	EEC	20	0	0	20	10

SUMMARY

S.NO.	SUBJECT AREA	CREDITS AS PER SEMESTER								CREDITS TOTAL
		I	II	III	IV	V	VI	VII	VIII	
1.	**HS**	4	4	-	-	-	-	-	-	**8**
2.	**BS**	12	7	7	4	-	-	-	-	**30**
3.	**ES**	5	6	6	-	-	-	-	-	**17**
4.	**PC**	-	8	10	20	16	16	16	-	**86**
5.	**PE**	-	-	-	-	3	3	6	9	**21**
6.	**OE**	-	-	-	-	3	3	-	-	**6**
7.	**EEC**	-	-	-	-	1	2	-	10	**13**
	Total	**21**	**25**	**23**	**24**	**23**	**24**	**22**	**19**	**181**
8.	**Non Credit / Mandatory**									

HS7151 **FOUNDATIONAL ENGLISH** **L T P C**
4 0 0 4

COURSE DESCRIPTION:
This course aims at developing the language skills necessary for the first year students of Engineering and Technology.

OBJECTIVES:
- To develop the four language skills – Listening, Speaking, Reading and Writing.
- To improve the students' communicative competence in English.
- To teach students the various aspects of English language usage.

CONTENTS:

UNIT I GREETING AND INTRODUCING ONESELF 12
Listening- Types of listening – Listening to short talks, conversations; **Speaking** – Speaking about one's place, important festivals etc. – Introducing oneself, one's family/ friend; **Reading** – Skimming a passage– Scanning for specific information;**Writing**- Guided writing - Free writing on any given topic (My favourite place/ Hobbies/ School life, writing about one's leisure time activities, hometown, etc.); **Grammar** – Tenses (present and present continuous) -Question types - Regular and irregular verbs; **Vocabulary** – Synonyms and Antonyms.

UNIT II GIVING INSTRUCTIONS AND DIRECTIONS 12
Listening – Listening and responding to instructions; **Speaking** – Telephone etiquette - Giving oral instructions/ Describing a process – Asking and answering questions; **Reading** – Reading and finding key information in a given text - Critical reading - **Writing –**Process description(non-technical)- **Grammar** – Tense (simple past& past continuous) - Use of imperatives – Subject – verb agreement – Active and passive voice; - **Vocabulary** – Compound words – Word formation – Word expansion (root words).

UNIT III READING AND UNDERSTANDING VISUAL MATERIAL 12
Listening- Listening to lectures/ talks and completing a task; **Speaking** –Role play/ Simulation – Group interaction; **Reading** – Reading and interpreting visual material;**Writing**- Jumbled sentences – Discourse markers and Cohesive devices – Essay writing (cause & effect/ narrative);**Grammar** – Tenses (perfect), Conditional clauses –Modal verbs; **Vocabulary** –Cause and effect words; Phrasal verbs in context.

UNIT IV CRITICAL READING AND WRITING 12
Listening- Watching videos/ documentaries and responding to questions based on them; **Speaking**Informal and formal conversation; **Reading** –Critical reading (prediction & inference);**Writing**–Essay writing (compare & contrast/ analytical) – Interpretation of visual materials; **Grammar** – Tenses (future time reference);**Vocabulary** – One word substitutes (with meanings) – Use of abbreviations & acronyms – Idioms in sentences.

UNIT V LETTER WRITING AND SENDING E-MAILS 12
Listening- Listening to programmes/broadcast/ telecast/ podcast; **Speaking** – Giving impromptu talks, Making presentations on given topics- Discussion on the presentation; **Reading** –Extensive reading; **Writing**- Poster making – Letter writing (Formal and E-mail) ;**Grammar** – Direct and Indirect speech – Combining sentences using connectives; **Vocabulary** –Collocation;

TEACHING METHODS:
Interactive sessions for the speaking module.
Use of audio – visual aids for the various listening activities.
Contextual Grammar Teaching.

EVALUATION PATTERN:
Internals – 50%
End Semester – 50%

TOTAL: 60 PERIODS

LEARNING OUTCOMES:

- Students will improve their reading and writing skills
- Students will become fluent and proficient in communicative English
- Students will be able to improve their interpersonal communication

TEXTBOOK:

1. Richards, Jack.C with Jonathan Hull and Susan Proctor **New Interchange : English for International Communication. (level2, Student's Book)** Cambridge University Press, New Delhi: 2010.

REFERENCES:

1. Bailey, Stephen. **Academic Writing: A practical guide for students**. New York: Rutledge, 2011.
2. Morgan, David and Nicholas Regan. **Take-Off: Technical English for Engineering**. London: Garnet Publishing Limited, 2008.
3. Redston, Chris & Gillies Cunningham **Face 2 Face** (Pre-intermediate Student's Book& Workbook) Cambridge University Press, New Delhi: 2005
4. Comfort, Jeremy, Pamela Rogerson-Revell, Trish Stott , Derek Utley **Speaking Effectively: Developing Speaking Skills for Business English.** Cambridge University Press, Cambridge: Reprint 2011.

MA7151	MATHEMATICS – I (Common to all branches of B.E. / B.Tech. Programmes in I Semester)	L	T	P	C
		4	0	0	4

OBJECTIVES:

- The goal of this course is for students to gain proficiency in calculus computations. In calculus, we use three main tools for analyzing and describing the behavior of functions: limits, derivatives, and integrals. Students will use these tools to solve application problems in a variety of settings ranging from physics and biology to business and economics.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I DIFFERENTIAL CALCULUS 12

Representation of functions - New functions from old functions - Limit of a function - Limits at infinity - Continuity - Derivatives - Differentiation rules - Polar coordinate system - Differentiation in polar coordinates - Maxima and Minima of functions of one variable.

UNIT II FUNCTIONS OF SEVERAL VARIABLES 12

Partial derivatives – Homogeneous functions and Euler's theorem – Total derivative – Differentiation of implicit functions – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Errors and approximations – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT III INTEGRAL CALCULUS 12

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV MULTIPLE INTEGRALS 12

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

UNIT V DIFFERENTIAL EQUATIONS 12

Method of variation of parameters – Method of undetermined coefficients – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients.

TOTAL: 60 PERIODS

OUTCOMES:

- Understanding of the ideas of limits and continuity and an ability to calculate with them and apply them.
- Improved facility in algebraic manipulation.
- Fluency in differentiation.
- Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
- Understanding the ideas of differential equations and facility in solving simple standard examples.

TEXTBOOKS:

1. James Stewart, "Calculus with Early Transcendental Functions", Cengage Learning, New Delhi, 2008.
2. Narayanan S. and Manicavachagom Pillai T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 9th Edition, New Delhi, 2014.
4. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.

REFERENCES:

1. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2010.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
4. Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education, New Delhi, 2nd Edition, 5th Reprint, 2009.
5. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.

PH7151	ENGINEERING PHYSICS	L T P C
	(Common to all branches of B.E / B.Tech programmes)	3 0 0 3

OBJECTIVE:

- To introduce the basic physics concepts relevant to different branches of Engineering and Technology.

UNIT I PROPERTIES OF MATTER 9

Elasticity – Poisson's ratio and relationship between moduli (qualitative) - stress-strain diagram for ductile and brittle materials, uses - factors affecting elastic modulus and tensile strength - bending of beams - cantilever - bending moment - Young's modulus determination - theory and experiment - uniform and non-uniform bending - I shaped girders - twisting couple - hollow cylinder - shaft - torsion pendulum - determination of rigidity modulus- moment of inertia of a body (regular and irregular).

UNIT II ACOUSTICS AND ULTRASONICS 9

Classification of sound - loudness and intensity - Weber-Fechner Law - standard intensity and intensity level - decibel - reverberation - reverberation time - calculation of reverberation time for different types of buildings – sound absorbing materials - factors affecting acoustics of buildings : focussing, interference, echo, echelon effect, resonance - noise and their remedies. Ultrasonics: production - magnetostriction and piezoelectric methods - detection of ultrasound - acoustic grating – ultrasonic interferometer - industrial applications – Non-destructive testing - ultrasonic method: scan modes and practice.

UNIT III THERMAL AND MODERN PHYSICS 9

Thermal expansion - thermal stress - expansion joints - bimetallic strips - thermal conductivity- heat conductions in solids – flow of heat through compound media - Forbe's and Lee's disc method: theory and experiment- Black body radiation – Planck's theory (derivation) – Compton effect – wave model of radiation and matter – Schrödinger's wave equation – time dependent and independent equations – Physical significance of wave function – particle in a one dimensional box.

UNIT IV APPLIED OPTICS 9

Interference - Michelson interferometer: construction, working, determination of wave length and thickness - anti-reflection coating - air wedge and its applications - Lasers – principle and applications – Einstein's coefficients – CO_2 and Nd:YAG laser - semiconductor lasers: homo junction and hetro junction - construction and working – applications. Optical fibres - classification (index & mode based) - principle and propagation of light in optical fibres - acceptance angle and numerical aperture - fibre optic communication system - active and passive sensors.

UNIT V CRYSTAL PHYSICS 9

Single crystalline, polycrystalline and amorphous materials – Single crystals: unit cell, crystal systems, Bravais lattices, ditections and planes in a crystal, Miller indices - interplanar distance for a cubic crystal - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - structure and significance of NaCl, CsCl, ZnS and graphite - crystal imperfections: point defects, line defects – Burger vectors, dislocations and stacking faults – Growth of single crystals: Bridgman and Czochralski methods.

TOTAL: 45 PERIODS

OUTCOME:

- The students will acquire knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.

TEXTBOOKS:

1. Gaur R.K. and Gupta S.L., “Engineering Physics”, Dhanpat Rai Publications (2013)
2. Palanisamy P.K., “Engineering Physics”, Scitech Publications (P) Ltd. (2006).
3. Arumugam M., “Engineering Physics”, Anuradha Publications (2000)

REFERENCES:

1. Serway R.A. and Jewett, J.W. “Physics for Scientists and Engineers with Modern Physics”. Brooks/cole Publishing Co. 2010.
2. Tipler P.A. and Mosca, G.P., “Physics for Scientists and Engineers with Modern Physics”. W.H.Freeman, 2007.
3. Markert J.T.,Ohanian, H. and Ohanian, M. “Physics for Engineers and Scientists”. W.W.Norton & Co. 2007.

CY7151 ENGINEERING CHEMISTRY

L	T	P	C
3	0	0	3

OBJECTIVE

To develop an understanding about fundamentals of polymer chemistry.
Brief elucidation on surface chemistry and catalysis.
To develop sound knowledge photochemistry and spectroscopy.
To impart basic knowledge on chemical thermodynamics.
To understand the basic concepts of nano chemistry.

UNIT I POLYMER CHEMISTRY 9

Introduction: Functionality-degree of polymerization. Classification of polymers- natural and synthetic, thermoplastic and thermosetting. Types and mechanism of polymerization: addition (free radical, cationic, anionic and living); condensation and copolymerization. Properties of polymers: Tg, tacticity, molecular weight-weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension.

UNIT II SURFACE CHEMISTRYAND CATALYSIS 9

Adsorption-Types of adsorption-adsorption of gases on solids- adsorption from solutions-Types of isotherms–Frendlich adsorption isotherm, Langmuir adsorption isotherm. Industrial applications of adsorption. Catalysis: Characteristics and types of catalysts-homogeneous and heterogeneous, auto catalysis. Enzyme catalysis -factors affecting enzyme catalysis, Michaelis-Menton equation.Industrial applications of catalysts.

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY 9

Photochemistry: Laws of photochemistry-Grotthuss-Draper law, Stark-Einstein law and Lambert-Beer Law. Photo processes-internal conversion, inter-system crossing, fluorescence, phosphorescence, chemiluminescence and photo-sensitization. Spectroscopy: Electromagnetic spectrum-absorption of radiation-electronic, vibrational and rotational transitions. Width and intensities of spectral lines. Spectrophotometric estimation of iron. UV-Vis and IR spectroscopy- principles, instrumentation (Block diagram) and applications.

UNIT IV CHEMICAL THERMODYNAMICS 9

Second law: Entropy-entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Free energy and work function: Helmholtzand Gibbs free energy functions; Criteria of spontaneity; Gibbs-Helmholtz equation; Clausius Clapeyron equation; Maxwell relations-Van’t Hoff isotherm and isochore. Chemical potential; Gibbs-Duhem equation- variation of chemical potential with temperature and pressure.

UNIT V NANOCHEMISTRY 9

Basics-distinction between molecules, nanoparticles and bulk materials; size-dependent properties.Preparation of nanoparticles – sol-gel and solvothermal.Preparation of carbon nanotube by chemical vapour deposition and laser ablation. Preparation of nanowires by VLS growth, electrochemical deposition and electro spinning.Properties and uses of nanoparticles, nanoclusters, nanorods, nanotubes and nanowires.

TOTAL: 45 PERIODS

OUTCOMES:

- Will be familiar with polymer chemistry, surface chemistry and catalysis.
- Will know the photochemistry, spectroscopy and chemical thermodynamics.
- Will know the fundamentals of nano chemistry.

TEXTBOOKS:

1. Jain P. C. & Monica Jain., “Engineering Chemistry”, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2014.
2. Kannan P., Ravikrishnan A., “Engineering Chemistry”, Sri Krishna Hitech Publishing Company Pvt. Ltd. Chennai, 2014.

REFERENCES:

1. Pahari. A., Chauhan B., “Engineering Chemistry”, Firewall Media, New Delhi, 2012.
2. Sivasankar B., “Engineering Chemistry”, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2012.
3. AshimaSrivastava. Janhavi N N, Concepts of Engineering Chemistry”, ACME Learning Private Limited., New Delhi., 2010.
4. Vairam S., Kalyani P., Suba Ramesh., “Engineering Chemistry”, Wiley India Pvt Ltd., New Delhi., 2011.

GE7151	COMPUTING TECHNIQUES	L	T	P	C
	(Common to all branches of Engineering and Technology)	**3**	**0**	**0**	**3**

OBJECTIVES:

- To learn programming using a structured programming language.
- To provide C programming exposure.
- To introduce foundational concepts of computer programming to students of different branches of Engineering and Technology.

UNIT I INTRODUCTION 9

Introduction to Computers – Computer Software – Computer Networks and Internet - Need for logical thinking – Problem formulation and development of simple programs - Pseudo code - Flow Chart and Algorithms.

UNIT II C PROGRAMMING BASICS 9

Introduction to C programming – Fundamentals – Structure of a C program – Compilation and linking processes - Constants, Variables – Data Types – Expressions - Operators –Decision Making and Branching – Looping statements – Solving Simple Scientific and Statistical Problems.

UNIT III ARRAYS AND STRINGS 9

Arrays – Initialization – Declaration – One dimensional and two dimensional arrays - Strings- String operations – String Arrays - simple programs- sorting- searching – matrix operations.

UNIT IV POINTERS 9

Macros - Storage classes –Basic concepts of Pointers– Pointer arithmetic - Example Problems - Basic file operations

UNIT V FUNCTIONS AND USER DEFINED DATA TYPES 9

Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion –Enumerators – Structures - Unions

TOTAL : 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Write C program for simple applications
- Formulate algorithm for simple problems
- Analyze different data types and arrays
- Perform simple search and sort**.**
- Use programming language to solve problems.

TEXTBOOKS:

1. Pradip Dey, Manas Ghosh, “Computer Fundamentals and Programming in C”, Second Edition, Oxford University Press, 2013
2. Ashok N. Kamthane, “Computer programming”, Pearson Education, 2007.
3. Yashavant P. Kanetkar. “Let Us C”, BPB Publications, 2011.

REFERENCES:

1. Kernighan,B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2006
2. Byron S Gottfried, “Programming with C”, Schaums Outlines, Second Edition, Tata McGraw-Hill, 2006.
3. R.G. Dromey, “How to Solve it by Computer”, Pearson Education, Fourth Reprint, 2007

BS7161 BASIC SCIENCES LABORATORY L T P C

(Common to all branches of B.E. / B.Tech Programmes) 0 0 4 2

OBJECTIVE:

To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

PHYSICS LABORATORY: (Any Seven Experiments)

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of young’s modulus
3. Uniform bending – Determination of young’s modulus
4. Lee’s disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. a) Optical fibre -Determination of Numerical Aperture and acceptance angle
   b) Compact disc- Determination of width of the groove using laser.
9. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
10. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
11. Post office box -Determination of Band gap of a semiconductor.
12. Spectrometer- Determination of wavelength using gating.

13. Viscosity of liquids - Determination of co-efficient of viscosity of a liquid by Poiseuille‟s flow

TOTAL: 30 PERIODS

OUTCOME:

The hands on exercises undergone by the students will help them to apply physics principles of optics and thermal physics to evaluate engineering properties of materials.

(CHEMISTRY LABORATORY) (Minimum of 8 experiments to be conducted)

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline/thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
11. Determination of molecular weight of poly vinyl alcohol using Ostwald viscometer.
12. Pseudo first order kinetics-ester hydrolysis.
13. Corrosion experiment-weight loss method.
14. Determination of CMC.
15. Phase change in a solid.

TOTAL: 30 PERIODS

TEXTBOOKS:

1. Vogel's Textbook of Quantitative Chemical Analysis (8^{TH} edition, 2014)
2. Laboratory Manual- Department of Chemistry, CEGC, Anna University (2014).

GE7161	**COMPUTER PRACTICES LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

OBJECTIVES:

- To understand the basic programming constructs and articulate how they are used to develop a program with a desired runtime execution flow.
- To articulate where computer programs fit in the provision of computer-based solutions to real world problems.
- To learn to use user defined data structures.

LIST OF EXPERIMENTS

1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions

9. Program using Recursive Function
10. Program using structures and unions.

TOTAL: 60 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Write and compile programs using C programs.
- Write program with the concept of Structured Programming
- Identify suitable data structure for solving a problem
- Demonstrate the use of conditional statement.

HS7251 TECHNICAL ENGLISH L T P C
4 0 0 4

OBJECTIVES:

- To enable students acquire proficiency in technical communication.
- To enhance their reading and writing skills in a technical context.
- To teach various language learning strategies needed in a professional environment.

CONTENTS

UNIT I ANALYTICAL READING 12

Listening- Listening to informal and formal conversations; **Speaking** – Conversation Skills(opening, turn taking, closing)-explaining how something works-describing technical functions and applications; **Reading** –Analytical reading, Deductive and inductive reasoning; **Writing**- vision statement–structuring paragraphs.

UNIT II SUMMARISING 12

Listening- Listening to lectures/ talks on Science & Technology; **Speaking** –Summarizing/ Oral Reporting, **Reading** – Reading Scientific and Technical articles; **Writing**- Extended definition –Lab Reports – Summary writing.

UNIT III DESCRIBING VISUAL MATERIAL 12

Listening- Listening to a panel discussion; **Speaking** – Speaking at formal situations; **Reading** – Reading journal articles - Speed reading; **Writing**-data commentary-describing visual material-writing problem-process- solution-the structure of problem-solution texts- writing critiques

UNIT IV WRITING/ E-MAILING THE JOB APPLICATION 12

Listening- Listening to/ Viewing model interviews; **Speaking** –Speaking at different types of interviews – Role play practice (mock interview); **Reading** – Reading job advertisements and profile of the company concerned; **Writing**- job application – cover letter –Résumé preparation.

UNIT V REPORT WRITING 12

Listening- Viewing a model group discussion; **Speaking** –Participating in a discussion - Presentation; **Reading** – Case study - analyse -evaluate – arrive at a solution; **Writing**– Recommendations- Types of reports (feasibility report)- designing and reporting surveys- – Report format.- writing discursive essays.

TEACHING METHODS:

Practice writing
Conduct model and mock interview and group discussion.
Use of audio – visual aids to facilitate understanding of various forms of technical communication.
Interactive sessions.

EVALUATION PATTERN:
Internals – 50%
End Semester – 50%

TOTAL: 60 PERIODS

LEARNING OUTCOMES

- Students will learn the structure and organization of various forms of technical communication.
- Students will be able to listen and respond to technical content.
- Students will be able to use different forms of communication in their respective fields.

TEXTBOOK:

1. Craig,Thaine**. Cambridge Academic English: An integrated skills course for EAP(Student's Book)Level: Intermediate** Cambridge University Press, New Delhi: 2012

REFERENCES:

1. Laws, Anne. **Presentations.** Hyderabad: Orient Blackswan, 2011.
2. Ibbotson, Mark. **Cambridge English for Engineering**. Cambridge University Press, Cambridge, New Delhi: 2008
3. Naterop, Jean B. and Rod Revell. **Telephoning in English**. Cambridge: Cambridge University Press, 2004.
4. Rutherford, Andrea J. **Basic Communication Skills for Technology**. New Delhi: Pearson Education, 2001.
5. Bailey, Stephen. **Academic Writing A practical Guide for Students**. Routledge, London: 2004
6. Hewings, Martin**. Cambridge Academic English: An integrated skills course for EAP(Student's Book)Level: Intermediate** Cambridge University Press, New Delhi: 2012.

MA7251	MATHEMATICS - II (Common to all branches of B.E. / B.Tech. Programmes in II Semester)	L	T	P	C
		4	0	0	4

OBJECTIVES:

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow of the electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I MATRICES 12

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of eigenvalues and eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II VECTOR CALCULUS **12**

Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTION **12**

Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w = z + c$, az, $\frac{1}{z}$, z^2 - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION **12**

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

UNIT V LAPLACE TRANSFORMS **12**

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem –– Transform of periodic functions – Application to solution of linear ordinary differential equations with constant coefficients.

TOTAL: 60 PERIODS

OUTCOMES:

Upon successful completion of the course, students should be able to:

- Evaluate real and complex integrals using the Cauchy integral formula and the residue Theorem
- Appreciate how complex methods can be used to prove some important theoretical results.
- Evaluate line, surface and volume integrals in simple coordinate systems
- Calculate grad, div and curl in Cartesian and other simple coordinate systems, and establish identities connecting these quantities
- Use Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.

TEXTBOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 9th Edition, New Delhi, 2014.
2. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.

REFERENCES:

1. Ramana, B.V. "Higher Engineering Mathematics", Tata McGraw Hill, New Delhi, 2010.
2. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, New Delhi, 2007.
3. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
4. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
5. Peter V. O'Neil , "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.

PH7255 PHYSICS FOR ELECTRONICS AND INFORMATION SCIENCE L T P C
(Common to ECE & IT Branches**) 3 0 0 3**

OBJECTIVE:

- To understand the essential principles of Physics of semiconductor device and Electron transport properties. Become proficient in magnetic and optical properties of materials and Nano-electronic devices.

UNIT I ELECTRICAL PROPERTIES OF MATERIALS 9

Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression - Wiedemann-Franz law – Success and failures - Quantum free electron theory – Particle in a finite potential well – Tunneling- Particle in a three dimensional box – degenerate states – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential – Energy bands in solids – tight binding approximation - Electron effective mass – concept of hole.

UNIT II SEMICONDUCTORS AND TRANSPORT PHYSICS 9

Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Variation of carrier concentration with temperature – Carrier transport in Semiconductors: Drift, mobility and diffusion – Hall effect and devices – Ohmic contacts – Schottky diode.

UNIT III MAGNETIC PROPERTIES OF MATERIALS 9

Magnetisation of matter: Magnetic dipole moment – atomic magnetic moments- magnetic permeability and susceptibility - Magnetic material classification : diamagnetism – paramagnetism – ferromagnetism – antiferromagnetism – ferrimagnetism – Ferromagnetism: origin and exchange interaction- saturation magnetization and curie temperature – Domain Theory- M versus H behaviour – Hard and soft magnetic materials – examples and uses-– Magnetic principle in computer data storage – Magnetic tapes – Magnetic hard disc (GMR sensor) - Magnetic recording materials .

UNIT IV OPTICAL PROPERTIES OF MATERIALS 9

Classification of optical materials – Absorption emission and scattering of light in metals, insulators & Semiconductors - LED's – Organic LED's – Plasma light emitting devices – LCD's – Laser diodes – Optical data storage techniques (including DVD, Blue -ray disc, Holographic data storage).

UNIT V NANO DEVICES 9

Electron density in a conductor – Significance between Fermi energy and volume of the material – Quantum confinement – Quantum structures – Density of states in lower dimensions – Band gap of nanomaterials –Tunneling – Single electron phenomena – Single electron Transistor. Conductivity of metallic nanowires – Ballistic transport – Quantum resistance and conductance – Carbon nanotubes: Properties and applications - Transport of spin – Spintronic devices and applications.

TOTAL: 45 PERIODS

OUTCOMES:

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

- understand the electrical, magnetic and optical properties of semiconductor materials.
- understand the concepts and applications of semiconductor devices.

TEXT BOOKS:

1. Balasubramaniam R. "Callister's Materials Science and Engineering", Wiley-India 2014.
2. Donald Askeland, "Materials Science and Engineering", Cengage Learning India Pvt Ltd., 2010.
3. Kasap S.O., "Principles of Electronic Materials and Devices", Tata McGraw-Hill 2007.
4. Pierret R.F., "Semiconductor Device Fundamentals", Pearson 2006.

REFERENCES:
1. Garcia N. and Damask A., “Physics for Computer Science Students”, Springer-Verlag, 2012.
2. Datta S., “Quantum Transport: Atom to Transistor”, Cambridge University Press 2013.
3. Hanson G.W., “Fundamentals of Nanoelectronics”, Pearson Education 2009.
4. Charles Kittel, “Introduction to Solid State Physics”, Wiley Publications 2012.
5. Wilson J. and Hawkes, J.F.B., “Optoelectronics: An introduction”, Prentice Hall 1989.
6. Neil Gershenfeld, “The Physics of Information Technology”, Cambridge Series on Information & the Natural Sciences, Cambridge University Press 2000.

IT 7202 DATA STRUCTURES L T P C
3 0 0 3

OBJECTIVES:
- To introduce the basics of C programming language
- To introduce the concepts of ADTs and linear data structures
- To introduce the concepts of Sorting and Searching techniques
- To familiarize the concepts of Hashing and Sets

UNIT I C PROGRAMMING 9
Arrays - Functions - Pointers - Structures - Union - Enumerated Data Types - File Handling - Preprocessor Directives

UNIT II LINEAR DATA STRUCTURES – LIST, STACK AND QUEUE 9
Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation – cursor-based linked lists – doubly-linked lists – circular linked list- applications of lists – Polynomial Manipulation – Stack ADT – Implementation of Stack- Applications- Queue ADT – Queue Implementation - Double ended Queues

UNIT III NON-LINEAR DATA STRUCTURES - TREES 9
Trees: Preliminaries – Binary Trees – Implementation of Binary trees – Tree traversals – Expression Trees- Binary Search Tree ADT - Priority Queues (Heaps)- Binary Heap Implementations- Applications of priority queues.

UNIT IV SORTING AND SEARCHING TECHNIQUES 9
Sorting algorithms: Insertion sort - Shell sort - Quick sort - Heap sort - Merge sort - External Sort– Searching: Linear search - Binary search

UNIT V HASHINGAND DISJOINT SETS 9
Hashing: Hash Functions – Separate Chaining – Open Addressing: Linear Probing- Quadratic Probing- Double Hashing- Rehashing – Extendible Hashing - Disjoint Sets – Basic data structure- Smart Union Algorithms - Path Compression

TOTAL: 45 PERIODS

OUTCOMES:
On Completion of the course, the students should be able to:
- Implement data structures using C language.
- Solve the problem using linear and non linear data structures.
- Analyze and implement hashing techniques that solves in linear time.

TEXT BOOK:
1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd edition, Pearson Education, 1997.

REFERENCES:

1. Aho, Hopcroft and Ullman, “Data Structures and Algorithms”, Pearson Education,1983.
2. ReemaThareja, “Data Structures Using C”, Oxford University Press, 2011

GE7152	ENGINEERING GRAPHICS	L	T	P	C
		3	2	0	4

OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION) 1

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HANDSKETCHING 14

Basic Geometrical constructions, Curves used in engineering practices-Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 14

Orthographic projection- principles-Principal planes-First angle projection-Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes-Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 14

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to both the principal planes by rotating object method and auxiliary plane method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 14

Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section.

Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 15

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems.

Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method and vanishing point method.

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY) 3

Introduction to drafting packages and demonstration of their use.

L= 45 + T = 30, TOTAL:75 PERIODS

OUTCOMES:

On Completion of the course the student will be able to

- Perform free hand sketching of basic geometrical shapes and multiple views of objects.
- Draw orthographic projections of lines, planes and solids
- Obtain development of surfaces.
- Prepare isometric and perspective views of simple solids.

TEXT BOOK:

1. N.D.Bhatt and V.M.Panchal, “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010.

REFERENCES:

1. K.R.Gopalakrishna., “Engineering Drawing” (Vol I&II combined) SubhasStores, Bangalore, 2007
2. Luzzader, Warren.J., and Duff,John M.,,’’ Fundamentals of Engineering Drawingwith an introduction to Interactive Computer Graphics for Design and Production”,Eastern Economy Edition, Prentice Hall of India Pvt Ltd, New Delhi, 2005
3. M.B.Shah and B.C.Rana, “Engineering Drawing”, Pearson, 2nd Edition, 2009
4. K.Venugopal and V.Prabhu Raja, “Engineering Graphics”, New Age International (P)Limited ,2008.
5. K. V.Natarajan, “A text book of Engineering Graphics”, 28th Edition, Dhanalakshmi Publishers, Chennai, 2015.
6. BasantAgarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
7. N.S Parthasarathy and Vela Murali, “ Engineering Drawing”, Oxford University Press, 2015.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out ofdrawing sheets
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

IT7201 INFORMATION TECHNOLOGY ESSENTIALS L T P C
3 0 0 3

OBJECTIVES:

- To introduce the concept of Internet, Networks and its working principles.
- To know scripting languages.
- To understand various applications related to Information Technology.

UNIT I WEB ESSENTIALS 9

Creating a Website - Working principle of a Website - Browser fundamentals - Authoring tools - Types of servers: Application Server - Web Server - Database Server

UNIT II SCRIPTING ESSENTIALS 9

Need for Scripting languages - Types of scripting languages - Client side scripting - Server side scripting - PHP - Working principle of PHP - PHP Variables - Constants - Operators – Flow Control and Looping - Arrays - Strings - Functions - File Handling - PHP and MySQL - PHP and HTML - Cookies - Simple PHP scripts

UNIT III NETWORKING ESSENTIALS 9

Fundamental computer network concepts - Types of computer networks - - Network layers - TCP/IP model - Wireless Local Area Network - Ethernet - WiFi - Network Routing - Switching - Network components

UNIT IV MOBILE COMMUNICATION ESSENTIALS 9

Cell phone working fundamentals - Cell phone frequencies & channels - Digital cell phone components - Generations of cellular networks - Cell phone network technologies / architecture - Voice calls & SMS

UNIT V APPLICATION ESSENTIALS 9

Creation of simple interactive applications - Simple database applications - Multimedia applications - Design and development of information systems – Personal Information System – Information retrieval system – Social networking applications

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Design and deploy web-sites
- Design and deploy simple web-applications
- Create simple database applications
- Develop information system
- Describe the basics of networking and mobile communications

TEXT BOOKS:

1. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5" Third Edition, O'REILLY, 2014.
2. James F. Kurose, “Computer Networking: A Top-Down Approach”, Sixth Edition, Pearson, 2012.

REFERENCES:

1. Gottapu Sasibhushana Rao, "Mobile Cellular Communication", Pearson, 2012.
2. R. Kelly Rainer , Casey G. Cegielski , Brad Prince, Introduction to Information Systems, Fifth Edition, Wiley Publication, 2014.
3. it-ebooks.org

IT7211 INFORMATION TECHNOLOGY ESSENTIALS AND DATA STRUCTURES LABORATORY L T P C 0 0 4 2

OBJECTIVES:

- To write simple scripts for the creation of web sites
- To create various information technology enabled applications

1. Creation of interactive web sites - Design using HTML and authoring tools
2. Creation of simple PHP scripts - Dynamism in web sites
3. Handling multimedia content in web sites
4. Database applications using PHP and MySQL
5. Study of computer networking components
6. Creation information retrieval system using web, PHP and MySQL

OUTCOMES:
On Completion of the course, the students should be able to:

- Design interactive websites using basic HTML tags, different styles, links and with all
- Basic control elements.
- Create client side and server side programs using scripts using PHP.
- Design dynamic web sites and handle multimedia components
    - Create applications with PHP connected to database.
    - Create Personal Information System
    - Implement the technologies behind computer networks and mobile communication.

Part B - DATA STRUCTUIRES LABORATORY

OBJECTIVES:

- To introduce the concepts of structured Programming language and writing ADT's.
- To introduce the concepts of primitive Data Structures.
- To introduce the concepts of Hashing and Sorting.

LIST OF EXCERCISE:

1. Practice of C Programming
2. Implementation of Linked List
3. Implementation of Stack using Arrays and Linked List.
4. Implementation of Queue using Arrays and Linked List.
5. Implementation of Stack and Queue applications.
6. Implementation of Binary Search Tree.
7. Implementation of Priority Queue.
8. Implementation of Sorting and Searching techniques.

TOTAL: 60 PERIODS

OUTCOMES:
On Completion of the course, the students should be able to:

- Implement any data structures using ADT's.
- Solve the given problem using appropriate data structures

GE7162	ENGINEERING PRACTICES LABORATORY	L	T	P	C
	(Common to all Branches of B.E. / B.Tech. Programmes)	**0**	**0**	**4**	**2**

OBJECTIVES:

- To provide exposure to the students with hands-on experience on various Basic Engineering Practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP – A (CIVIL & ELECTRICAL)

1. CIVIL ENGINEERING PRACTICES **15**

PLUMBING

Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.

- Laying pipe connection to the suction side of a pump.
- Laying pipe connection to the delivery side of a pump.
- Practice in connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK

- Sawing, planning and making joints like T-Joint, Mortise and Tenon joint and Dovetail joint.

STUDY

• Study of joints in door panels and wooden furniture
• Study of common industrial trusses using models.

2. ELECTRICAL ENGINEERING PRACTICES **15**

• Basic household wiring using Switches, Fuse, Indicator and Lamp etc.,
• Stair case light wiring
• Tube – light wiring
• Preparation of wiring diagrams for a given situation.
• Study of Iron-Box, Fan Regulator and Emergency Lamp

GROUP – B (MECHANICAL AND ELECTRONICS) **15**

3. MECHANICAL ENGINEERING PRACTICES

WELDING

• Arc welding of Butt Joints, Lap Joints, and Tee Joints
• Gas welding Practice.
• Basic Machining - Simple turning, drilling and tapping operations..
• Study and assembling of the following:
    a. Centrifugal pump
    b. Mixie
    c. Air Conditioner.

DEMONSTRATION ON FOUNDRY OPERATIONS.

4. ELECTRONIC ENGINEERING PRACTICES **15**

• Soldering simple electronic circuits and checking continuity.
• Assembling electronic components on a small PCB and Testing.
• Study of Telephone, FM radio and Low Voltage Power supplies.

TOTAL: 60 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Ability to fabricate carpentry components and to lay pipe connections including plumbing works.
- Ability to use welding equipments to join the structures
- Ability to do wiring for electrical connections and to fabricate electronics circuits.

GE7251 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To the study of nature and the facts about environment.
- To find and implement scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14

Definition, scope and importance of environment – need for public awareness - concept 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 (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of 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 loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

Field study of common plants, insects, birds.

Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c)Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards– soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.

Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10

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 – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, 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 – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act– Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS

OUTCOMES:

Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.

- Public awareness of environment at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions.
- Development and improvement in standard of living has lead to serious environmental disasters.

TEXT BOOKS:

1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education 2004.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.

REFERENCES:

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia',Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD,New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press 2005.

IT7301 DATABASE SYSTEMS L T P C
3 0 0 3

OBJECTIVES:

- To learn the fundamentals of data models and to conceptualize and depict a database system using ER diagram.
- To make a study of SQL and relational database design.
- To learn about the internal storage structures using different file and indexing techniques which will help in physical DB design.
- To know the fundamental concepts of transaction processing- concurrency control techniques and recovery procedure.
- To have an introductory knowledge about the Storage and Query processing Techniques

UNIT I RELATIONAL DATABASES 9

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

UNIT II DATABASE DESIGN 9

Entity-Relationship Model – E-R Diagrams - Functional Dependencies – Non-loss Decomposition – Functional Dependencies – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form - Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form

UNIT III TRANSACTION MANAGEMENT 9

Transaction Concepts - Transaction Recovery – ACID Properties – System Recovery – Media Recovery – Two Phase Commit -- Save Points – Concurrency – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Recovery Isolation Levels

UNIT IV IMPLEMENTATION TECHNIQUES 9

Overview of Physical Storage Media – RAID – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Catalog Information for Cost Estimation - Query Optimization

UNIT V ADVANCED TOPICS 9

Introduction to Distributed databases - Cloud Databases - Data warehouse and Mining - Mobile Databases - XML Databases - Multimedia Databases.

TOTAL : 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- To design database using E-R modeling and apply normalization techniques over it.
- To manage the transactions that happens in a database.
- To analyze the recent advancements in databases.
- To design and implement database for real world applications.

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Sixth Edition, Tata McGraw Hill, 2010.
2. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.

REFERENCES:

1. Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Sixth Edition, Pearson Education, 2010.
2. Raghu Ramakrishnan, Johannes Gehrke “Database Management Systems”, Fourth Edition, Tata Mc Graw Hill, 2010.
3. G.K.Gupta, “Database Management Systems”, Tata McGraw Hill, 2011.
4. Carlos Coronel, Steven Morris, Peter Rob, “Database Systems: Design, Implementation and Management”, Ninth Edition, Cengage Learning, 2011

IT7302 **DIGITAL COMMUNICATION** **L T P C**
3 0 0 3

OBJECTIVES:

- To provide knowledge on various amplitude, frequency and pulse modulation and demodulation systems.
- To provide some analysis of noise performance of various receivers.
- To study some basic information theory.

UNIT I INTRODUCTION TO DATA COMMUNICATION & STOCHASTIC PROCESSES **9**

Sources of information - Communication Resources - Communication channels and networks – Analog and Digital types of Communication - Modulation process – Definition of Random process - Stationery processes – Ergodic processes – Gaussian Process – Power Spectral Density – Noise – Narrowband Noise – Representation of Narrowband noise in various terms.

UNIT II REPRESENTATION OF SIGNALS AND SYSTEMS **8**

Signals and Systems - Fourier Series representation of signals - Sampling process - Discrete Fourier transform - Z-transform - Convolution and Correlation.

UNIT III MODULATION **10**

Continuous Wave Modulation: Amplitude and Frequency modulation - Frequency Division Multiplexing - Noise in continuous wave modulation - Pulse Modulation: Pulse amplitude modulation - Pulse Code Modulation - Time Division Multiplexing – Pseudo-Noise Sequences – A notion of Spread Spectrum – Direct Sequence Spread Spectrum – Frequency-Hop Spread Spectrum.

UNIT IV TRANSMISSION AND RECEPTION **9**

Baseband Transmission: Line coding - NRZ, RZ, Manchester Coding - Baseband M-ary PAM transmission - Pass band Transmission: Frequency Shift Keying - Phase Shift Keying- Reception: Correlation Filters - Matched filter - Error rate due to noise - Inter Symbol Interference

UNIT V INFORMATION THEORY AND ERROR CONTROL CODING **9**

Uncertainty, Information and Entropy - Source Coding theorem - Mutual information - Channel capacity - Channel coding theorem - Information capacity theorem - Rate-distortion theory and Data compression - Linear block codes - Cyclic codes - Convolutional Codes.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Know the various modulation and demodulation techniques.
- Know the representation of signals, will be able to analyze the transmission & reception processes and information coding techniques.

TEXT BOOK:

1. Simon Haykin, “Communication Systems”, John Wiley and Sons Inc. 4th Edition, 2001.

REFERENCES:

1. Taub & Schilling, “Principles of Communication systems”, McGraw-Hill, 3rd Edition, 2008.
2. Wayne Tomasi, “Electronic communication systems”, fundamentals through advanced, 5/e, Pearson Education, Fourth Reprint, 2005.

IT7303 OBJECT ORIENTED PROGRAMMING AND ADVANCED DATA STRUCTURES **L T P C 3 0 0 3**

OBJECTIVES:

- To introduce Object Oriented Programming language concepts and to implement Data Structures.
- To learn about Non linear Data Structures.
- To familiarize Graphs and its algorithms.

UNIT I OBJECT ORIENTED PROGRAMMING FUNDAMENTALS 9

Data Abstraction - Encapsulation - Class - Object - Constructors - Static members – Constant members – Member functions – Pointers – References - Role of **this** pointer - String Handling – Copy Constructor - Polymorphism – Function overloading – Operators overloading – Dynamic memory allocation - Inheritance.

UNIT II OBJECT ORIENTED PROGRAMMING - ADVANCED FEATURES 9

Generic Programming - Templates – Class template - Function template– Virtual functions - Abstract class - Exception handling - Standard libraries - STL – Containers – Algorithms - Iterators

UNIT III ADVANCED NON-LINEAR DATA STRUCTURES 9

AVL trees –Splay trees - B-Trees – Red Black trees -Leftist Heaps - Skew Heaps - Binomial Heaps – Fibonacci Heaps

UNIT IV ELEMENTARY GRAPH ALGORITHMS 9

Graphs: Definitions - Representation of Graphs - Graph Traversals - Topological Sort - Shortest Path Algorithms: Unweighted Shortest Path - Dijkstra's Algorithm - Single source Shortest Paths - Bellman-Ford algorithm - Minimum Spanning Tree - Prim's Algorithm - Kruskal's Algorithm

UNIT V GRAPH ALGORITHMS 9

Applications of Depth First Search - Undirected Graphs- Biconnectivity - Euler circuit - Directed Graph- Finding Strong Components– All Pair Shortest paths - Floyd -Warshall algorithm - Maximum Flow - Flow Networks - Ford-Fulkerson Method.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Solve the given problem using object oriented programming concepts.
- Implement advanced data structures through ADT's using OOP.
- Apply graph data structures for a real world problem.

TEXT BOOKS:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Fourth edition, Pearson Education, 2014.
2. Bjarne Stroustrup, “The C++ Programming Language”, Fourth edition, Pearson Education, 2014.

REFERENCES

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Third Edition, Mc Graw Hill, 2009.
2. Robert Sedgewick, "Algorithms in C++", Third Edition, Pearson Education , 1998.
3. Ira Pohl, “Object Oriented Programming using C++”, 2nd edition, Pearson Education, 1997.
4. Michael T Goodrich, Roberto Tamassia, David Mount, “Data Structures and Algorithms in C++”, 7th edition, Wiley Publishers, 2004.

IT7351 DIGITAL PRINCIPLES AND DESIGN L T P C
3 0 0 3

OBJECTIVES:

- Learn how to design digital circuits, by simplifying the Boolean functions.
- Learn to design combinational and sequential circuits.
- To study about asynchronous sequential logic.
- Give an idea about designs using PLDs.
- To write code in hardware definition languages for designing larger digital systems.

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES 9

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

UNIT II COMBINATIONAL LOGIC 9

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

UNIT III SYNCHRONOUS SEQUENTIAL LOGIC 9

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

UNIT IV ASYNCHRONOUS SEQUENTIAL LOGIC 9

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

UNIT V MEMORY AND PROGRAMMABLE LOGIC 9

RAM and ROM – Memory Decoding – Error Detection and Correction –PROM- Programmable Logic Array – Programmable Array Logic – Sequential Programmable Devices – Application Specific Integrated Circuits.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Design and analyze digital circuits.
- Simplify complex Boolean functions.
- Implement design using MSI chips and PLDs.
- Build digital systems involving combinational and sequential logic.

TEXT BOOK:

1. M. Morris Mano and Michael D. Ciletti, “Digital Design”, V Edition, Pearson Education, 2012.

REFERENCES:

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

MA7355 PROBABILITY AND QUEUEING THEORY L T P C
4 0 0 4

OBJECTIVES:

- To provide the required fundamental concepts in probability and queueing models and apply these techniques in networks, image processing etc.
- Acquire skills in analyzing queueing models.

UNIT I RANDOM VARIABLES 12

Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions - Functions of a random variable.

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES 12

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III RANDOM PROCESSES 12

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

UNIT IV QUEUEING THEORY 12

Markovian queues – Birth and Death processes – Single and multiple server queueing models – Little's formula - Queues with finite waiting rooms – Finite source models.

UNIT V NON-MARKOVIAN QUEUES AND QUEUEING NETWORKS 12

M/G/1 queue – Pollaczek Khinchin formula - M/D/1 and $M/E_K/1$ as special cases – Series queues – Open and closed Jackson networks.

TOTAL: 60 PERIODS

OUTCOMES:

- Students will be able characterize probability models using probability mass (density) functions & cumulative distribution functions.
- Students will be able to understand the terminology & nomenclature appropriate queueing theory.
- Students will demonstrate the knowledge and understand the various queueing models.
- Students will be able to formulate concrete problems using queueing theoretical approaches.

TEXT BOOKS:

1. Ibe, O.C. "Fundamentals of Applied Probability and Random Processes", Elsevier, U.P., 1st Indian Reprint, 2007.
2. Gross, D. and Harris, C.M., "Fundamentals of Queueing Theory", Wiley Student, 3rd Edition, New Jersy, 2004.

REFERENCES:

1. Allen, A.O., "Probability, Statistics and Queueing Theory with Computer Applications", Elsevier, California, 2nd Edition, 2005.
2. Taha, H.A., "Operations Research", Pearson Education, Asia, 8th Edition, 2007.
3. Trivedi, K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", PHI, New Delhi, 2nd Edition, 2009.
4. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill, New Delhi, 9th Reprint, 2010.

IT7311 DIGITAL AND DATABASE SYSTEMS LABORATORY L T P C
0 0 4 2

OBJECTIVES:

- To learn how to develop combinational and sequential circuits.
- To use Hardware description language for simulation of digital circuits.
- To write code in HDL - VHDL or Verilog.

LIST OF EXPERIMENTS FOR DIGITAL LAB:

1. Verification of Boolean Theorems using basic gates.
2. Design and implementation of combinational circuits using basic gates for arbitrary functions, code converters.
3. Design and implementation of combinational circuits using MSI devices
   - 4 – bit binary adder / subtractor
   - Parity generator / checker
   - Application using multiplexers and decoders
4. Design and implementation of sequential circuits:
   - Shift –registers
   - Synchronous and asynchronous counters
5. Coding combinational / sequential circuits using HDL and a simple digital system (Mini Project).

OUTCOMES:

On Completion of the course, the students should be able to:

- Build digital circuits using basic gates and MSI devices
- Simulate and analyze digital circuits.
- Debug implementation issues for Boolean functions.

OBJECTIVES:

- To learn and implement DDL, DML, DCL and TCL commands in query language
- To practice SQL Queries, PL/SQL programming concepts and Triggers
- To design and develop a database application

LIST OF EXPERIMENTS FOR DATABASE LAB:

1. Data Definition, Manipulation of Tables and Views
2. Database Querying – Simple queries, Nested queries, Join Queries, Views
3. Triggers
4. High level language extensions - PL/SQL Basics
5. Procedures and Functions
6. Front End Tools/Programming Languages
7. Database Connectivity with Front End Tools
8. Database Design and Implementation (Case Study)

TOTAL: 60 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- To design databases using E-R modeling and apply normalization techniques.
- To implement DDL, DML and DCL commands in SQL.
- To implement database in open source software environment.
- To design and implement database for real world applications.

IT7312	OBJECT ORIENTED PROGRAMMING AND ADVANCED DATA STRUCTURES LABORATORY	L T P C 0 0 4 2

OBJECTIVES:

- To understand the concepts of Object Oriented Programming
- To use standard template library in the implementation of standard data structures
- To learn advanced data structures using Object Oriented Programming language
- To expose graph structures and traversals using OOP concepts.
- To understand various graph algorithms using OOP concepts.

LIST OF EXPERIMENTS:

1. Practicing C++ programs with Classes, Objects, Constructors and Destructors.
2. Function overloading and Operator overloading.
3. Inheritance.
4. Polymorphism – Virtual functions.
5. Templates and STL
6. Exception handling.
7. Implementation of AVL tree.
8. Implementation of Splay Tree.
9. Implementation of a Heap tree
10. Implementation of Graphs - Topological Sort
11. Graph Traversals Algorithms - Breadth-First Search – Depth-First Search
12. Shortest Path Algorithms – Dijkstra's algorithm – Bellman-Ford algorithm – Floyd-Warshall algorithm.
13. Minimum Spanning Tree Implementation – Kruskal and Prim's algorithm.

TOTAL: 60 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Implement the given problem using object oriented programming concepts.
- Implement advanced data structures through ADT's using OOP.
- Analyze and apply the graph data structures for a real world problem.

CS7351	SOFTWARE ENGINEERING	L T P C 3 0 0 3

OBJECTIVES:

- To be aware of generic models to structure the software development process.
- To understand fundamental concepts of requirements engineering and requirements specification.
- To understand different notion of complexity at both the module and system level.
- To be aware of some widely known design methods.
- To understand the role and contents of testing activities in different life cycle phases

UNIT I SOFTWARE PROCESS MODELS 9

The Evolving Role of Software – Software – The changing Nature of Software – Legacy software –— A generic view of process– A layered Technology – A Process Framework – The Capability Maturity Model Integration (CMMI) – Process Assessment –Personal and Team Process Models – Product and Process – Process Models – The Waterfall Model – Incremental Process Models – Incremental Model – The RAD Model – Evolutionary Process Models – Prototyping – The Spiral Model – The Concurrent Development Model – Specialized Process Models – The Unified Process.

UNIT II REQUIREMENT ENGINEERING 9

Software Engineering Practice – Communication Practice – Planning Practice - Modeling Practice– Construction Practice –Deployment. Requirements Engineering - Requirements Engineering Tasks – Initiating the Requirements Engineering Process - Eliciting Requirements – Developing Use Cases – Building the Analysis Models –Elements of the Analysis Model – Analysis Pattern – Negotiating Requirements – Validating Requirements.

UNIT III ANALYSIS MODELLING 9

Requirements Analysis – Analysis Modeling Approaches – Data Modeling Concepts – Object Oriented Analysis – Scenario Based Modeling – Flow Oriented Modeling – Class Based Modeling – Creating a Behaviour Model.

UNIT IV DESIGN AND TESTING 9

Design Engineering – Design Process -Design Quality - Design Model - User Interface Design – Testing Strategies - Testing Tactics - Strategies Issues for Conventional and Object Oriented Software - Validation Testing – System Testing – Art of Debugging – Project Management

UNIT V QUALITY AND MAINTENANCE 9

Software Evolution - Verification and Validation -Critical Systems Validation – Metrics for Process, Project and Product-Quality Management - Process Improvement – Risk Management - Configuration Management – Software Cost Estimation

TOTAL: 45PERIODS

OUTCOMES:

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

- To differentiate the perspective of various software process models
- To elicit the requirements for real-time problems
- To compile a SRS pertaining to industry standards
- To create a behavioral model from the set of requirements
- To develop a user-interface design for the given system
- To outline various software metrics and their context in measuring software programs
- To estimate the software cost

TEXTBOOKS:

1. Roger S. Pressman, “Software Engineering: A Practitioner’s Approach”, McGraw Hill International edition, Seventh edition, 2009.
2. Ian Sommerville, “Software Engineering”, Ninth Edition, Pearson Education, 2008.

REFERENCES:

1. Stephan Schach, “Software Engineering”, Tata Mc Graw Hill, 2007.
2. Pfleeger and Lawrence “Software Engineering: Theory and Practice”, Pearson Education, Second edition, 2001.

CS7451 COMPUTER ARCHITECTURE

L	T	P	C
4	0	0	4

OBJECTIVES:

- To identify the functional units in a digital computer system
- To distinguish between the various ISA styles
- To trace the execution sequence of an instruction through the processor
- To compare different approaches used for implementing a functional unit
- To understand the fundamentals of memory and I/O systems and their interaction with the processor
- To evaluate different computer systems based on performance metrics

UNIT I FUNDAMENTALS OF A COMPUTER SYSTEM 12

Functional Units of a Digital Computer – Hardware – Software Interface –Translation from a High Level Language to the Hardware Language – Instruction Set Architecture – Styles and Features – RISC and CISC Architectures – Performance Metrics – Amdahl's Law – Case Studies of ISA.

UNIT II ARITHMETIC FOR COMPUTERS 12

Addition and Subtraction – Fast Adders – Binary Multiplication - Binary Division – Floating Point Numbers – Representation, Arithmetic Operations.

UNIT III BASIC PROCESSING UNIT 12

Components of the Processor – Datapath and Control – Execution of a Complete Instruction – Hardwired and Micro programmed Control. Instruction Level Parallelism – Basic Concepts of Pipelining – Pipelined Implementation of Datapath and Control – Hazards – Structural, Data and Control Hazards – Exception Handling.

UNIT IV MEMORY AND I/O 12

Need for a Hierarchical Memory System – Types and Characteristics of Memories – Cache Memories – Improving Cache Performance – Virtual Memory – Memory Management Techniques – Associative Memories. Accessing I/O devices – Programmed Input/Output - Interrupts – Direct Memory Access.

UNIT V ILP AND PARALLEL PROCESSING 12

Exploitation of more ILP – Dynamic Scheduling – Speculation – Multiple Issue Processors. Parallel Processing - SISD, MIMD, SIMD, SPMD and Vector Architectures - Hardware Multithreading- Shared Memory Multiprocessors – Multicore Processors - Graphics Processing Units. Study of a Basic Architectural Simulator.

TOTAL : 60 PERIODS

OUTCOMES:

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

- Identify the functional units of a computer system and their operation
- Point out the various metrics of performance
- Critically analyze the different types of ISA styles
- Explain the data path and control path implementation of a processor
- Discuss the implementations of various functional units
- Point out the characteristics of the memory and I/O systems and discuss their design

TEXTBOOK:

1. David A. Patterson and John L. Hennessy, “Computer Organization and Design: The Hardware/Software Interface”, Fourth Edition, Morgan Kaufmann / Elsevier, 2009.

REFERENCES:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, “Computer Organization and Embedded Systems”, Sixth Edition, Tata McGraw Hill, 2012.
2. William Stallings, “Computer Organization and Architecture – Designing for Performance”, Sixth Edition, Pearson Education, 2003.
3. John P. Hayes, “Computer Architecture and Organization”, Third Edition, Tata McGraw Hill, 1998.
4. John L. Hennessey and David A. Patterson, “Computer Architecture – A Quantitative Approach”, Morgan Kaufmann / Elsevier Publishers, Fourth Edition, 2007.
5. V.P. Heuring, H.F. Jordan, “Computer Systems Design and Architecture”, Second Edition, Pearson Education, 2004.
6. Behrooz Parhami, “Computer Architecture”, Oxford University Press, 2007.

CS7452 OPERATING SYSTEMS L T P C
3 0 0 3

OBJECTIVES:

- To learn the concepts of operating systems.
- To learn about the various issues in operating systems.
- To familiarize with the important mechanisms in operating systems.
- To appreciate the emerging trends in operating systems.

UNIT I OPERATING SYSTEMS OVERVIEW 9

Introduction to operating systems – Computer system organization, architecture – Operating system structure, operations – Process, memory, storage management – Protection and security – Distributed systems – Computing Environments – Open-source operating systems – OS services – User operating-system interface – System calls – Types – System programs – OS structure – OS generation – System Boot – Process concept, scheduling – Operations on processes – Cooperating processes – Inter-process communication – Examples – Multithreading models – Thread Libraries – Threading issues – OS examples.

UNIT II PROCESS MANAGEMENT 9

Basic concepts – Scheduling criteria – Scheduling algorithms – Thread scheduling – Multiple-processor scheduling – Operating system examples – Algorithm Evaluation – The critical-section problem – Peterson’s solution – Synchronization hardware – Semaphores – Classic problems of synchronization – Critical regions – Monitors – Synchronization examples – Deadlocks – System model – Deadlock characterization – Methods for handling deadlocks – Deadlock Prevention – Deadlock Avoidance – Deadlock detection – Recovery from deadlock.

UNIT III STORAGE MANAGEMENT 9

Memory Management – Swapping – Contiguous memory allocation – Paging –Segmentation – Example: The Intel Pentium - Virtual Memory: Background – Demand paging – Copy on write – Page replacement – Allocation of frames – Thrashing**.**

UNIT IV I/O SYSTEMS 9

File concept – Access methods – Directory structure – File-system mounting – Protection – Directory implementation – Allocation methods – Free-space management – Disk scheduling – Disk management – Swap-space management – Protection.

UNIT V CASE STUDY **9**

The Linux System – History – Design Principles – Kernel Modules – Process Management – Scheduling – Memory management – File systems – Input and Output – Inter-process Communication – Network Structure – Security – Windows 7 – History – Design Principles – System Components – Terminal Services and Fast User – File system – Networking.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Articulate the main concepts, key ideas, strengths and limitations of operating systems
- Explain the core issues of operating systems
- Know the usage and strengths of various algorithms of operating systems

TEXT BOOK:

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, “Operating System Concepts Essentials”, John Wiley & Sons Inc., 2010.

REFERENCES:

1. Andrew S. Tanenbaum, “Modern Operating Systems”, Second Edition, Addison Wesley, 2001.
2. D M Dhamdhere, “Operating Systems: A Concept-based Approach”, Second Edition, Tata McGraw-Hill Education, 2007.
3. Charles Crowley, “Operating Systems: A Design-Oriented Approach”, Tata Mc Graw Hill Education”, 1996.
4. William Stallings, “Operating Systems: Internals and Design Principles”, Seventh Edition, Prentice Hall, 2011.

IT7401 ALGORITHMICS **L T P C**

3 0 0 3

OBJECTIVES:

- To learn about the process of problem solving and writing algorithms
- To analyze the algorithms for time/space complexity
- To use algorithm design paradigms for various algorithmic design
- To learn the applications of algorithmic design.

UNIT I FUNDAMENTALS **9**

The Role of Algorithms in Computing – Algorithms - Insertion Sort - Analyzing algorithms – Designing algorithms – Growth of Functions - Asymptotic Notations -Recurrence equations - Substitution Method - Recursion Tree method- Master Method

UNIT II DESIGNTECHNIQUES **9**

Divide-and-Conquer - Merge Sort - Dynamic Programming - Matrix chain multiplication - Elements of Dynamic programming - Longest common subsequence - Greedy Algorithms - Activity selection problem -Elements of the Greedy Strategy - Huffman code – Task scheduling problem

UNIT III ANALYSIS AND SEARCH TECHNIQUES **9**

Probabilistic Analysis and Randomized Algorithms -The Hiring Problem - Randomized Algorithms - Amortized Analysis - Branch and Bound - Integer Linear Programming - Job Scheduling - Backtracking - All Simple Paths in a Graph

UNIT IV APPLICATIONS **9**

Matrix Operations – Solving systems of Linear equations - Linear Programming - Simplex algorithm - Standard and Slack forms – Duality - Initial basic feasible solution - String Matching - Naive string-matching algorithm - Knuth-Morris-Pratt algorithm

UNIT V NP-COMPLETENESS 9

NP-completeness – Polynomial Time - Polynomial Time Verification - Reducibility - NP-completeness proofs - Approximation Algorithms - Vertex-Cover problem – Travelling-Salesman problem

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Design and implement any problem using design techniques
- Critically analyze the complexity of the given algorithm.
- Solve the problem in polynomial time or prove that to be a NP-Complete problem.

TEXT BOOK:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Introduction to Algorithms", Third Edition, Mc Graw Hill, 2009.

REFERENCES:

1. S.Sridhar, "Design and Analysis of Algorithms", Oxford University Press, First Edition, 2015.
2. Steven S Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2010.
3. Robert Sedgewick and Kevin Wayne, “Algorithms”, Fourth Edition, Pearson Education, 2011.
4. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, Reprint 2006.
5. Donald E Knuth, “Art of Computer Programming-Volume I- Fundamental Algorithms”, Third edition, Addison Wesley, 1997.

IT7402 WEB TECHNOLOGY L T P C
3 0 0 3

OBJECTIVES:

- To know the object oriented programming basics using Java
- To train the students to acquire knowledge in Object Oriented application development
- To acquire knowledge in concurrent programming in Java
- To gain skill to develop simple web applications using Java based technologies
- To know the basics of python programming

UNIT I JAVA BASICS 9

Introduction to Java - Test-driving a java application - Input / Output and operators - Classes, Objects, Methods and strings - control statements - Methods: A deeper look - Arrays and Array Lists - classed and objects: A deeper look - Inheritance - polymorphism and Interfaces

UNIT II JAVA GUI, FILE STREAM AND CONCURRENCY 9

Exception handling - swing GUI components - Graphics and Java 2d - Strings, characters and Regular Expressions - File streams and object serialization - Generic collections - Lamdas and Streams - Generic classes and methods - advanced Swing GUI components - concurrency - thread states and life cycles - thread synchronization

UNIT III HTML AND JAVA SCRIPT 9

HTML5 - HTML forms - Cascading Style Sheets - java script basics - form validation - java script objects and functions - Dynamic HTML - XML basics - DTD - XML schema - DOM - SAX - XSL - Web Servers - Java script HTML DOM - DOM Events - Modules - Angular Javascript - AJAX - JSON

UNIT IV JAVA SERVER SIDE PROGRAMMING 9

Servlet Overview - Life cycle of a Servlet - Handling HTTP request and response - Using Cookies - Session tracking - Java Server Pages - Anatomy of JSP - Implicit JSP Objects – Accessing database with JDBC - Java Beans - Advantages

UNIT V PYTHON PROGRAMMING BASED WEB DEVELOPEMNT 9

Strings - Operators - Decisions- Functions - Classes and Objects - Files and Directories - Modules - Text processing - Accessing Databases - Simple web application using python

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Have knowledge on the concepts of Java based implementation of Object Oriented system
- Write thread based parallel programs using Java
- Develop simple web applications using Java based technologies
- Write simple programs using Python language

TEXT BOOKS:

1. Paul Deitel and Harvey Deitel, "Java SE 8 for programmers", Pearson Education, 2015
2. Harvey Deitel, Abbey Deitel," Internet and World Wide Web How To Program", 5th Edition,Pearson Publication, 2012
3. James Payne, Beginning Python - Using Python 2.6 and 3.1, Wiley India Pvt. Ltd., 2010

REFERENCES:

1. Marty Hall and Larry Brown, “Core Servlets And Javaserver Pages”, Second Edition
2. Bryan Basham, Kathy Siegra, Bert Bates, “Head First Servlets and JSP”, Second Edition
3. Uttam K Roy, “Web Technologies”, Oxford University Press, 2011.
4. http://www.w3schools.com/
5. http://nptel.ac.in/courses/106105084/

MA7451 DISCRETE MATHEMATICS L T P C
4 0 0 4

OBJECTIVES:

- Have knowledge of the concepts needed to test the logic of a program.
- Have an understanding in identifying structures on many levels.
- Be aware of a class of functions which transform a finite set into another finite set which relates to input output functions in computer science.
- Be aware of the counting principles.
- Be exposed to concepts and properties of algebraic structures such as semi groups, monoids and groups.

UNIT I LOGIC AND PROOFS 12

Propositional Logic – Propositional equivalences - Predicates and Quantifiers – Nested quantifiers – Rules of inference - Introduction to proofs – Proof methods and strategy.

UNIT II COMBINATORICS 12

Mathematical induction – Strong induction and well ordering – The basics of counting - The pigeonhole principle – Permutations and combinations – Recurrence relations -Solving linear recurrence relations using generating functions – Inclusion - Exclusion - Principle and its applications.

UNIT III GRAPHS 12

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.

UNIT IV ALGEBRAIC STRUCTURES 12

Algebraic systems – Semi groups and monoids – Groups - Subgroups - Homomorphisms – Normal subgroup and coset - Lagrange's theorem – Definitions and examples of Rings and Fields.

UNIT V LATTICES AND BOOLEAN ALGEBRA 12

Partial ordering – Posets – Lattices as Posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra.

TOTAL: 60 PERIODS

OUTCOMES:

On completion of the module the student should be able to:

- Understand the notion of mathematical thinking, mathematical proofs, and algorithmic thinking, and be able to apply them in problem solving.
- Understand the basics of discrete probability and number theory, and be able to apply the methods from these subjects in problem solving.
- Use effectively algebraic techniques to analyse basic discrete structures and algorithms.
- Understand asymptotic notation, its significance, and be able to use it to analyse asymptotic performance for some basic algorithmic examples.
- Understand some basic properties of graphs and related discrete structures, and be able to relate these to practical examples.

TEXTBOOKS:

1. Kenneth H.Rosen, "Discrete Mathematics and its Applications", Tata Mc Graw Hill Pub. Co. Ltd., New Delhi, 7th Edition, Special Indian edition, 2011.
2. Tremblay J.P. and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.

REFERENCES:

1. Ralph. P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", Pearson Education Asia, Delhi, 4th Edition, 2007.
2. Thomas Koshy," Discrete Mathematics with Applications", Elsevier Publications, 2006.
3. Seymour Lipschutz and Mark Lipson,"Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.

IT7411 OPERATING SYSTEMS LABORATORY L T P C
0 0 4 2

OBJECTIVES:

• To learn about the basic commands of operating systems.
• To learn various process management schemes in operating systems.
• To practice with the important memory management mechanisms in operating systems.
• To implement the file handling techniques in operating systems

LIST OF EXERCISES:

1. Basic unix commands such as ls, cd, mkdir, rmdir, cp, rm, mv, more, lpr, man, grep, sed, etc.,
2. Shell script
3. Process control System calls - demonstration of fork, execute and wait
4. Thread management
5. Thread synchronization
6. Deadlock avoidance using semaphores
7. Interprocess communication using pipes
8. Interprocess communication using FIFOs
9. Interprocess communication using signals
10. Implementation of CPU scheduling policy in Linux
11. Implement a memory management policy in Linux
12. Implement a file system in Linux
13. Linux kernel configuration

TOTAL : 60 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Learn the concepts to identify, create and maintain the basic command in operating systems
- Express strengths and limitations of various managements schemes in operating systems
- Explain the core issues of operating systems
- Implement algorithms of operating systems

IT7412 WEB TECHNOLOGY LABORATORY L T P C
0 0 4 2

OBJECTIVES:

- To learn about web technologies related concepts
- To develop Java and HTML based web applications
- To implement parsers and XML related concepts

EXERCISES:

1. Creating simple applications using JAVA by exploring all the object oriented programming concepts such as inheritance, polymorphism, interfaces and packages.
2. Creating GUI based application using JAVA Swings
3. Developing concurrent and generic programming using Threads
4. Creation of simple websites using HTML 5 Tags
5. Creation of web forms and validating it through javascripts
6. Creation of XML file and validating with DTD and XML schema
7. Working with DOM and SAX parsers
8. Creation of AJAX based application
9. Developing JSON application
10. Creation of dynamic HTML based web applications
11. Creation of servlet based web application with JDBC
12. Developing JSP application
13. Creating simple applications using python
14. Simple database and web application using python

TOTAL: 60 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Create simple web applications
- Implement server side and client side programming develop web applications with various web technology concepts.

IT7501 COMPILER ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To learn the concepts in the design of compilers
- To learn about the runtime store organization.
- To know the data structures used to implement symbol tables.
- To be familiar with garbage collection.

UNIT I LEXICAL ANALYSIS 9

Introduction-The Structure of Compiler-Evolution of Programming Languages - Application of Compiler Technology-Programming Languages Basics- Lexical Analysis-Role of Lexical Analyzer-Specification and Recognition of Tokens- Lexical Analyzer Generators.

UNIT II SYNTAX ANALYSIS 9

Introduction-Context Free Grammar-Top Down Parsing-Recursive Descend Parsing-Predictive Parsing-Non-Recursive Predictive Parsing-Error Recovery- Bottom Up Parsing- LR Parsers-Construction of SLR(1) Parsing Table, Canonical LR(1) Parsing Table and LALR(1) Parsing Table - Parser Generators.

UNIT III INTERMEDIATE CODE GENERATION 9

Syntax Directed Definitions- Evaluation Orders for Syntax Directed Definitions-Applications of Syntax Directed Translation- Intermediate Code Generation-Three Address Code -Types And Declarations – Expression Translation - Type Checking – Control Flow- Back Patching -Switch Statements-Procedures.

UNIT IV RUNTIME ENVIRONMENT 9

Storage Organization - Stack Allocation - Access To Non-Local Data - Heap Management - Symbol Tables - Introduction to Garbage Collection - Trace-Based Collection.

UNIT V CODE GENERATION 9

Issues - Design of Code Generator - Addresses in the Target Code - Basic Blocks in Flow Graph - Simple Code Generator - Peephole Optimization - Machine Independent Optimization - Principal Sources of Optimizations - Bootstrapping a Compiler - Compiling Compilers -Full Bootstrap.

TOTAL : 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Use compiler construction tools.
- Design and implement a prototype compiler

TEXT BOOK:

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, and Jeffrey D. Ullman, "Compilers: Principles, Techniques, and Tools", Second Edition, Pearson Education, 2009.

REFERENCES:

1. Torben gidius Mogensen, "Basics of Compiler Design", Springer, 2011.
2. LeBlanc Jr., Richard J., Cytron, Ron K., Fischer, Charles N. ,Crafting a Complier, Addison-Wesley, First Edition, 2009.
3. K.D. Cooper and L.Torczon, Engineering a Compiler, Morgan-Kaufmann, Second Edition, 2011.
4. K. Muneeswaran, "Compiler Design", Oxford University Press, 2013.

IT7502 COMPUTER NETWORKS L T P C
3 0 0 3

OBJECTIVES:

- Identify the component required to build different types of networks
- To learn about the division of network functionalities into layers.
- Identify solution for each functionality at each layer
- Choose the required functionality at each layer for given application

UNIT I FUNDAMENTALS 9

Building a network - Network edge and core - Layering and protocols - Internet Architecture - Networking devices: Modems, Routers, Switches, Gateways - Needs/Principles of Application Layer Protocols - Web and HTTP - FTP - Electronic Mail (SMTP, POP3, IMAP, MIME) - DNS – SNMP- Peer to Peer- Distributed Hash table

UNIT II TRANSPORT LAYER 9

Overview of Transport layer – Multiplexing and Demultiplexing - UDP – Building a reliable Data transfer protocol - TCP – Connection – Segment Structure -Reliable byte stream - Connection management - Flow control – Round Trip Time - Congestion control – Causes and approaches – Network assisted example – TCP Congestion Control and avoidance.

UNIT III NETWORK LAYER AND UNICAST ROUTING 9

Introduction - Virtual Switch and Datagram Network - Switching – IP - Global Address - Datagram Forwarding - Subnetting – CIDR - IPv6 - Routing – link state – Distance vector.

UNIT IV NETWORK RELATED PROTOCOLS 9

Intra Domain Routing - RIP - OSPF- Inter Domain Routing - BGP, ICMP - ARP - DHCP - Multicasting –Basics- Protocol Independent Multicast.

UNIT V DATA LINK LAYER AND LAN 9

Link layer services - Framing – Error Detection and Correction - Flow control - Media access control - Ethernet - CSMA/CD - Token Ring - FDDI - Link Virtualization - Data Center Networking Wireless LANs - CSMA/CA –BLUETOOTH

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Differentiate between the various fundamental computer network concepts
- Analyze issues in design and deployment of a computer network
- Solve computational problems in networks
- Design and implement a networking application incorporating the different layering protocols

TEXT BOOKS:

1. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A systems approach”, Fifth Edition, Morgan Kaufmann Publishers, 2010.
2. James F. Kurose, Keith W. Ross, “Computer Networking - A Top-Down Approach Featuring the Internet”, Sixth Edition, Pearson Education, 2013.

REFERENCES:

1. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, “Computer Networks: An Open Source Approach”, McGraw Hill Publisher, 2011.
2. Nader. F. Mir, “Computer and Communication Networks”, Pearson Prentice Hall Publishers, 2010.
3. Forouzan, Behrouz A., and Firouz Mosharraf. "Computer networks: a top-down approach", McGraw-Hill, Special Indian Edition 2012.

IT7503 EMBEDDED SYSTEMS L T P C
3 0 0 3

OBJECTIVES:

- To learn the internal architecture of an embedded processor including timers and interrupts
- To quantize the core specifications of an embedded processor
- To introduce interfacing I/O devices to the processor
- To learn programming an embedded processor
- To run and debug programs in an IDE

UNIT I 8-BIT EMBEDDED PROCESSOR 11

8051 Microcontroller – Architecture, Instruction set and programming. Programming parallel ports, Timers and serial port – Memory system mechanisms – Memory and I/O devices and interfacing – Interrupt handling.

UNIT II EMBEDDED C PROGRAMMING 7

Programming embedded systems in C – Implementing Timers, Interrupts and Serial communication in embedded C- Multi-state systems

UNIT III LOW-POWER EMBEDDED PROCESSORS 9

ARM7 TDMI processing core - instruction sets and programming – Intel ATOM/Quark Processor – Architecture – Programming- Advanced Low Power Processors - Introduction to IoT

UNIT IV RTOS 9

Multiple tasks and processes – Context switching – Scheduling policies – Interprocess communication mechanisms – Performance issues - Need for RTOS - Introduction to µC/OS II

UNIT V EMBEDDED SYSTEM DEVELOPMENT 9

Embedded software development tools – Emulators and debuggers. Challenges of Embedded Systems – Embedded system design process - Design issues – Design methodologies – Case studies – Complete design of example embedded systems.

TOTAL: 45 PERIODS

OUTCOMES :

On Completion of the course, the students should be able to:

- Design a simple embedded application
- Compare various embedded processors
- Design and deploy timers and interrupts
- Design an embedded processor based system for a real-time application

TEXT BOOKS:

1. Muhammed Ali Mazidi, Janice Gillispie Mazidi and Rolin D. Mc Kinlay, “The 8051
2. Microcontroller and Embedded Systems”, Pearson Education, Second edition, 2007.
3. Wayne Wolf, “Computers as Components:Principles of Embedded Computer System Design”, Elsevier, 2006.
4. Andrew N Sloss, D. Symes, C. Wright, ” Arm system developers guide”, Morgan Kauffman/ Elsevier, 2006.

REFERENCES:

1. Michael J. Pont, “Embedded C”, Pearson Education , 2007.
2. Steve Heath, “Embedded System Design” , Elsevier, 2005
3. Muhammad Ali Mazidi , Sarmad Naimi , Sepehr Naimi, "The AVR Microcontroller and Embedded Systems: Using Assembly and C" Pearson Education, First edition, 2014
4. Arshdeep Bahga, Vijay Madisetti, " Internet of Things: A Hands-on-Approach**"** VPT First Edition, 2014

IT7551 UNIX INTERNALS L T P C
3 0 0 3

OBJECTIVES:

- To learn about the design of the UNIX operating system.
- To become familiar with the various data structures used.
- To learn the various low-level algorithms used in UNIX.

UNIT I OVERVIEW 9

General Overview of the System: History – System structure – User perspective –Operating System Services – Assumptions about Hardware. Introduction to the Kernel Architecture of the UNIX Operating System – Introduction to System Concept - The Buffer Cache - Buffer headers – Structure of the Buffer Pool – Scenarios for Retrieval of a Buffer– Reading and Writing Disk Blocks – Advantages and Disadvantages of the Buffer Cache.

UNIT II FILE SUBSYSTEM 9

Internal Representation of Files: Inodes – Structure of a Regular File – Directories –Conversion of a Path Name to an Inode – Super Block – Inode Assignment to a New File – Allocation of Disk Blocks.

UNIT III SYSTEM CALLS FOR THE FILE SYSTEM 9

Open – Read – Write – File And Record Locking – Adjusting the Position of File I/O – lseek – close – File Creation – Creation of Special Files – Changing Directory – Root – Owner - Mode – stat and fstat – Pipes – dup – Mounting And Un mounting File Systems – link – unlink.

UNIT IV PROCESSES 9

Process States and Transitions – Layout of System Memory – The Context of a Process – Saving the Context of a Process – Manipulation of the Process Address Space - Process Control - process Creation – Signals – Process Termination – Awaiting Process Termination – Invoking other programs – User Id of a Process – Changing the size of a Process – Shell – System Boot and the INIT Process– Process Scheduling.

UNIT V MEMORY MANAGEMENT AND I/O 9

Memory Management Policies - Swapping – Demand Paging - The I/O Subsystem: Driver Interface – Disk Drivers – Terminal Drivers.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- To design and implement the subsystems of an operating system.
- To explain the data structures of an open source operating system.
- To modify and implement the data structures and algorithms of an open source operating system.

TEXT BOOK:

1. Maurice J. Bach, “The Design of the Unix Operating System”, First Edition, Pearson Education, 1999.

REFERENCES:

1. B. Goodheart, J. Cox, “The Magic Garden Explained”, Prentice Hall of India,1986.
2. S. J. Leffler, M. K. Mckusick, M. J. .Karels and J. S. Quarterman., “The Design and Implementation of the 4.3 BSD Unix Operating System”, Addison Wesley, 1998.
3. Robert Love, "Linux Kernel Development", III Edition, Addison Wesley, 2010.

IT7511 COMPUTER NETWORKS LABORATORY L T P C
0 0 4 2

OBJECTIVES:

To learn about the low-level network programming concepts using APIs and Simulation tools.

LIST OF EXERCISES:

1. Write a network application program
2. Use tools to visualize packet flow
3. Configure Router/Switch to set up network (network administration)
4. Simple Chat Program using TCP Sockets
5. Simulation of HTTP Protocol using TCP Sockets
6. Simulation of Sliding Window Protocol using TCP Sockets
7. Simulation of DNS using UDP Sockets
8. Simulation of Ping using Raw Sockets
9. Learn to use commands like TCP Dump, Netstat, Trace Route
10. Study of TCP/UDP performance using simulation tool
11. Performance comparison of MAC protocols using simulation tool
12. Performance comparison of Routing protocols using simulation tool

TOTAL: 60 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- To implement a network layer software and analyze functionalities of computer networks

IT7512 EMBEDDED SYSTEMS LABORATORY L T P C
0 0 4 2

OBJECTIVES:

- To learn tools relevant to Embedded Systems
- To explore Embedded C Programs for different embedded processor
- To write and interpret simple assembly programs that use various features of the processor.

LIST OF EXERCISES:

1. 8051 Assembly Language Experiments(Kit and Simulator) based on:
   Data transfer programs
   Arithmetic and logical programs
   Conversions and sorting
   Timers and Interrupts
   Serial Communication
   I/O interfacing: Traffic Generator ,DAC, ADC, Stepper Motor
2. Basic and Interfacing Programs Using Embedded C
3. Real time system programs (Embedded C)
4. KEIL software example programs
2. ARM/Atom based Application Development:
   i. Programs to practice data processing instructions.
   ii. Interfacing programs
   iii. Program that uses combination of C and ARM/Atom assembly code.
3. Embedded Application Development on Platforms like Bluemix:

TOTAL : 60 PERIODS

OUTCOMES :

On Completion of the course, the students should be able to:

- Develop Applications based on Embedded Systems
- Write an Embedded C Program, Debug and interpret the Results
- Write and implement simple assembly programs that use various features of the processor.
- Able to do an experiment that senses an analog signal, process and control [e.g., Keypad, Display.

IT7513 SOCIALLY RELEVANT PROJECT L T P C
0 0 2 1

Students are expected to take up problems that would directly benefit the society and design and implement an IT based solution for the problem, based on the courses undertaken up to that semester. The evaluation of the project would be based on the formulation of the problem, and the technical merit of the solution.

OUTCOMES:

On Completion of the course, the students should be able to:

- Be a benefit to the society by solving a socially pertinent problem, design and implement it with an IT based solution for the problem.

TOTAL: 30 PERIODS

IT7601 INFORMATION SECURITY L T P C
3 0 0 3

OBJECTIVES:

- To introduce the concepts and models of security in computing
- To design and implement symmetric and asymmetric cryptosystems
- To explain the security standards followed at the network level and at the application level
- To estimate the level of security risk faced by an organization and the counter measures to handle the risk
- To learn secured software development

UNIT I SECURITY - AN OVERVIEW 9

Basics of Security - CIA Triad - Threats, Attacks and Controls - Security Models- Bell-LaPadula model - Biba Integrity model - Chinese Wall model - Malicious Logic - Viruses, Worms, Logic Bombs - Basics of Cryptography - Mathematics for Cryptography - Modulo Arithmetic - Euclidean and extended Euclidean Theorem - Chinese Remainder Theorem - Euler and Fermat theorem - Classical Cryptosystems - Substitution and Transposition.

UNIT II ADVANCED CRYPTOGRAPHY 9

DES and AES - Public Key Cryptography - RSA and ElGamal algorithms - Authentication and Key Exchange - Biometric authentication - Diffie Hellman and Needem Schroeder algorithms - Elliptic Curve Cryptosystems - Digital Signatures - Message Digest - Certificates - Directories and Revocation of keys and certificates.

UNIT III SECURITY STANDARDS 9

Public Key Infrastructure - Kerberos - X.509 - IPSec - Virtual Private Networks - E-Mail Security - PGP and PEM - Web Security - Secured DNS - SSL, TLS and SET - CoBIT Framework - Compliances - Credit Card Applications - GLBA.

UNIT IV SECURITY PRACTICES 9

Vulnerability Analysis - Flaw Hypothesis Methodology, NRL taxonomy and Aslam's model - Auditing - Anatomy of an Auditing System - Design of Auditing Systems - Posteriori Design - Auditing mechanisms - Risk Analysis and Management - Disaster Recovery Planning/Incident Response Planning.

UNIT V SECURE DEVELOPMENT 9

Secure Coding - OWASP/SANS Top Vulnerabilities - Buffer Overflows - Incomplete mediation - XSS - Anti Cross Site Scripting Libraries - Canonical Data Format - Command Injection - Redirection - Inference – Application Controls - Secured Software Development Life Cycle - Evaluation of Security Systems- Case Studies-Legal and Ethical Issues- Cybercrime and computer crime - Intellectual property-Copyright, patent, trade secret - Hacking and Intrusion privacy-Identity theft.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Apply the basic security algorithms and policies required by computing system.
- Predict the vulnerabilities across any computing system and hence be able to design a security solution for any computing system.

TEXT BOOKS:

1. Charles Pfleeger, Shari Lawrence Pfleeger, Devin N Paul, "Security in Computing ", Pearson, 2007.
2. William Stallings, "Cryptography and Network Security – Principles and Practices", Pearson Education, Sixth Edition, 2013.

REFERENCES:

1. Wade Trappe, Lawrence C Washington, “Introduction to Cryptography with Coding and Theory”, Second Edition, Pearson, 2007.
2. Wenbo Mao, “Modern Cryptography Theory and Practice”, Pearson, 2004.
3. Matt Bishop, “Computer Security: Art and Science”, Pearson, 2003.
4. Behrouz A Forouzan and Debdeep Mukhopadhyay, "Cryptography and Network Security", Tata Mc Graw Hill Ltd. 2010.

IT7602 INTEGRATED PROGRAMMING L T P C
3 0 0 3

OBJECTIVES:

- To know the importance of Java based Enterprise level application development
- To train the students to acquire knowledge in various frameworks
- To gain skill to develop enterprise applications using Java based technologies

UNIT I SERVER SIDE PROGRAMMING 9

Java EE 7 - Enterprise Architecture Types - Features of the Java EE Platform - Architecture of Java EE 7 - Java EE 7 Containers - Developing Java EE 7 Applications - Compatible Products for the Java EE Platform - Web Servers and Application Servers - JDBC Architecture - JDBC Drivers - JDBC Processes with the java(x).sql Package - Features of Java Servlet - Servlet Life Cycle - Sample Servlet - Implementing Servlet Collaboration - Session Tracking Mechanisms - Event Handling and Wrappers in Servlets - Architecture of a JSP Page - Life Cycle of a JSP Page - JSP Tag Extensions

UNIT II ENTERPRISE JAVA BEANS 9

JavaServer Faces - JSF Architecture - JSF Request Processing Life Cycle - JSF UI and Message Components - Developing a JSF Application - JavaMail Architecture - JavaMail API - Sending and Reading Mails - Enterprise JavaBeans Architecture - Session Beans - MessageDrivenBean - Transactions in Java EE - Entity Bean - Life Cycle of Entity Bean - Entity inheritance and relationship

UNIT III HIBERNATE FRAMEWORK 9

Hibernate - Architecture of Hibernate - Exploring HQL - Hibernate O/R Mapping - JBoss Seam - Features of the Seam Framework - Working with the Seam Framework - Implementing BPM and Page Flow in Seam - Java EE Connector Architecture - Key Concepts of Java Connector Architecture (JCA)

UNIT IV JAVA WEB SERVICES 9

Overview of SOA - Overview of Java Web Services (JWS) - Role of WSDL, SOAP, and Java/XML Mapping in SOA - JAX-WS 2.2 and JAXB 2.2 Specification - WSEE , WS-Metadata, SAAJ, JAXR specifications

UNIT V STRUT AND SPRING FRAMEWORKS 9

Struts - Struts 2 Architecture - Actions in Struts 2 - Spring Framework Architecture - Spring's web MVC framework - Spring with Hibernate - Struts 2 with Spring - Securing Java EE Applications - JAAS - AJAX

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Develop complex real world web applications
- Differentiate the importance of various application development frameworks

TEXT BOOKS:

1. Kogent Learning Solutions Inc.," Java Server Programming Java EE7 (J2EE 1.7): Black Book", Dream Tech Press, 2014.
2. https://docs.oracle.com/javaee/7/JEETT.pdf

REFERENCES:

1. Ed Roman, Rima Patel Sriganesh, Gerald Brose, Mastering Enterprise JavaBeans, 3rd Edition, WILEY publication,2005.
2. Jim Keogh, J2EE: The Complete Reference, TATA Mc-Graw Hill, 2002.
3. James Holmes, Struts: The Complete Reference, 2nd Edition, TATA McGraw Hill, 2007.

IT7603 MOBILE COMPUTING L T P C
3 0 0 3

OBJECTIVES :

- To know about the intricacies of wireless communication
- To study about the popular cellular networking technologies
- To learn about widely used wireless LAN technologies
- To explore the various protocols that support mobility at network layer and transport layer
- To learn the principles of mobile application development

UNIT I WIRELESS COMMUNICATION 9

Frequencies and Regulations - Signals - Antennas - Propagation Ranges and Effects - Multipath Propagation - Effects of Mobility - Multiplexing - Modulation and Shift Keying - Spread Spectrum - Frequency Hopping and Direct Sequence - Evolution of Wireless Telephony.

UNIT II TELECOMMUNICATION NETWORKS 9

Cellular System - Cellular Network Structure and Operation - Principles - Tessellation, Frequency Reuse, Hand off - GSM - System Architecture, Elements, Interfaces, Frame Structure, Protocol Stack, Types of Handover – CDMA - UMTS and IMT-2000 - Architecture, User Equipment, RNS, UTRAN, Node B, RNC functions - W-CDMA - HSPA+, HSUPA, HSDPA+

UNIT III WIRELESS LAN 9

Need and Advantages - Applications - IEEE 802.11 WLAN - Architecture, Protocol stack - Physical layer - MAC Layer - CSMA/CA, Virtual Carrier Sense, Fragmentation and Reassembly , Inter Frame Spacing - Security - WEP - 802.1x Authentication - Synchronization - Power management - ETSI HIPERLAN - Characteristics, Services, Protocols - Physical Layer - Channel Access Control - Bluetooth - PHY and MAC layers

UNIT IV MOBILE NETWORK AND TRANSPORT LAYER 9

Mobile IP - IPv6 Mobility Features - Mobility header, Mobility options - Ad hoc networks - AODV and DSDV Protocols - Limitations of traditional TCP - Indirect TCP - Snoop TCP - Mobile TCP - Different Approaches in Transmission and Retransmission - Explicit Link Failure Notification - Wireless Transport Layer Security (WTLS)

UNIT V MOBILE APPLICATION DEVELOPMENT 9

Three Tier Architecture - Presentation Tier - Application Tier and Data Tier – Google Android Platform – Eclipse Simulator – Android Application Architecture – Apple iPhone Platform – UI Tool Kit Interfaces – Event Handling – Event based Programming – Storing and Retrieval of data

TOTAL:45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- To articulate the concept of wireless communication
- To have knowledge on the architecture of GSM and LTE protocol
- To choose the appropriate WLAN technology for a given scenario
- To deploy various protocols that support mobility at network layer and transport layer
- To design and implement mobile applications

TEXT BOOKS:

1. Jochen Schiller, “Mobile Communications”, Second Edition, Pearson, 2009.
2. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, “Mobile Computing Technology, Applications and Service Creation”, 2nd edition, Tata McGraw Hill, 2010.

REFERENCES:

1. William Stallings, “Wireless Communication and Networks”, Pearson Education, 2009.
2. Uwe Hansmaan, Lothar Merk, Martin S. Nicklons and Thomas Stober, ‘Principles of Mobile Computing’, Springer, 2003.
3. Pattnaik Prasant Kumar and Mall Rajib, "Fundamentals of Mobile Computing", PHI, 2012
4. Zigurd Mednieks, Laird Dornin, G, Blake Meike and Masumi Nakamura, “Programming Android”, O"Reilly, 2011.

IT7604 PARALLEL AND DISTRIBUTED SYSTEMS L T P C
3 0 0 3

OBJECTIVES:

- To provide knowledge on principles underlying the design of distributed and parallel systems
- To lay the foundations of Distributed and Parallel Systems.
- To introduce the idea of Distributed and Parallel Architecture.
- To introduce the idea of Distributed operating system and related issues.

UNIT I INTRODUCTION TO DISTRIBUTED AND PARALLEL SYSTEMS 8

Characterization of Distributed Systems – System Models –Introduction to Parallel Computing Systems – Scope of Parallel Computing –Parallel Programming Platforms Dichotomy – Communication Cost in Parallel Machines –Principles of Parallel Algorithm Design.

UNIT II COMMUNICATION IN DISTRIBUTED AND PARALLEL ENVIRONMENT 9

Paradigms in Distributed Applications – Remote Procedure Call – Remote Object Invocation – Group Communication – Threads in Distributed Systems –Basic Communication Operations in Parallel Systems –Principles of Message-Passing Programming Paradigm– The Building Blocks– Message Passing Interface (MPI).

UNIT III DISTRIBUTED OPERATING SYSTEMS 10

Issues in Distributed Operating System – Clock Synchronization – Causal Ordering – Global States – Election Algorithms – Distributed Mutual Exclusion – Distributed Deadlock Management.

UNIT IV DISTRIBUTED RESOURCE MANAGEMENT 10

Distributed Shared Memory Algorithms – Distributed Coherence Protocols – Data Consistency Models – Distributed Scheduling –Load Distributing and Sharing – Distributed File Systems.

UNIT V FAULT TOLERANCE AND CONSENSUS 8

Introduction to Fault Tolerance – Distributed Commit Protocols – Voting Protocols – Coordination and Agreement in Groups – Consensus – Byzantine Fault Tolerance – Impossibilities in Fault Tolerance.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Articulate the principles and standard practices underlying the design of distributed and parallel systems.
- Explain the core issues of distributed and parallel systems.
- Appreciate the difficulties in implementing basic communication in parallel and distributed systems.
- Have knowledge on the substantial difficulty in designing parallel and distributed algorithms in comparison to centralized algorithms.
- Appreciate the issues in distributed operating system, resource management and fault tolerance

TEXT BOOKS:

1. George Coulouris, Jean Dollimore, Tim Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Pearson Education Asia, 2011.
2. MukeshSinghal, “Advanced Concepts In Operating Systems”, McGraw Hill Series in Computer Science, 1994.
3. Introduction to Parallel Computing, Second Edition, Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar,: Addison Wesley 2003

REFERENCES:

1. Ajay D. Kshemkalyani and Mukesh Singhal, “Distributed Computing: Principles, Algorithms and Systems”, Cambridge Press.
2. A.S.Tanenbaum, M.Van Steen, “Distributed Systems”, Pearson Education, 2004.
3. M.L.Liu, “Distributed Computing Principles and Applications”, Pearson Addison Wesley, 2004.
4. Tom White, “Hadoop: The Definitive Guide”, O'REILLY Media, 2009.

IT7611 CREATIVE AND INNOVATIVE PROJECT L T P C

0 0 4 2

OBJECTIVES:

The goal of this course is to encourage the students to identify innovative projects that help in exploring variables that promote creativity and innovation. Each student is expected to choose a real life or socially relevant problem At the end of the project, students should be familiar with the state of art in their respective fields. They would be able to apply the concepts learnt to relevant research problems or practical applications.

OUTCOMES:

On Completion of the course, the students should be able to:

Know concepts, models, frameworks, and tools that engineering graduates’ need in a world where creativity and innovation is fast becoming a pre-condition for competitive advantage**.**

TOTAL: 60 PERIODS

IT7612 INFORMATION SECURITY AND MOBILE COMPUTING LABORATORY **L T P C 0 0 4 2**

OBJECTIVES:

- The Information Security Laboratories to present several hands-on exercises to help reinforce the students knowledge and understanding of the various Information security aspects.
- The lab exercises are based on implementation of cryptographic algorithms and with usage of various security attacks/defenses related tools and utilities.

LIST OF EXERCISES:

The following exercises are based on the cryptographic algorithms. They can be implemented using C, C++, Java, etc.

1. Write a program to perform encryption and decryption using the following algorithms
    a. Ceaser cipher
    b. Substitution cipher
    c. Hill Cipher
2. Write a program that contains functions, which accept a key and input text to be encrypted/decrypted. This program should use the key to encrypt/decrypt the input by using the triple DES algorithm. Make use of Cryptography package.
3. Write a program to implement the Rijndael algorithm logic.
4. Write the RC4 logic in any language
5. Using cryptography, encrypt the text “Helloworld”using Blowfish.Create your own key using key tool.
6. Write a program to implement RSA algorithm.
7. Implement the Diffie-Hellman Key Exchange mechanism using HTML and Script. Consider the end user as one of the parties(Alice) and the Script application as the other party(Bob)
8. Calculate the message digest of a text using the SHA-1/MD5 algorithm in any language
9. Create a digital certificate of your own by using the key tool.
10. Write a program to encrypt user’s passwords before they are stored in a database table, and to retrieve the whenever they are to be brought back for verification.
11. Key generation (public and private key pair)can be performed using Java. Write a program which can do this.
12. Write a program which performs a digital signature on a given text.

TOTAL: 60 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Have knowledge on the fundamentals of secret and public cryptography.
- Familiar with network security designs using available secure solutions (such as PGP, SSL, IPSec, etc)

IT7613 INTEGRATED PROGRAMMING LABORATORY **L T P C 0 0 4 2**

OBJECTIVES:

- To learn about the concepts of developing simple web applications
- To practice the concepts of enterprise level java frameworks
- To familiarize the students with the development of advanced java applications

EXERCISES

1. Creating servlet based application with session and cookies
2. Developing JSP applications with JDBC and session management

3. Experimenting with basic EJB applications.
4. Developing EJB application with session and entity beans
5. Creation of web services using JAVA
6. Creation of RESTful web services and SOAP based web services
7. Developing SOA based solutions using web service composition
8. Hibernate based application development
9. Application development using spring
10. Application development using strut framework
11. Creation of Database applications using Hibernate
12. Creation of java based secure application

TOTAL : 60 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Develop enterprise level java applications
- Implement enterprise java concepts such as JSP, Servlet, EJB
- Create the applications using the concepts of hibernate, spring, struts

IT7701 COMPUTER GRAPHICS AND MULTIMEDIA L T P C
3 0 0 3

OBJECTIVES:

- To know the mathematical basis of computer graphics
- To train the students to acquire knowledge in Graphic generation and Animation creation
- To acquire knowledge about multimedia compression techniques
- To gain skill to develop multimedia systems

UNIT I INTRODUCTION TO COMPUTER GRAPHICS 9

Graphics display devices-Graphics input primitives and devices - OpenGL basic graphic primitives-Line drawing algorithms DDA and Bresenham - World windows and viewports- Clipping algorithms for lines, Regular polygons, circles and arcs- The parametric form for a curve- Review of vectors-Representations of key geometric objects- Lines and Planes

UNIT II MODELING AND TRANSFORMATIONS OF OBJECTS 9

Introduction to transformations-Two dimensional transformations-3D affine transformations-Drawing 3D scenes interactively- Introduction to solid modeling with polygonal meshes-Mesh approximations to smooth objects-Particle systems and physically based systems-Three-dimensional viewing -Perspective projections of 3D objects - Introduction to shading models-Flat shading and smooth shading- Adding texture to faces.

UNIT III VISUAL REALISM 9

Manipulating pixmaps-Manipulating symbolically defined regions-Aliasing and anti aliasing techniques-Describing curves using polynomials-Bezier curves-The B-Spline basis functions-Modeling curved surfaces- Color theory- Overview of the ray tracing process-Intersecting rays with other primitives-Adding shadows for greater realism-Reflections and transparency- Boolean operations on objects-Ray casting.

UNIT IV INTRODUCTION TO MULTIMEDIA 9

Multimedia and hypermedia-world wide web-overview of multimedia software tools - Multimedia authoring-Editing and authoring tools-VRML - Graphics/Image data types-popular file formats-Fundamental Concepts in Video- Types of Video Signals-Analog Video-Digital Video- Basics of Digital Audio- Digitization of sound-MIDI-Quantization and transmission of audio-Surround sound-Dolby-DTS.

UNIT V COMPRESSION TECHNIQUES 9

Run-length coding -lossless image compression- Transform coding-Wavelet-based coding -JPEG standard- JPEG2000 Standard- JPEG-LS standard-Bi-level image compression standards- MPEG Video Coding1-MPEG-1 and - MPEG Video Coding II-MPEG-4,7 and Beyond- Basic Audio Compression Techniques- MPEG Audio Compression.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Articulate the concepts and techniques used in three-dimensional graphics
- Design and model graphical structures
- Design and implement algorithms and techniques applied to multimedia objects

TEXTBOOKS:

1. F.S. Hill, Jr. and Stephen M. Kelley, Jr., "Computer graphics using OpenGL", Pearson Prentice Hall, Third edition, 2007.
2. Mark S Drew and Zee Nian Li, "Fundamentals of multimedia", Prentice Hall, 2006.

REFERENCES:

1. Alan Watt, "3D Computer Graphics", Pearson Addison Wesley, Third edition, 2000.
2. Hearn and Baker, "Computer Graphics with OpenGL", Pearson, Fourth edition.
3. Ralf Steinmetz and Klara Nahrstedt, "Multimedia Systems", Springer IE, 2004.

IT7702 DATA ANALYTICS L T P C

3 0 0 3

OBJECTIVES:

- To introduce big data and its importance towards analytics
- To familiarize the students with fundamentals of data analysis
- To expose the students to different of big data frameworks
- To learn about the stream mining concepts

UNIT I INTRODUCTION TO DATA ANALYTICS 9

Introduction to Big Data – Need for big data - Web Data – Evolution Of Analytic Scalability - Analytic Processes and Tools - Analysis vs Reporting – Core Analytics vs Advanced Analytics – Statistical significance – Sampling – inference - Modern Data Analytic Tools.

UNIT II DATA ANALYSIS - FUNDAMENTALS 9

Data Analysis Foundations - Univariate, bivariate and multivariate analysis of Numeric and Categorical Attributes – Graph Data - Kernel Methods - Kernel Matrix, Vector Kernels, Basic Kernel Operations in Feature Space and Kernels for Complex Objects - High-dimensional Data - Dimensionality Reduction - Principal Component Analysis, Kernel Principal Component Analysis, Singular Value Decomposition.

UNIT III ANALYTICAL FRAMEWORKS - I 9

Introduction to Hadoop and MapReduce – Hadoop Features – Components of Hadoop - Hadoop Distributed File Systems (HDS) and MapReduce Architectures – Hadoop Instalation - Writing Mapreduce Programs – Algorithms Using Map-Reduce - Matrix-Vector Multiplication, Relational-Algebra Operations, Grouping and Aggregation.

UNIT IV ANALYTICAL FRAMEWORKS – II 9

Overview of Application development in Languages for Hadoop – PigLatin, Hive, jaql, Sqoop, Apache drill, Cloudera Impala – Introduction to NoSQL databases - HBase, MongoDB – CouchDB – Introduction to R Language for statistical computing and visualization – R Installation and integration with Hadoop.

UNIT V MINING DATA STREAMS 9

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.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Identify the differences between reporting and analytics
- Demonstrate fundamental mathematics behind analytics
- Install Hadoop and write Map Reduce Programs
- Critically analyze different big data frameworks for programming, storage and statistical analysis
- Apply mining techniques for stream data

TEXT BOOKS:

1. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
2. Mohammed j. Zaki and Wagner Meira, Data Mining and Analysis - Fundamental Concepts and Algorithms, Cambridge University Press, 2014.
3. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
4. Vignesh Prajapati, Big Data Analytics with R and Hadoop, Packt Publishing Ltd, 2013.

REFERENCES:

1. Paul Zikopoulos and Chris Eaton, Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw-Hill Education; 1 edition 2011
2. Philipp K. Janert, Data Analysis with Open Source Tools, O’Reilly Media, 2010.
3. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
4. Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons, 2007.

IT7703 KNOWLEDGE ENGINEERING AND INTELLIGENT SYSTEMS L T P C
3 0 0 3

OBJECTIVES:

- The background of intelligent agents and search mechanisms
- The various knowledge representation techniques
- The reasoning methods of proposition, predicate and higher order logics
- The learning techniques in artificial agents

UNIT I KNOWLEDGE REPRSENTATION IN INTELLIGENT AGENTS 9

Intelligent agents - Classification - Environment - Architecture - Models of knowledge representation - Procedural rules - Semantic representation - Semantic networks - Frames - Conceptual dependency - Ontology

UNIT II SEARCH STRATEGIES 9

Uninformed search - Informed search strategies: Greedy best first search - A* search algorithm - Constraint Satisfaction Problems: Backtracking search - Local search - Game Playing: Optimal decisions in games - Alpha-Beta Pruning

UNIT III REASONING WITH PROPOSITION AND PREDICATE LOGIC 9

Proposition Logic - Syntax - Semantics - Horn Clauses - Resolution - First Order Logic - Syntax - Conversion from English Statements to First order logic formula - Semantics - Reasoning methods - Forward chaining - Backward chaining - Resolution - Application: AI Planning

UNIT IV REASONING WITH HIGHER ORDER LOGICS 9

Modal Logic - Syntax - Semantics - Kripke structures - Temporal Logic - Syntax and Semantics - Reasoning mechanisms using Temporal Logic - Epistemic Logic - Syntax and Semantics - Multiagent reasoning using Epistemic Logic- Case based reasoning

UNIT V LEARNING 9

Statistical methods - Bayesian techniques- Supervised learning- Unsupervised learning- Regression methods - Learning under uncertainty - Probability methods - Text processing

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Use the knowledge representation and reasoning techniques for the design of intelligent systems
- Apply the reasoning methods of various logics to computer science domains.
- Create intelligent systems using learning mechanisms.

TEXT BOOKS:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach", Third Edition, Pearson Education, 2009.
2. Michael Huth and Mark Ryan," Logic in Computer Science: Modelling and Reasoning about Systems", Cambridge University Press, Second edition, 2004.

REFERENCES:

1. Saroj Kaushik, "Artificial Intelligence", Cengage Learning, 2012.
2. Ronald Brachman, Hector Levesque “Knowledge Representation and Reasoning “, The Morgan Kaufmann Series in Artificial Intelligence, 2004.
3. Johan van Benthem, Hans van Ditmarsch, Jan van Eijck and Jan Jaspars," Logic in Action, A new introduction to Logic", Available in http://www.logicinaction.org/, 2014.

IT7704 PRINCIPLES OF HUMAN COMPUTER INTERACTION L T P C
3 0 0 3

OBJECTIVES:

- To study about the design, implementation and evaluation of effective and usable graphical computer interfaces.
- To describe and apply core theories, models and methodologies from the field of HCI.
- To learn various case studies in HCI

UNIT I FOUNDATIONS FOR INTERACTION DESIGN 9

The psychopathology of Everyday things – Psychology of everyday actions - Human memory – Thinking – Emotion - Psychology and design of interactive system - Text entry devices - display devices - devices for virtual reality and 3D interaction - Models of interaction - Frame work and HCI-Ergonomics - Interaction styles - Elements of WIMP interface – Interactivity - paradigms for interaction - Affective aspects of HCI.

UNIT II MODELS AND THEORIES 9

Cognitive models: Linguistic models-Physical and device models - Cognitive architecture, Communication and collaboration models: Face to face communication - conversation - Text based communication - Group working, Models of the system: Standard formalisms - Interaction models - Continuous behavior, Modeling rich interaction: Status event analysis - Rich contexts - Low interaction and sensor based interaction.

UNIT III DESIGN PROCESS 9

Interaction design basics: The process of design - user focus - navigation design - Screen design and layout - iteration and prototyping, HCI in software Process: Usability Engineering - iterative design and prototyping, Design rules: Principles to support usability - Standards - Guidelines - Golden rules and heuristics - HCI patterns, Designing for collaboration and communication.

UNIT IV IMPLEMENTATION AND EVALUATION TECHNIQUES 9

Interaction styles – Direct manipulation and virtual environments – menu selection – form fill in – dialog boxes – command and natural languages – interaction devices – layouts – fragments – widgets – views – adapters – evaluation strategies

UNIT V CASE STUDIES 9

Goals of HCI case studies: Exploration - Explanation - Description - Demonstration, Types of case study: Intrinsic or instrumental - Single case multiple cases - Embedded or holistic, Groupware: Groupware systems - Computer mediated communication - Meeting and decision support system - Shared applications and artifacts - Frameworks for groupware - Implementing synchronous groupware, Ubiquitous computing and augmented realities: Ubiquitous computing applications research - Virtual and augmented reality - Information and data visualization - HCI for smart environment – Virtual reality – HCI for scientific applications, medical applications – HCI for assistive technology

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Interpret the contributions of human factors and technical constraints on human-computer interaction.
- Evaluate the role of current HCI theories in the design of software.
- Apply HCI techniques and methods to the design of software.
- Categorize and carefully differentiate various aspects of multimedia interfaces
- Design and develop issues related to HCI for real application.

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, Human – Computer Interaction, Third Edition, Pearson, 2004.
2. Ben Shneiderman, Catherin Plaisant, Maxine Cohen and Steven M. Jacobs, Designing the user interface: Strategies for effective human computer interaction, Fifth edition, Pearson 2009.

REFERENCES:

1. Donald A. Norman, Design of everyday things, Basic books, Revised edition, 2013.
2. Reto Meier, Professional Android 4 Application Development, Wiley, 2012.

IT7711 GRAPHICS AND MULTIMEDIA LABORATORY L T P C
0 0 4 2

OBJECTIVES:

- To introduce the necessary background, the basic algorithms, and the applications of computer graphics.
- To examine the various graphics applications of modeling, design and visualization.
- To develop an innovative multimedia projects.

Implement the exercises from 1 to 4 using C/ OpenGL / Java

1. Implementation of Algorithms for drawing 2D Primitives with attributes
    a. Line (DDA, Bresenham) - all slopes
    b. Circle (Midpoint), Ellipse.
2. 2D Geometric Transformations -
    a. Translation
    b. Rotation
    c. Scaling
    d. Reflection
    e. Shear
3. Window- Viewport transformation
4. Composite 2D Transformations
5. Line Clipping - Liang Barsky, Cohen Sutherland

Implement the exercises from 6 to 8 using OpenGL

6. 3D Transformations - Translation, Rotation, Scaling
7. 3D Projections - Parallel, Perspective
8. Creating 3D Scenes

Implement the exercise 9 and 10 using any programming language

9. To implement text compression algorithms
10. To implement image compression algorithms

Implement the exercises from 11 to 12 using respective open source tools

11. Image Editing and Manipulation - Basic Operations on image using any image editing software, Creating gif animated images, Image optimization
12. 3D Animation - To create Interactive animation using any open source 3D Modelling tool

TOTAL : 60 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Be able to construct interactive computer graphics programs using OpenGL.
- Have a thorough understanding of working of 2D and 3D computer graphics.
- Able to create animation in both 2D and 3D.
- Have the ability to build a multimedia application.

IT7712	MINI PROJECT	L T P C 0 0 4 2

Three member team is identified to carry out mini project, the goal of mini project is to choose the final year project, Perform Literature Survey, refer IEEE papers, IEEE/ACM papers, study the implementation issues, familiarize with the tools needed for implementation, study necessary simulation software (if any) and implement the initial phase of the project. Three reviews needs to be conducted project report has to be submitted by the team. Final review will be conducted by external member.

TOTAL : 60 PERIODS

CS7072	GRAPH THEORY	L T P C 3 0 0 3

OBJECTIVES:

- To comprehend graphs as modeling and analysis tool
- To introduce various data structures with graph theory
- To learn fundamentals behind principle of counting and combinatory.

UNIT I INTRODUCTION 9

Graphs – Introduction – Isomorphism – Sub Graphs – Walks, Paths, Circuits – Connectedness– Components – Euler Graphs – Hamiltonian paths and circuits – Trees – Properties of Trees– Distance and Centers in Tree – Rooted and Binary Trees.

UNIT II TREES, CONNECTIVITY & PLANARITY 9

Spanning Trees – Fundamental Circuits – Spanning Trees in a Weighted Graph – Cut Sets – Properties of Cut Set – All Cut Sets – Fundamental Circuits and Cut Sets – Connectivity and Separability – Network Flows – 1-Isomorphism – 2-Isomorphism – Combinational and Geometric Graphs – Planer Graphs – Different Representation of a Planer Graph.

UNIT III MATRICES, COLOURING AND DIRECTED GRAPH 9

Chromatic Number – Chromatic Partitioning – Chromatic Polynomial – Matching – Covering – Four Color Problem – Directed Graphs – Types of Directed Graphs – Digraphs and Binary Relations – Directed Paths and Connectedness – Euler Graphs.

UNIT IV PERMUTATIONS & COMBINATIONS 9

Fundamental Principles of Counting - Permutations and Combinations - Binomial Theorem - Combinations with Repetition - Combinatorial Numbers - Principle of Inclusion and Exclusion - Derangements - Arrangements with Forbidden Positions.

UNIT V GENERATING FUNCTIONS 9

Generating Functions - Partitions Of Integers - Exponential Generating Function - Summation Operator - Recurrence Relations - First Order and Second Order – Non- Homogeneous Recurrence Relations - Method of Generating Functions.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Write programs involving basic graph algorithms
- Write programs for graph coloring
- Differentiate the potential use of directed and undirected graphs
- Outline the concepts of permutations and combinations

TEXTBOOKS:

1. Narsingh Deo, “Graph Theory: With Application to Engineering and Computer Science”, Prentice Hall of India, 2003.
2. Grimaldi R.P., “Discrete and Combinatorial Mathematics: An Applied Introduction”, Addison Wesley, 1994.

REFERENCES:

1. Clark J. and Holton D.A., “A First Look at Graph Theory”, Allied Publishers, 1995.
2. Mott J.L., Kandel A. and Baker T.P., “Discrete Mathematics for Computer Scientists and Mathematicians”, Prentice Hall of India, 1996.
3. Liu C.L., “Elements of Discrete Mathematics”, McGraw Hill, 1985.
4. Rosen K.H., “Discrete Mathematics and Its Applications”, McGraw Hill, 2007.

CS7074	SOFT COMPUTING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To give students knowledge of soft computing theories fundamentals,
- To learn the fundamentals of non-traditional technologies and approaches to solving hard real-world problems.
- To learn and apply artificial neural networks, fuzzy sets and fuzzy logic, and genetic algorithms in problem solving and use of heuristics based on human experience
- To introduce the ideas of fuzzy sets, fuzzy logic To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems
- To familiarize with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations

UNIT I NEURAL NETWORKS - I **9**

(Introduction and Architecture) Neuron, Nerve Structure and Synapse, Artificial Neuron and its Model, Activation Functions, Neural Network Architecture: Single Layer and Multilayer Feed Forward Networks, Recurrent Networks. Various Learning Techniques; Perception and Convergence Rule, Auto-Associative and Hetro-Associative Memory.

UNIT II NEURAL NETWORKS - II **9**

(Back Propagation Networks) Architecture: Perceptron Model, Solution, Single Layer Artificial Neural Network, Multilayer Perception Model; Back Propagation Learning Methods, Effect of Learning Rule Co-Efficient ;Back Propagation Algorithm, Factors Affecting Back Propagation Training, Applications.

UNIT III FUZZY LOGIC - I **9**

(Introduction) Basic Concepts of Fuzzy Logic, Fuzzy Sets and Crisp Sets, Fuzzy Set Theory and Operations, Properties of Fuzzy Sets, Fuzzy and Crisp Relations, Fuzzy to Crisp Conversion.

UNIT IV FUZZY LOGIC – II **9**

(Fuzzy Membership, Rules) Membership Functions, Interference in Fuzzy Logic, Fuzzy If-Then Rules, Fuzzy Implications and Fuzzy Algorithms, Fuzzifications and Defuzzificataions, Fuzzy Controller, Industrial Applications

UNIT V GENETIC ALGORITHM **9**

Basic Concepts, Working Principle, Procedures of GA, Flow Chart of GA, Genetic Representations, (Encoding) Initialization and Selection, Genetic Operators, Mutation, Generational Cycle, Applications.

TOTAL :45 PERIODS

OUTCOMES:

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

- Awake the importance of tolerance of imprecision and uncertainty for design of robust and low-cost intelligent machines.
- Acquire knowledge of soft computing theories fundamentals and so they will be able to design program systems using approaches of these theories for solving various real-world problems.
- Try and integrate the knowledge of neural networks, fuzzy logic, genetic algorithms, probabilistic reasoning, rough sets, chaos, hybrid approaches (combinations of neural networks, fuzzy logic and genetic algorithms).

TEXTBOOKS:

1. S. Rajasekaran and G.A. Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications”, Prentice Hall of India, 2003.
2. N.P.Padhy,”Artificial Intelligence and Intelligent Systems”, Oxford University Press, 2005.
3. J.S.R. Jang, C.T. Sun and E. Mizutani, “Neuro-Fuzzy and Soft Computing”, Pearson Education, 2004.

REFERENCES:

1. Siman Haykin, “Neural Networks ”, Prentice Hall of India, 1999
2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, Third Edition, Wiley India, 2010
3. S.Y.Kung, “Digital Neural Network”, Prentice Hall International, 1993.
4. Aliev.R.A and Aliev,R.R, “ Soft Computing and its Application”, World Scientific Publishing Company, 2001.
5. Wulfram Gerstner and Wenner Kristler, “Spiking Neural Networks”, Cambridge University Press.
6. Bart Kosko, “Neural Networks and Fuzzy Systems: Dynamical Systems Application to Machine Intelligence”, Prentice Hall, 1992.

CS7551 DIGITAL SIGNAL PROCESSING

L	T	P	C
3	0	0	3

OBJECTIVES:

- To get an idea on designing analog and digital filters
- To acquire knowledge related to Fourier transform and its applications.
- To learn the design of infinite and finite impulse response filters for filtering undesired signals.
- To understand signal processing concepts in systems having more than one sampling frequency.

UNIT I SIGNALS AND SYSTEMS **9**

Basic Elements of DSP – Concepts of Frequency in Analog and Digital Signals – Sampling Theorem – Discrete – Time Signals, Systems – Analysis of Discrete Time LTI Systems – Z Transform – Inverse Z Transform – Convolution – Correlation.

UNIT II FREQUENCY TRANSFORMATIONS **9**

Introduction to DFT – Properties of DFT – Circular Convolution – Filtering -Methods Based on DFT – FFT Algorithms – Decimation - in - Time Algorithms, Decimation – in – Frequency Algorithms – Use of FFT in Linear Filtering – DCT – Use and Application of DCT- Introduction to Wavelet Transform – Haar Transform.

UNIT III IIR FILTER DESIGN 9

Structures of IIR – Analog Filter Design – Discrete Time IIR Filter from Analog Filter – IIR Filter Design by Impulse Invariance, Bilinear Transformation, Approximation of Derivatives – (LPF, HPF, BPF, BRF) Filter Design using Frequency Translation.

UNIT IV FIR FILTER DESIGN 9

Structures of FIR – Linear Phase FIR Filter – Fourier Series - Filter Design using Windowing Techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency Sampling Techniques – Finite Word Length Effects in Digital Filters: Errors, Limit Cycle, Noise Power Spectrum.

UNIT V APPLICATIONS 9

Multirate Signal Processing: Decimation, Interpolation, Sampling Rate Conversion by a Rational Factor – Adaptive Filters: Introduction, Applications of Adaptive Filtering to Equalization, Echo Cancellation – Speech Recognition Systems, Speech Synthesis Systems – Image Enhancement, Case Study.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Perform frequency transforms for signals
- Design IIR and FIR filters
- Write programs using analog and digital filters and to compare the respective output
- Identify finite word length errors in digital filters

TEXTBOOKS:

1. John G. Proakis and Dimitris G. Manolakis, “Digital Signal Processing – Principles, Algorithms and Applications”, Pearson Education / Prentice Hall, Fourth edition, 2007.
2. Emmanuel C. Ifeachor and Barrie. W. Jervis, “Digital Signal Processing”, Pearson Education / Prentice Hall, Second Edition, 2002.

REFERENCES:

1. Sanjit K. Mitra, “Digital Signal Processing – A Computer Based Approach”, Tata McGraw Hill, Fourth Edition, 2011.
2. Alan V. Oppenheim, Ronald W. Jchafer and Hohn. R. Back, “Discrete Time Signal Processing”, Pearson Education, Third Edition, 2009.
3. K. P. Soman and K. I. Ramachandran, "Insight into Wavelets - From Theory to Practice", Prentice Hall of India, Third Edition, 2010.
4. Lawrence Rabiner and Biing-Hwang Juang, "Fundamentals of Speech Recognition", First Edition, Prentice Hall, 1993.
5. Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2009.
6. Dake Liu, “Embedded DSP Processor Design: Application Specific Instruction Set Processors”, Morgan Kaufmann, First Edition, 2008.

GE7071 DISASTER MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS 9

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) 9

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 9

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS 9

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management

TEXTBOOKS:

1. Singhal J.P. “Disaster Management”, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

REFERENCES:

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

GE7072	FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the global trends and development methodologies of various types of products and services
- To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems
- To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them in to design specification
- To understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
- To develop documentation, test specifications and coordinate with various teams to validate and sustain up to the EoL (End of Life) support activities for engineering customer

UNIT I FUNDAMENTALS OF PRODUCT DEVELOPMENT 9

Global Trends Analysis and Product decision - Social Trends - Technical Trends- Economical Trends - Environmental Trends - Political/Policy Trends **- Introduction to Product Development Methodologies and Management -** Overview of Products and Services - Types of Product Development - Overview of Product Development methodologies **-** Product Life Cycle – Product Development Planning and Management.

UNIT II REQUIREMENTS AND SYSTEM DESIGN 9

Requirement Engineering - Types of Requirements - Requirement Engineering - traceability Matrix and Analysis - Requirement Management - **System Design & Modeling -** Introduction to System Modeling - System Optimization - System Specification - Sub-System Design - Interface Design.

UNIT III DESIGN AND TESTING 9

Conceptualization - Industrial Design and User Interface Design - Introduction to Concept generation Techniques – **Challenges in Integration of Engineering Disciplines** - Concept Screening & Evaluation - **Detailed Design -** Component Design and Verification – **Mechanical, Electronics and Software Subsystems** - High Level Design/Low Level Design of S/W Program **-** Types of Prototypes, S/W Testing- Hardware Schematic, Component design, Layout and Hardware Testing – **Prototyping -** Introduction to Rapid Prototyping and Rapid Manufacturing - **System Integration, Testing, Certification and Documentation**

UNIT IV SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT 9

Introduction to Product verification processes and stages - Introduction to Product Validation processes and stages - Product Testing Standards and Certification - Product Documentation - **Sustenance -**Maintenance and Repair – Enhancements - **Product EoL -** Obsolescence Management – Configuration Management - EoL Disposal

UNIT V BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY 9

The Industry - Engineering Services Industry - Product Development in Industry versus Academia –**The IPD Essentials -** Introduction to Vertical Specific Product Development processes - Manufacturing/Purchase and Assembly of Systems - Integration of Mechanical, Embedded and Software Systems – Product Development Trade-offs - Intellectual Property Rights and Confidentiality – Security and Configuration Management.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Define, formulate and analyze a problem
- Solve specific problems independently or as part of a team
- Gain knowledge of the Innovation & Product Development process in the Business Context
- Work independently as well as in teams
- Manage a project from start to finish

TEXTBOOKS:

1. Book specially prepared by NASSCOM as per the MoU.
2. Karl T Ulrich and Stephen D Eppinger, "Product Design and Development", Tata McGraw Hill, Fifth Edition, 2011.
3. John W Newstorm and Keith Davis, "Organizational Behavior", Tata McGraw Hill, Eleventh Edition, 2005.

REFERENCES:

1. Hiriyappa B, “Corporate Strategy – Managing the Business”, Author House, 2013.
2. Peter F Drucker, “People and Performance”, Butterworth – Heinemann [Elsevier], Oxford, 2004.
3. Vinod Kumar Garg and Venkita Krishnan N K, “Enterprise Resource Planning – Concepts”, Second Edition, Prentice Hall, 2003.
4. Mark S Sanders and Ernest J McCormick, "Human Factors in Engineering and Design", McGraw Hill Education, Seventh Edition, 2013

GE7074 HUMAN RIGHTS L T P C
3 0 0 3

OBJECTIVE:

To sensitize the Engineering students to various aspects of Human Rights.

UNIT I 9

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT II **9**

Evolution of the concept of Human Rights Magana carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

UNIT III **9**

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV **9**

Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V **9**

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabled persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

TOTAL : 45 PERIODS

OUTCOME:

- Engineering students will acquire the basic knowledge of human rights.

REFERENCES:

1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.

GE7652 **TOTAL QUALITY MANAGEMENT** **L T P C**
3 0 0 3

AIM

To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management.

OBJECTIVES

- To understand the need for quality, its evolution, basic concepts, contribution of quality gurus, TQM framework, Barriers and Benefits of TQM.
- To understand the TQM Principles.
- To learn and apply the various tools and techniques of TQM.
- To understand and apply QMS and EMS in any organization.

UNIT I INTRODUCTION **9**

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality –Definition of TQM-- Basic concepts of TQM –-Gurus of TQM (Brief introduction) -- TQM Framework- Barriers to TQM –Benefits of TQM.

UNIT II TQM PRINCIPLES **9**

Leadership--The Deming Philosophy, Quality council, Quality statements and Strategic planning--Customer Satisfaction –Customer Perception of Quality, Feedback, Customer complaints, Service Quality, Kano Model and Customer retention – Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition & Reward and Performance Appraisal--Continuous process improvement –Juran Trilogy, PDSA cycle, 5s and Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating and Relationship development.

UNIT III TQM TOOLS & TECHNIQUES I 9

The seven traditional tools of quality – New management tools – Six-sigma Process Capability– Bench marking – Reasons to bench mark, Bench marking process, What to Bench Mark, Understanding Current Performance, Planning, Studying Others, Learning from the data, Using the findings, Pitfalls and Criticisms of Bench Marking – FMEA – Intent of FMEA, FMEA Documentation, Stages, Design FMEA and Process FMEA.

UNIT IV TQM TOOLS & TECHNIQUES II 9

Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Performance measures-- Cost of Quality - BPR.

UNIT V QUALITY MANAGEMENT SYSTEM 9

Introduction—Benefits of ISO Registration—ISO 9000 Series of Standards—Sector-Specific Standards—AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements—Implementation—Documentation—Internal Audits—Registration--**ENVIRONMENTAL MANAGEMENT SYSTEM:** Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001—Benefits of EMS.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to apply TQM concepts in a selected enterprise.
- Ability to apply TQM principles in a selected enterprise.
- Ability to apply the various tools and techniques of TQM.
- Ability to apply QMS and EMS in any organization.

TEXT BOOK:

1. Dale H.Besterfiled, Carol B.Michna,Glen H. Besterfield,Mary B.Sacre,Hemant Urdhwareshe and Rashmi Urdhwareshe, “Total Quality Management”, Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression,2013.

REFERENCES:

1. James R. Evans and William M. Lindsay, “The Management and Control of Quality”, (6th Edition), South-Western (Thomson Learning), 2005.
2. Oakland, J.S. “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford, Third Edition, 2003.
3. Suganthi,L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd., 2006 .
4. Janakiraman,B and Gopal, R.K, “Total Quality Management – Text and Cases”,Prentice Hall (India) Pvt. Ltd., 2006.

IT7001 ADVANCED DATABASE TECHNOLOGY L T P C
3 0 0 3

OBJECTIVES:

- To learn the advanced concepts of databases.
- To familiarize the concepts of spatial and xml databases for better representation.
- To learn various enhanced data models.
- To learn and understand the concepts of No SQL databases for large scale data management.

UNIT I PARALLEL AND DISTRIBUTED DATABASES 9

Database System Architectures: Centralized and Client-Server Architectures - Parallel databases: I/O Parallelism - Inter and Intra query parallelism - Inter and Intra operation parallelism - Distributed database concepts - Distributed data storage - Distributed transactions - Commit protocols - Concurrency control - Distributed Query Processing - Heterogeneous Distributed databases - Cloud based Databases.

UNIT II SPATIAL DATABASES & XML DATABASES 9

Spatial Concepts and Data Models - Representation of Spatial Objects -Spatial Modeling - Spatial Access Methods- Spatial Storage and Indexing - Spatial Query Languages - XML Databases: XML data model - DTD - XML Schema - XML querying - Storage of XML data.

UNIT III INFORMATION RETRIEVAL AND WEB SEARCH 9

Information Retrieval concepts- Retrieval Models - Types of Queries in IR systems- Text Preprocessing- Inverted Indexing- Evaluation measures of search relevance- Web search and analysis - Web databases

UNIT IV ENHANCED DATA MODELS 9

Active database concepts and Triggers - Temporal Database concepts- Object Oriented Databases - Multimedia Database concepts- Introduction to Deductive databases - Mobile Databases- Data Warehousing - Data Mining

UNIT V NoSQL DATABASES 9

Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – column family stores - relationships – graph databases – schema-less databases – materialized views -Cassandra - MongoDB

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- To create data models and representations for a database application.
- To evaluate the usage and effectiveness of various databases.
- To develop IR systems and Web search engines.
- To demonstrate the NoSQL databases using recent big data tools.

TEXT BOOKS:

1. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Sixth Edition, Pearson Education, 2010.
2. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Sixth Edition, McGraw Hill, 2010.

REFERENCES:

1. C.J.Date, A.Kannan and S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Pearson Education, 2013.
3. Rigaux, Scholl and Voisard, "Spatial Databases With Application to GIS, 1st Edition, Morgan Kaufmann, 2002.
4. ShashiShekhar, Sanjay Chawla, "Spatial Databases: A Tour", Prentice Hall, 2003.
5. Thomas M Connolly and Carolyn E Begg, “Database Systems: A Practical Approach to Design, Implementation and Management”, Fourth Edition, Pearson Education, 2008

IT7002 ADVANCED NETWORKS L T P C
3 0 0 3

OBJECTIVES:

- To explain QoS requirements and compare different approaches to QoS.
- To appreciate need for high speed networks
- To identify reliability issues and provide solutions

UNIT I INTERNETWORKING 9

IPv6 - Design issues - Scalability - Addressing - Headers - Routing - Auto configuration - Transition from IPv4 to IPv6 - Interoperability - QoS in IPv6 - Multicast support - ICMPv6 - Security in IPv6

UNIT II QUALITY OF SERVICE 9

QoS taxonomy - Resource allocation - Scheduling - Queuing disciplines - Delay Analysis - Integrated services - Differentiated services - RSVP.

UNIT III MPLS AND VPN 9

MPLS Architecture - MPLS to GMPLS - Traffic engineering with MPLS - QoS -Network recovery and restoration with MPLS – VPN L2 – VPN L3 .

UNIT IV OPTICAL NETWORKS 9

Photonic Packet switching - WDM network design - Introduction to optical networks -optical layer - SONET/SDH - Optical packet switching - Client layers - Signaling protocols and network operation

UNIT V SOFTWARE DEFINED NETWORKING 9

Introduction to SDN - Network Function Virtualization - Data Plane- Control Plane - SDN software stack - Data center Traffic Management

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Gain an understanding of advanced networks concept.
- Describe the principles behind the enhancement in networking
- Know the recent development in networks

TEXT BOOKS:

1. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Fifth Edition, Elsevier/Morgan Kaufmann Publishers, 2011.
2. Bruce S. Davie, Adrian Farrel, “MPLS: Next Steps”, Morgan Kaufmann Publishers, 2011.
3. Rajiv Ramaswami, Kumar N. Sivarajan and Galen H. Sasaki, "Optical Networks A Practical Perspective " ,Third Edition, Morgan Kaufmann,2010.

REFERENCES:

1. William Stallings, " High-speed networks and internets ", Second Edition Pearson Education India, 2002.
2. "MPLS Configuration Examples and TechNotes " , www.cisco.com.
3. Ying-Dar Lin , Ren-Hung Hwang , Fred Baker , "Computer Networks: An Open Source Approach", McGraw-Hill Higher Education, 2011.

IT7003 AGENT BASED INTELLIGENT SYSTEMS L T P C
3 0 0 3

OBJECTIVES:

- The structure of agents
- The learning mechanisms of agents
- The communication and cooperation within agents
- The design of agents

UNIT I INTRODUCTION 9

Agents as a paradigm for software engineering - Agents as a tool for understanding human societies- Intelligent Agent: Agents and Objects - Agents and Expert Systems - Agents as Intentional Systems - Abstract Architectures for Intelligent Agents - How to Tell an Agent What to Do

UNIT II LEARNING IN AGENTS 9

Proportional case - Handling variables and qualifiers - Dealing with intractability - Reasoning with horn clauses - Procedural control of reasoning - Rules in production – Reasoning with Higher order Logics.

UNIT III COMMUNICATION AND COOPERATION IN AGENTS 9

Software tools for ontology - OWL - XML - KIF - Speech acts - Cooperative Distributed Problem Solving - Task Sharing and Result Sharing - Result Sharing - Combining Task and Result Sharing - Handling Inconsistency - Coordination - Multi agent Planning and Synchronization

UNIT IV DEVELOPING INTELLIGENT AGENT SYSTEMS 9

Situated Agents: Actions and Percepts - Proactive and Reactive Agents: Goals and Events - Challenging Agent Environments: Plans and Beliefs - Social Agents - Agent Execution Cycle - Deciding on the Agent Types - Grouping functionalities - Review Agent Coupling - Acquaintance Diagrams - Develop Agent Descriptors

UNIT V APPLICATIONS 9

Agent for workflow and business process management- Mobile agents - Agents for distributed systems - agents for information retrieval and management - agents for electronic commerce - agent for human- computer interface - agents for virtual environments - agents for social simulation.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Implement a computational agent with various searching techniques.
- Apply the reasoning mechanisms of proposition and predicate logic to agents.
- Use the learning mechanisms for an artificial agent.
- Execute different communication and co-operation methodologies in a multi-agent setup.

TEXT BOOKS:

1. Michael Wooldridge, An Introduction to Multi Agent Systems, Second Edition, John Wiley and Sons, 2009.
2. Stuart Russell, Peter Norvig, “Artificial Intelligence: A Modern Approach”, Third Edition, Pearson Education, 2009.
3. Lin Padgham, Michael Winikoff, Developing Intelligent Agent Systems: A Practical Guide, Wiley publications, 2005.

REFERENCES:

1. Ronald Brachman, Hector Levesque “Knowledge Representation and Reasoning ”, The Morgan Kaufmann Series in Artificial Intelligence 2004
2. Arthur B. Markman, “Knowledge Representation”, Lawrence Erlbaum Associates,1998

IT7004 C# AND .NET PROGRAMMING L T P C

3 0 0 3

OBJECTIVES:

- To cover all segments of programming in C# starting from the language basis, followed by the object oriented programming concepts
- To update and enhance skills in writing Windows applications, ADO.NET and ASP .NET
- To introduce advanced topics namely data connectivity, WPF, WCF and WPF with C# and .NET 4.5
- To implement mobile applications using .Net Compact Framework

UNIT I C# LANGUAGE BASICS 9

.Net Architecture - Core C# - Variables - Data Types - Flow control - Objects and Types- Classes and Structs - Inheritance- Generics – Arrays and Tuples - Operators and Casts - Indexers

UNIT II C# ADVANCED FEATURES 9

Delegates - Lambdas - Lambda Expressions - Events - Event Publisher - Event Listener - Strings and Regular Expressions - Generics - Collections - Memory Management and Pointers - Errors and Exceptions - Reflection

UNIT III BASE CLASS LIBRARIES AND DATA MANIPULATION 9

Diagnostics -Tasks, Threads and Synchronization - .Net Security - Localization - Manipulating XML- SAX and DOM - Manipulating files and the Registry- Transactions - ADO.NET- Peer-to-Peer Networking - PNRP - Building P2P Applications - Windows Presentation Foundation (WPF)

UNIT IV WINDOW BASED APPLICATIONS, WCF AND WWF 9

Window based applications - Core ASP.NET- ASP.NET Web forms -Windows Communication Foundation (WCF)- Introduction to Web Services - .Net Remoting - Windows Service - Windows Workflow Foundation (WWF) - Activities - Workflows

UNIT V .NET FRAMEWORK AND COMPACT FRAMEWORK 9

Assemblies - Shared assemblies - Custom Hosting with CLR Objects - Appdomains - Core XAML - Bubbling and Tunneling Events- Reading and Writing XAML - .Net Compact Framework - Compact Edition Data Stores – Errors, Testing and Debugging – Optimizing performance – Packaging and Deployment – Networking and Mobile Devices

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Write various applications using C# Language in the .NET Framework
- Develop distributed application using .NET Framework
- Create Mobile Application using .NET compact Framework

TEXT BOOK:

1. Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner . “Professional C# 2012 and .NET 4.5”, Wiley, 2012

REFERENCES:

1. Andrew Troelsen, Pro C# 5.0 and the .NET 4.5 Framework, Apress publication, 2012.
2. Ian Gariffiths, Mathew Adams, Jesse Liberty, “Programming C# 4.0”, O’Reilly, Fourth Edition, 2010.
3. Andy Wigley, Daniel Moth, Peter Foot, “Mobile Development Handbook”, Microsoft Press, 2011.
4. Harsh Bhasin, “Programming in C#”, Oxford University Press, 2014.

IT7005 CLOUD COMPUTING L T P C
3 0 0 3

OBJECTIVES:

- To learn about the concept of cloud and utility computing.
- To have knowledge on the various issues in cloud computing.
- To be familiar with the lead players in cloud.
- To appreciate the emergence of cloud as the next generation computing paradigm.

UNIT I 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 VIRTUALIZATION 9

Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices – Desktop Virtualization – Server Virtualization.

UNIT III CLOUD ENABLING TECHNOLOGIES AND INFRASTRUCTURE 9

Service Oriented Architecture – RESTful Web Services – NIST Cloud Computing Reference Architecture – laaS – PaaS – SaaS – Public, Private and Hybrid Clouds – Cloud Storage –Design Challenges in Cloud – Peer-to-Peer Architecture.

UNIT IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD 9

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

UNIT V PROGRAMMING MODELS 9

Parallel and Distributed programming Paradigms – MapReduce – Hadoop – Mapping Applications – Google App Engine – Amazon AWS – Cloud Software Environments –Eucalyptus – Open Nebula – Open Stack.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Articulate the main concepts, key technologies, strengths and limitations of cloud computing. Identify the architecture, infrastructure and delivery models of cloud computing.
- Explain the core issues of cloud computing such as security, privacy and interoperability.
- Choose the appropriate technologies, algorithms and approaches for the related issues.

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. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approach", TMH,2009.

REFERENCES:

1. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation "Management, and Security", CRC Press, 2010.
2. Rajkumar Buyya, Christian Vecchiola, S.ThamaraiSelvi "Mastering Cloud Computing", Tata Mcgraw Hill, 2013.
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.

IT7006 COMPUTATIONAL LINGUISTICS L T P C
3 0 0 3

OBJECTIVES:

- Learn about the statistical modeling and classification for NLP
- Learn the basic techniques of information retrieval
- Know about the basics of text mining
- Learn the generic issues in speech processing and applications relevant to natural language generation

UNIT I NATURAL LANGUAGE PROCESSING 9

Linguistic background - spoken language input and output technologies - Written language input - Mathematical methods - Statistical modeling and classification - Finite state methods: Grammar for NLP - Parsing - Semantic interpretation: Semantics and logical form - Ambiguity Resolution - Other strategies for semantic interpretation - Word Sense Disambiguation - Named Entity Recognition

UNIT II INFORMATION RETRIEVAL 9

Information Retrieval architecture - Indexing - Storage - Compression techniques - Retrieval approaches - Evaluation - Search Engines - Commercial search Engine features - comparison - Performance measures - Document processing - NLP based Information Retrieval - Information Extraction - Vector Space Model

UNIT III TEXT MINING 9

Categorization : Extraction based Categorization - Clustering - Hierarchical clustering - Flat Clustering - Document classification and routing - Finding and organizing answers from text search - Categories and clusters for organizing retrieval results - Text Categorization - Efficient summarization using lexical chains - Pattern extraction

UNIT IV GENERIC ISSUES 9

Multilinguality - Multilingual Information Retrieval and Speech Processing - Multimodality- Text and Images - Modality Integration - Transmission and storage - Speech coding - Evaluation of systems - Human factors and user acceptability.

UNIT V APPLICATIONS 9

Machine translation - Transfer metaphor - Interlingua and statistical approaches - Discourse processing - Dialog and conversational agents - Natural language generation - Surface Realization and discourse planning.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Develop applications related to speech processing
- Develop applications related to text mining

TEXT BOOKS:

1. Daniel Jurafsky, James H. Martin, " Speech and Language Processing", Pearson Education, 2009.
2. Ronald Cole, J.Mariani, et.al, "Survey of the state of the art in human language Technology", Cambridge University Press, 1997.
3. Michael W.Berry, " Survey of Txt Mining: Clustering, Classification and Retrieval", Springer Verlag, 2004.
4. Christopher D.Manning, Hinrich Schutze, "Foundations of Statistical Natural Language Processing ", MIT Press, 1999.

REFERENCES:

1. James Allen, "Natural Language Understanding", Second Edition, Pearson Education, 2008.
2. Gerald J.Kowalski, Mark. T. Maybury, " Information Storage and Retrieval systems" , Kluwer Academic Publishers, 2000.
3. Tomek Strzalkowski, " Natural Language Information Retrieval", Kluwer Academic Publishers, 1999.

IT7007 COMPUTER FORENSICS L T P C
3 0 0 3

OBJECTIVES:

- To introduce the concept of Computer Forensic and Investigations
- To know about the principles of evidence collection and management
- To learn about the types of attacks and remedial actions in the context of systems, networks, images and video.

UNIT I INCIDENT AND INCIDENT RESPONSE 9

Introduction to Security threats: Introduction, Computer crimes, Computer threats and Intrusions, Telecommunication Fraud, Phishing , Identity theft, Cyber terrorism and cyber war. Need for Security : Information Security, OS security, Database security, Software Development Security – Security Architecture. Introduction to Incident - Incident Response Methodology – Steps - Activities in Initial Response Phase after detection of an incident.

UNIT II FILE STORAGE AND DATA RECOVERY 9

File Systems-FAT,NTFS - Forensic Analysis of File Systems - Storage Fundamentals-Initial Response & Volatile Data Collection from Windows system - Initial Response & Volatile Data Collection from Unix system - Forensic Duplication – Tools - Discover of Electronic Evidence – Identification of Data – Reconstructing Past Events – Networks.

UNIT III NETWORKAND EMAIL FORENSICS 9

Network Attacks – Denial of Service attacks - Collecting Network Based Evidence - Investigating Routers - Network Protocols Email Tracing - Internet Fraud – Spam Investigations Mobile Forensics – Subscriber Identity Module (SIM) Investigations – Wireless device Investigations – PDA Investigations

UNIT IV SYSTEM FORENSICS 9

Data Analysis Techniques - Investigating Live Systems (Windows &Unix) ,Hacking - Investigating Hacker Tools - Ethical Issues – Cybercrime. Forensic and Investigative tools – Forensic Equipments for evidence collection

UNIT V IMAGE AND VIDEO FORENSICS 9

Image encryption and decryption –Steganography – Fraud using image and video – Detection of Fraud in images and video.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Able to recognize attacks on systems
- Design an counter attack incident response
- To plan and implement counter-attacks
- To use Forensic tools and collect evidences of a computer crime.

TEXT BOOKS:

1. Kevin Mandia, Chris Prosise, “Incident Response and Computer Forensics”, Tata Mc Graw Hill, 2006.
2. Bill Nelson, Amelia Philips, Christopher Stueart, "Guide to Computer Forensics and Investigations", Cengage Learning, 2013.

REFERENCES:

1. John R. Vacca, “Computer Forensics”, Firewall Media, 2009.
2. Eoghan Casey, "Handbook Computer Crime Investigation's Forensic Tools and Technology", Academic Press, 1st Edition, 2001.
3. Davide Cowen, " Computer Forensics: A Beginners Guide", McGraw Hill Education (India) Private Limited, 2011.

IT7008 E-LEARNING TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:

- To gain knowledge about modern technology for learning.
- To be acquainted with e-Learning Tools.
- To learn technologies involved in e-learning application development.
- To become aware of the current business potential of e-learning based business.

UNIT I INTRODUCTION 9

Definition – Benefits – Challenges & opportunities- Developing E-learning-E-learning approaches-E-learning components-Synchronous and asynchronous e-learning-Quality of e-learning-Blended learning- ROI metrics & evaluation – E-Learning cycle – Learning strategy – Business drivers – E-learning strategy.

UNIT II DESIGN 9

Identifying and organizing course content-Needs analysis- Analyzing the target audience-Identifying course content-Defining learning objectives-Defining the course sequence-Defining instructional, media, evaluation and delivery strategies-Defining instructional methods, Defining the delivery strategy, Defining the evaluation strategy. Instructional design – Design issues – Types of learning engagements – Blended learning – Team – Infra structure – Vendor relationships

UNIT III CREATING INTERACTIVE CONTENT 9

Multi-channel delivery – Learner support – Developing curriculum – E-learning standards – Content development process- Creating storyboards-Structure of an interactive e-lesson-Techniques for presenting content-Integrating media elements-Courseware development-Authoring tools-Types of authoring tools-Selecting an authoring tool.

UNIT IV WEB BASED TRAINING 9

Definition – Need for web based training – Choosing an approach - Kind of courses – Technical standards – Metaphors – Course framework – registration – Running the course – resources – Feedback – Access - Collaborative learning- Moodle and other open-source solutions - E-learning methods.

UNIT V LEARNING METHODOLOGY 9

Organizing learning sequences – Common lesson structures – Creating building blocks – Designing learning sequences – Learning activities – Test and exercise learning – Planning tests – Selecting questions – Sequencing test questions – Feedback – Improve testing – Prevent cheating.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Work with technologies involved in e-Learning Applications.
- Design and Develop e-Learning Application and working with e-Learning tools.

TEXTBOOKS:

1. Clark, R. C. and Mayer, R. E. (2011) eLearning and the Science of Instruction. 3rd edition.
2. Means, B., Toyama, Y., and Murphy, R. (2010) Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies.

REFERENCES :

1. Crews, T. B., Sheth, S. N., and Horne, T. M. (2014) Understanding the Learning Personalities of Successful Online Students. Educause Review. Jan/Feb 2014.
2. Madhuri Dubey,"Effective E-learning Design,Development and Delivery",University Press 2011.

IT7009 GAME PROGRAMMING L T P C

3 0 0 3

OBJECTIVES:

- To know the mechanics and logic of Game design
- To train the students to acquire knowledge in game modeling techniques
- To acquire knowledge about the issues in game design
- To gain skill in game engine development

UNIT I 3D GRAPHICS FOR GAME PROGRAMMING 9

Coordinate Systems, Ray Tracing, Modeling in Game Production, Vertex Processing Rasterization, Fragment Processing and Output Merging, Illumination and Shaders, Parametric Curves and Surfaces, Shader Models, Image Texturing, Bump Mapping, Advanced Texturing, Character Animation, Physics-based Simulation

UNIT II GAME DESIGN PRINCIPLES 9

Character development, Story Telling, Narration, Game Balancing, Core mechanics, Principles of level design, Genres of Games, Collision Detection, Game Logic, Game AI, Path Finding

UNIT III GAMING ENGINE DESIGN 9

Renderers, Software Rendering, Hardware Rendering, and Controller based animation, Spatial Sorting, Level of detail, collision detection, standard objects, and physics

UNIT IV GAMING PLATFORMS AND FRAMEWORKS 9

Flash, DirectX, OpenGL, Java, Python, XNA with Visual Studio, Mobile Gaming for the Android, iOS, Game engines - Adventure Game Studio, DX Studio, Unity

UNIT V GAME DEVELOPMENT 9

Developing 2D and 3D interactive games using OpenGL, DirectX – Isometric and Tile Based Games, Puzzle games, Single Player games, Multi Player games.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Have knowledge on the concepts and techniques used in Game design
- Design and model interactive game.
- Design and implement algorithms and techniques applied to Game design

REFERENCES:
1. David H. Eberly, “3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics” Morgan Kaufmann, 2 Edition, 2006.
2. Jung Hyun Han, “3D Graphics for Game Programming”, Chapman and Hall/CRC,1st edition, 2011.
3. Mike Mc Shaffrfy, “Game Coding Complete”, Third Edition, Charles River Media, 2009.
4. Jonathan S. Harbour, “Beginning Game Programming”, Course Technology PTR, 3 edition, 2009.
5. Ernest Adams and Andrew Rollings, “Fundamentals of Game Design”, Prentice Hall 1st edition, 2006.
6. Roger E. Pedersen, “Game Design Foundations”, Edition 2, Jones & Bartlett Learning, 2009.
7. Scott Rogers, “Level Up!: The Guide to Great Video Game Design”, Wiley, 1st edition, 2010.

IT7010 HETEROGENEOUS COMPUTING L T P C
3 0 0 3

OBJECTIVES:
- To learn about the development of massively parallel systems
- To learn about the challenges in heterogeneous processing systems
- Learn to program heterogeneous systems
- Learn to provide effective parallel solutions for GPGPU architectures

UNIT I PARALLEL COMPUTING BASICS 9

Importance of parallelism – Processes, tasks and threads - Modifications to von-Neumann model – ILP, TLP - Parallel hardware – Flynns classification – Shared memory and distributed memory architectures - Cache Coherence - Parallel software – Performance – Speedup and scalability – Massive parallelism - GPUs - GPGPUs

UNIT II SHARED MEMORY PROGRAMMING WITH OpenMP 9

OpenMP program structure - OpenMP Clauses and directives – Scheduling primitives – Synchronization primitives – Performance issues with caches - Case study – Tree Search

UNIT III PROGRAMMING GPUS 9

GPU architectures - Data parallelism - CUDA Basics – CUDA program structure - Threads, Blocks, Grids - Memory handling

UNIT IV PROGRAMMING WITH CUDA 9

Parallel patterns – Convolution – Prefix sum – Sparse matrix-vector multiplication – Imaging case study

UNIT V OTHER GPU PROGRAMMING PLATFORMS 9

Introduction to Open CL – Open ACC – C++AMP – Thrust – Programming Heterogeneous clusters – CUDA and MPI

TOTAL: 45 PERIODS

OUTCOMES:
On Completion of the course, the students should be able to:
- Identify parallelism in an application
- Choose the right parallel processing paradigm for a given problem
- Devise solutions for an application on a heterogeneous multi-core platform
- Program using CUDA and Open MP

TEXT BOOKS:

1. Peter Pacheco, “Introduction to parallel programming”, Morgan Kauffman, 2011.
2. David B. Kirk, Wen-mei W. Hwu, “Programming massively parallel processors”, Morgan Kauffman, 2013, 2nd Edition.

REFERENCES:

1. Shane Cook, “CUDA Programming – A developers guide to parallel computing with GPUs”, Morgan Kauffman, 2013.
2. B.R. Gaster, L. Howes, D.R. Kaeli, P. Mistry, D. Schaa, “ Heterogeneous computing with OpenCL”, Morgan Kauffman, 2012.

IT7011 INTELLECTUAL PROPERTY RIGHTS L T P C
3 0 0 3

OBJECTIVES:

- To learn about the patents processing system
- To be familiar with copyrights and IPR related issues

UNIT I INTRODUCTION TO IPR 9

Basic types of property - Tangible and Intangible property - Movable Property and Immovable Property - Intellectual Property – Invention and Creativity - Innovation – Intellectual Property (IP) – Importance – Protection of IPR.

UNIT II CLASSIFICATIONS OF IPR 9

IP – Patents – Copyrights and related rights – Trade Marks and rights arising from Trademark registration – Definitions – Industrial Designs and Integrated circuits – Protection of Geographical Indications at national and International levels – Application Procedures.

UNIT III INTERNATIONAL TREATIES ON IPR 9

International convention relating to Intellectual Property – TRIPS Agreement - Madrid Agreement - Hague Agreement - Budapest Treaty; Berne convention-Patent cooperation treaty-Paris convention-Lisbon Agreement – Establishment of WIPO – Mission and Activities – History – General Agreement on Trade and Tariff (GATT).

UNIT IV INDIAN IPR LEGISLATIONS 9

Indian Position Vs WTO and Strategies – The Patent Act, 1970 – Inventions Non-Patentable – Compulsory licensing – Patents of Addition – commitments to WTO-Patent Ordinance and the Bill – Draft of a national Intellectual Property Policy – Present against unfair competition.

UNIT V IPR IN ELECTRONICS AND INFORMATION TECHNOLOGY 9

IPR in Electronics & Information Technology -Case Studies on – Patents pertaining to Electronics & Information Technology – Software patents International scenario – Patent & Copyright Protection for software& Electronic inventions - IPR in Electronics and Information Technology.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- File patents for their innovations.
- Distinguish between legal procedures for patents and copyrights.

TEXT BOOKS:

1. BARE ACT, Indian Patent Act 1970 Acts & Rules, Universal Law Publishing Co. Pvt. Ltd., 2007.
2. Stim,"Intellectual Property Copyrights, trademarks, and Patents," Cengage Learning India Private Ltd, 2004.
3. Deborah E. Bouchoux, "Intellectual Property Rights," Cengage Learning India Private Ltd, 2005.

REFERENCES :

1. Prabuddha Ganguli, "Intellectual Property Rights,", TMH, 2001.
2. A. Primer, R. Anita Rao and Bhanoji Rao, Intellectual Property Rights, Lastain Book company.
3. V. Sople Vinod, Managing Intellectual Property by (Prentice Hall of India Pvt.Ltd), 2006.
4. Lal, C.S, "Intellectual property handbook: copyright, designs, patent and trademarks", Law Publishers Allahabad, 2000.
5. P.Narayanan, "Patent Law", 3rd Edition; Eastern law house, 1998.

IT7012 INTERNET OF THINGS L T P C
3 0 0 3

OBJECTIVES:

- To learn about the fundamentals of Internet of Things
- To build a small low cost embedded system using Arduino/ Raspberry Pi or equivalent boards
- To apply the concept of Internet of Things in real world scenario

UNIT I FUNDAMENTALS OF IOT 9

Introduction-Characteristics - Physical design - Protocols-Logical design - Enabling technologies - IoT levels-Domain specific IoTs - IoT vs M2M

UNIT II IOT DESIGN METHODOLOGY 9

IoT systems management - IoT design methodology-Specifications - Integration and Application Development

UNIT III IOT COMPONENTS 9

Sensors and activators - Communication modules - Zigbee-RFID-Wi-Fi-Power sources.

UNIT IV BUILDING IOT WITH HARDWARE PLATFORMS 9

Platform - Arduino/Intel Galileo/Raspberry Pi- Physical device - Interfaces - Programming - APIs/Packages - Web services.

UNIT V CASE STUDIES AND ADVANCED TOPICS 9

Various Real time applications of IoT-Connecting IoT to cloud-Cloud storage for IoT-Data Analytics for IoT- Software & Management Tools for IoT.

TOTAL:45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Design a portable IoT using Arduino/Equivalent boards and relevant protocols
- Develop web services to access/control IoT devices
- Deploy an IoT application and connect to the cloud
- Analyze applications of IoT in real time scenario

TEXT BOOK:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things-A hands-on approach", Universities Press, 2015.

REFERENCES:

1. Manoel Carlos Ramon, “Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers”, Apress, 2014.
2. Marco Schwartz, “Internet of Things with the Arduino Yun”, Packt Publishing, 2014.

IT7013 MOBILE APPLICATION DEVELOPMENT L T P C
3 0 0 3

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.
- To learn development of mobile applications.

UNIT I INTRODUCTION 9

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

UNIT II 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.

UNIT III 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.

UNIT IV APPLICATION DEVELOPMENT 9

Intents and Services – Storing and Retrieving data – Communication via the Web – Notification and Alarms – Graphics and Multimedia – Telephony – Location based services – Packaging and Deployment – Security and Hacking.

UNIT V 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.

TOTAL:45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- To design and implement the user interfaces for mobile applications.
- To design the mobile applications that is aware of the resource constraints of mobile devices.
- To develop advanced mobile applications that accesses the databases and the web.
- To develop useful mobile applications in the current scenario using Google Android and Eclipse simulator.

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 Private Limited
2. Reto Meier, Wrox Wiley, “Professional Android 2 Application Development”, 2010.
3. Alasdair Allan, “iPhone Programming”, O‟Reilly, 2010.
4. Wei-Meng Lee, “Beginning iPhone SDK Programming with Objective-C”, Wrox Wiley, 2010.
5. Stefan Poslad, “Ubiquitous Computing: Smart Devices, Environments and interactions”, Wiley, 2009.
6. Pro iOS Table VIews: for iPhone, iPad and IPod Touch Paperback,2012, Tim Duckett, Apress
7. iOS Programming: The Big Nerd Ranch Guide Paperback, 2014, Joe COnway, Aaron Hilegass, Christian Keur.
8. iOS in Practise Paperback, 2012, Bear Cachil.
9. Mobile Authentication: Problems and Solutions (SpringerBriefs in Computer Science) Paperback, 2012, Markus Jakobsson.
10. Android App Development for Young Adults & The Rest of US Paperback, 2015, Paula Beer, Carl Simmons.
11. Oracle Mobile Application Framework Developer Guide: Build Multiplatform Enterprise Mobile Apps Paperback, 2014, Luc Bros.

IT7014 NETWORK PROGRAMMING AND MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- To learn the basics of socket programming using TCP Sockets.
- To learn about Socket Options
- To learn to develop Macros for including Objects In MIB Structure
- To have knowledge on SNMPv1and SDN concepts.

UNIT I SOCKETS AND APPLICATION DEVELOPMENT 9

Introduction to Socket Programming - System Calls - Address conversion functions - POSIX Signal Handling - Server with multiple clients - Boundary conditions - Server process Crashes, Server host Crashes, Server Crashes and reboots, Server Shutdown - I/O Multiplexing - I/O Models -TCP echo client/server with I/O Multiplexing.

UNIT II SOCKET OPTIONS 9

Socket options - getsockopt and setsockopt functions - Generic socket options - IP socket options - ICMP socket options - TCP socket options - Multiplexing TCP and UDP sockets - SCTP Sockets - SCTP Client/server - Streaming Example - Domain name system - gethostbyname, gethostbyaddr, getservbyname and getservbyport functions - Protocol Independent functions in TCP Client/Server Scenario.

UNIT III ADVANCED SOCKETS 9

IPv4 and IPv6 interoperability - Threaded servers - Thread creation and termination - TCP echo server using threads - Mutex - Condition variables - Raw sockets - Raw socket creation - Raw socket output - Raw socket input - ping program - trace route program.

UNITIV SIMPLE NETWORK MANAGEMENT 9

SNMP network management concepts - SNMPv1 - Management information - MIB Structure - Object syntax - Standard MIB's - MIB-II Groups - SNMPv1 protocol and Practical issues- Overview of RMON- Statistics and collection- Alarms and Filters.

UNIT V SOFTWARE DEFINED NETWORK 9

Routes, Paths, And Connections -Traffic Engineering and Control Of Path Selection- Separation Of Data and Control - The SDN Architecture and External Controllers - SDN Across Multiple Devices- Implementing SDN With Conventional Switches- Open Flow Technology and basics- Software Defined Radio (SDR).

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Implement Client/Server communications using TCP and UDP Sockets
- Describe the usage of Socket Options for handling various Sockets in programming
- Learn about handling Raw sockets
- Learn the functionalities of SNMP and MIB structure
- Articulate network engineering principles and implementation of SDN.

TEXT BOOKS:

1. W. Richard Stevens, "UNIX Network Programming Vol-I", Third Edition, PHI Pearson Education, 2003.
2. William Stallings, "SNMP, SNMPv2, SNMPv3 and RMON 1 and 2", Third Edition, Pearson Edition, 2009.

REFERENCES:

1. D.E. Comer, "Internetworking with TCP/IP Vol- I: Sixth Edition, Pearson Edition, 2013.
2. D.E. Comer, "Internetworking with TCP/IP Vol- III: Client-Server Programming and Application BSD Sockets Version", Second Edition, Pearson Edition, 2003.

IT7015 PATTERN RECOGNITION L T P C
3 0 0 3

OBJECTIVES:

- To know about supervised and unsupervised Learning.
- To study about feature extraction and structural pattern recognition.
- To explore different classification models.
- To learn about fuzzy pattern classifiers and perception.

UNIT I PATTERN CLASSIFIER 9

Overview of Pattern recognition – Discriminant functions – Supervised learning – Parametric estimation – Maximum Likelihood Estimation – Bayesian parameter Estimation – Problems with Bayes approach– Pattern classification by distance functions – Minimum distance pattern classifier.

UNIT II CLUSTERING 9

Clustering for unsupervised learning and classification – Clustering concept – C Means algorithm – Hierarchical clustering – Graph theoretic approach to pattern Clustering – Validity of Clusters.

UNIT III FEATURE EXTRACTION AND STRUCTURAL PATTERN RECOGNITION 9

KL Transforms – Feature selection through functional approximation – Binary selection -Elements of formal grammars - Syntactic description - Stochastic grammars - Structural representation.

UNIT IV HIDDEN MARKOV MODELS AND SUPPORT VECTOR MACHINE 9

State Machines – Hidden Markov Models – Training – Classification – Support vector Machine – Feature Selection.

UNIT V RECENT ADVANCES 9

Fuzzy logic – Fuzzy Pattern Classifiers – Pattern Classification using Genetic Algorithms – Case Study Using Fuzzy Pattern Classifiers and Perception.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Classify the data and identify the patterns.
- Extract feature set and select the features from given data set.

TEXT BOOKS:

1. M. Narasimha Murthy and V.Susheela Devi, “Pattern Recognition”, Springer 2011.
2. S.Theodoridis and K.Koutroumbas, “Pattern Recognition”, 4th Edition., Academic Press, 2009

REFERENCES:

1. Robert J.Schalkoff, “Pattern Recognition Statistical, Structural and Neural Approaches”, John Wiley & Sons Inc., New York, 1992.
2. C.M.Bishop,“Pattern Recognition and Machine Learning”, Springer, 2006.
3. R.O.Duda, P.E.Hart and D.G.Stork, “Pattern Classification”, John Wiley, 2001.
4. Andrew Webb, “Stastical Pattern Recognition”, Arnold publishers, London, 1999.

IT7016 PROGRAMMING WITH OPEN SOURCE SOFTWARE L T P C
3 0 0 3

OBJECTIVES:

- To learn about the various Linux distributions.
- To learn the programming practices in FOSS
- To explore Linux embedded device
- To acquire the knowledge of open source programming using embedded Linux device.

UNIT I INTRODUCTION TO LINUX BASED DISTRIBUTIONS 9

Philosophy - licences - Distributions - Desktop environments - Bash commands - Files and file systems - Partitions- Installing software - Configuration

UNIT II PROGRAMMING TECHNIQUES AND PRACTICES 9

Programming using python - GUI development - Menu and toolbar - Layout management - event-dialog - widget - Programming practices - Documentation - use of version control system in FOSS

UNIT III OVERVIEW OF AN EMBEDDED LINUX DEVICE 9

Peripherals - Choice of distribution and installation - commands - files and file systems - configuration - game programming

UNIT IV WEB PROGRAMMING USING EMBEDDED LINUX DEVICE 9

Web server - Linux - Apache - Mysql - Php - Content management systems - adding content - text - images - components, modules and plugin- development of a sample content management site.

UNIT V INTERFACE WITH OTHER HARDWARE 9

Basic Inputs and outputs - Scheduling commands with Cron - installing and testing GPIO with python- Expansion boards - Prototyping boards

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Work in the linux environment and contribute to free and open source software
- Implement content management systems
- Install and configure linux os distribution in embedded devices that support linux
- Build simple hardware projects using embedded linux devices

TEXT BOOK:

1. Roderick W Smith, Linux Essentials, Wiley Publications, 2012.

REFERENCES:

1. Philosophy of GNU URL: http://www.gnu.org/philosophy/
2. Overview of Linux Distributions URL: http://distrowatch.com/dwres.php?resource=major
3. Introduction to Linux – A Hands on Guide, URL: http://tldp.org/guides.html
4. Linux: Rute's User tutorial and exposition , URL: http://rute.2038bug.com/index.html.gz
5. Version control system , URL: http://git-scm.com/\
6. Stephen Burge,Joomla! 3 Explained: Your step-by-step guide, Pearson education, 2014.
7. Simon Monk, "Programming the Raspberrypi: Getting started with python", McGraw Hill, 2013

IT7017 SEMANTIC WEB L T P C
3 0 0 3

OBJECTIVES:

- To learn the fundamentals of semantic web and to conceptualize and depict Ontology for semantic web.
- To make a study of languages for semantic web.
- To learn about the ontology learning algorithms and to utilize in the development of an application.
- To know the fundamental concepts of management of ontology.

UNIT I THE QUEST FOR SEMANTICS 9

Building Models - Calculating with Knowledge - Exchanging Information - Semantic Web Technologies – Layers – Architecture - Components –Types – Ontological Commitments – Ontological Categories – Philosophical Background - Sample Knowledge Representation Ontologies –Top Level Ontologies – Linguistic Ontologies – Domain Ontologies – Semantic Web – Need – Foundation.

UNIT II LANGUAGES FOR SEMANTIC WEB AND ONTOLOGIES 9

Web Documents in XML – RDF - Schema – Web Resource Description using RDF - RDF Properties –Topic Maps and RDF – Overview – Syntax Structure – Semantics – Pragmatics - Traditional Ontology Languages – LOOM - OKBC – OCML - Flogic Ontology Markup Languages – SHOE – OIL - DAML + OIL - OWL.

UNIT III ONTOLOGY LEARNING FOR SEMANTIC WEB 9

Taxonomy for Ontology Learning – Layered Approach – Phases of Ontology Learning –Importing and Processing Ontologies and Documents – Ontology Learning Algorithms -Evaluation

UNIT IV ONTOLOGY MANAGEMENT AND TOOLS 9

Overview – Need for management – development process – target ontology – ontology mapping – Skills management system – Ontological class – Constraints – Issues. Evolution –Development of Tools and Tool Suites – Ontology Merge Tools – Ontology based Annotation Tools.

UNIT V APPLICATIONS 9

Web Services – Semantic Web Services - Case Study for specific domain – Security issues – Web Data Exchange and Syndication - Semantic Wikis - Semantic Portals - Semantic Metadata in Data Formats - Semantic Web in Life Sciences - Ontologies for Standardizations - RIF Applications.

TOTAL :45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Create Ontology for a given domain.
- Develop an application using ontology languages and tools.
- Design and develop web service applications using semantic portals.

TEXT BOOKS:

1. Asuncion Gomez-Perez, Oscar Corcho, Mariano Fernandez-Lopez “Ontological Engineering: with examples from the areas of Knowledge Management, e-Commerce and the Semantic Web” Springer, 2004.
2. Pascal Hitzler, Markus Krötzsch, Sebastian Rudolph, "Foundations of Semantic Web Technologies", Chapman & Hall/CRC, 2009.

REFERENCES:

1. Grigoris Antoniou, Frank van Harmelen, “A Semantic Web Primer (Cooperative Information Systems)”, The MIT Press, 2004.
2. Alexander Maedche, “Ontology Learning for the Semantic Web”,Springer; 1 edition, 2002.
3. John Davies, Dieter Fensel, Frank Van Harmelen, “Towards the Semantic Web: Ontology – Driven Knowledge Management”, John Wiley & Sons Ltd., 2003.
4. John Davies(Editor), Rudi Studer(Co-Editor), Paul Warren(Co-Editor)“Semantic Web Technologies: Trends and Research in Ontology-based Systems”Wiley Publications, Jul 2006.
5. Dieter Fensel (Editor), Wolfgang Wahlster, Henry Lieberman, James Hendler, “Spinning the Semantic Web: Bringing the World Wide Web to Its Full Potential”, The MIT Press, 2002.
6. Michael C. Daconta, Leo J. Obrst, Kevin T. Smith, “The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management”, Wiley, 2003.
7. Steffen Staab (Editor), Rudi Studer, “Handbook on Ontologies (International Handbooks on Information Systems)”, Springer 1st edition, 2004.
8. Dean Allemang(Author),James Hendler(Author) “Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL” (Paperback), Morgan Kaufmann, 2008.

IT7018 SERVICE ORIENTED ARCHITECTURE L T P C
3 0 0 3

OBJECTIVES:

- To learn the concepts of distributed application development
- To differentiate XML based web services from other standard models
- To study the importance of service composition

UNIT I SOA FUNDAMENTALS 9

SOA – Services – Loose Coupling – The Enterprise service bus – Service Classification – Business process management – SOA and the organization – SOA and the organization - SOA in context – Message exchange patterns – SOA life cycle – Versioning – Web services

UNIT II SERVICE-ORIENTED ANALYSIS AND DESIGN 9

SOA Terminology and Concepts - REST Design Constraints and Goals - RESTful Service-Orientation - Service Contracts with REST - Service-Orientation and REST Service-Oriented Analysis and Design with REST - Mainstream SOA Methodology - Analysis and Service Modeling with REST - Service-Oriented Design with REST HTML - Cookies - Simple PHP scripts

UNIT III SERVICE COMPOSITION 9

Service Composition with REST - Fundamental Service Composition with REST - Advanced Service Composition with REST - Service Composition with REST Case Study - Design Patterns for SOA with REST - Service Versioning with REST - Uniform Contract Profiles

UNIT IV RESTFUL SERVICES AND THE RESOURCE-ORIENTEDARCHITECTURE 9

Introducing the Simple Storage Service - Object-Oriented Design of S3 - URIs - Addressability - Statelessness - Representations - Links and Connectedness - The Uniform Interface - Resource Design - Turning Requirements into Read-Only Resources - Service Implementation - Web service case studies - Connect Resources to Each Other - Controller Code - Model Code

UNIT V SOA TRANSACTION AND SECURITY 9

SOA and performance - SOA and security – Service Management - Model driven service deployment – Establishing SOA and SOA governance

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Analyze and design SOA based solutions
- Create RESTful and SOAP based services
- Define workflow automation and develop BPM based applications

TEXT BOOKS:

1. Nicolai M.Josuttis, SOA in design - The art of distributed system design, O'REILLY publication, 2007.
2. Raj Balasubramanian, Benjamin Carlyle, Thomas Erl, Cesare Pautasso, "SOA with REST - Principles, Patterns & Constraints for building Enterprise solutions with REST", Prentice Hall/PearsonPTR , 2012.
3. Leonard Richardson and Sam Ruby, RESTful Web Services, O'REILLY publication, 2007.

REFERENCE:

1. Thomas Erl, “Service Oriented Architecture: Concepts, Technology, and Design”, Pearson education,2005.

IT7019 SOCIAL NETWORK ANALYSIS L T P C
3 0 0 3

OBJECTIVES:

- To gain knowledge about social networks, its structure and social network data sources
- To learn the analysis and mining techniques for Social networks
- To study about the semantic technologies for social network analysis
- To gain knowledge on Visualization of Social networks and its applications

UNIT I INTRODUCTION 9

Social Network Analysis: Definition and Features - The Development of Social Network Analysis - Basic graph theoretical Concepts of Social Network Analysis – ties, density, path, length, distance, betweenness, centrality, clique - Electronic sources for network analysis - Electronic discussion networks, Blogs and online communities, Web-based networks.

UNIT II SOCIAL NETWORK ANALYSIS 9

Introduction to Social networks profiles – types of commercial social network profiles (CSNP) - Quantitative and Qualitative Analysis of CSNPs – Analysis of social networks extracted from log files - Data Mining Methods Related to SNA and Log Mining - Clustering Techniques – Case study.

UNIT III SEMANTIC TECHNOLOGY FOR SOCIAL NETWORK ANALYSIS 9

Introduction to ontology-based knowledge representation - - Ontology languages for the Semantic Web – RDF and OWL - Modeling Social network data - State-of-the-art in network data representation, Ontological representation of social individuals, Ontological representation of social relationships.

UNIT IV SOCIAL NETWORK MINING 9

Detecting and discovering Communities in Social Networks - Definition of Community - Evaluating Communities - Methods for Community Detection – divisive, spectral and modularity optimization algorithms - Applications of Community Mining Algorithms - Overview of tools for Detecting Communities - Understanding and Predicting Human Behavior for Social Communities.

UNIT V VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS 9

Visualization of Social Networks - Node-Edge Diagrams - Random Layout - Force-Directed Layout - Tree Layout - Matrix Representations - Hybrid Representations - Visualizing Online Social Networks - Applications - Covert Networks – Community Welfare - Collaboration Networks - Co-Citation Networks.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- To apply knowledge for current web development in the era of Social Web
- To model and represent knowledge for Semantic Web
- To design extraction and mining tools for Social networks
- To develop personalized visualization for Social networks

TEXT BOOKS:

1. Peter Mika, “Social Networks and the Semantic Web”, Springer, 1st edition 2007.
2. BorkoFurht, “Handbook of Social Network Technologies and Applications”, Springer, 1st edition, 2010.

REFERENCES:

1. GuandongXu ,Yanchun Zhang and Lin Li, “Web Mining and Social Networking Techniques and applications”, Springer, 1st edition, 2011.
2. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, “Collaborative and Social Information Retrieval and Access: Techniques for Improved User Modelling”, IGI Global snippet, 2009.
3. John G. Breslin, Alexandre Passant and Stefan Decker, “The Social Semantic Web”, Springer, 2009.

IT7020 SOFTWARE PROJECT MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- To develop an awareness of the need for project planning and management
- To learn about the stages in the software development lifecycle and associated activities.
- To know about the procedures needed to schedule , monitor and control the project.
- Discuss and where appropriate apply the principles of project risk management.
- Understand the key concepts relating to managing projects.
- Create and schedule tasks and add project constraints and deadlines.
- Assign costs and learn about different effort estimation techniques.
- View the critical path, monitor progress and reschedule work.

UNIT I FUNDAMENTALS 9

Conventional software management - Evolution of software economics - Improving software economics - Conventional Vs Modern software project management.

UNIT II SOFTWARE MANAGEMENT PROCESS FRAMEWORK 9

Lifecycle phases - Artifacts of the process - Model based software architectures -Workflows of the process - Checkpoints of the process.

UNIT III SOFTWARE PROCESS MATURITY MODELS 9

Quality management and ISO 9000 - Process improvements - SCI/CMM models - Other process models. Iterative process planning - Organization and Responsibilities - Process automation - Process control and process instrumentation - Tailoring the process.

UNIT IV SOFTWARE EFFORT ESTIMATION 9

Issues in effort estimation - Effort Estimation techniques - Expert judgment - Estimation by Analogy - Albrecht Function Point Analysis - COCOMO Cost Estimation Model - Project planning - Scheduling - Tracking and Control - Time and Cost overruns.

UNIT V SOFTWARE RISK AND PEOPLE MANAGEMENT 9

Nature of Risk - Managing Risk - Risk Identification - Risk Analysis - Risk Reduction Techniques - Managing People and Organizing Teams.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Know about software Economics.
- Discuss about software process models: their advantages and disadvantages
- Discuss about software estimation techniques
- Know activity planning techniques
- Have project planning skills.
- Have Project scheduling and risk evaluation skills.
- Have Professional skills.

TEXT BOOKS:

1. Bob Hughes, Mike Cotterell, “Software Project Management”, Fifth edition, Tata Mc Graw Hill, 2011.
2. Walker Royce “Software Project Management A Unified Framework”, Pearson Education, 2004

REFERENCES:

1. Rishabh Anand ,"Software Project Management"' S.K. Kataria & Sons; 2013 .
2. S.A. Kelkar, "Software Project Management: A Concise Study Paperback " , Phi 2013.
3. Ramesh Gopalaswamy, “Managing Global Software Projects”, Tata McGraw Hill, 2001.
4. Humphrey Watts, “Managing the software process”, Addison Wesley, 1989.
5. Ashfaque Ahmed "Software Project Management Process Driven Approach", Auerbach Publications , 2011.

IT7021 **SOFTWARE TESTING** **L T P C**
3 0 0 3

OBJECTIVES:

- To introduce the basics and necessity of Software testing
- To provide various testing techniques along with concepts of Software bugs and its impact
- To develop and validate a test plan
- To design and choose test cases
- To prepare testing policies and standards and make use of automation tools

UNIT I OVERVIEW OF SOFTWARE TESTING 9

Software quality and reliability - Testing and Debugging - Verification and Validation - Test metrics – Test plan – Test-generation strategies - Static testing - Model based testing and Model checking - Saturation effect - Defect management - Origins of defects - Cost of defects - Defect classes - Defect repository and Test design.

UNIT II TEST CASE DESIGN AND SELECTION 9

Design strategies - Black box approach - Random testing - Boundary value analysis - State based testing - Cause-effect graphing - User documentation testing - Domain testing - White box approach - Test adequacy criteria - Code functional testing - Coverage and control flow graphs - Covering code logic – Scaffolding - Generic Vs specific scaffolding - Test Oracles - Self-checks as Oracles - Capture and replay.

UNIT III EXECUTION OF ADEQUACY TEST 9

Process: Test and analysis activities - Quality process - Planning and Monitoring - Testing - Improving the process - Organizational factors - Integration testing strategies - Testing components and assemblies - System testing - Acceptance testing - Usability - Regression testing - Regression test selection techniques - Test case prioritization.

UNIT IV TEST MANAGEMENT 9

Organization structures for testing teams - Test plan components and attachments - Locating test items - Test management tools: HP ALM/Quality center, qTest, PractiTest, TestRail and TestLink - Reporting test results - Role of three groups in test planning and policy development - Test specialist - Skills - Building a testing group.

UNIT V TEST AUTOMATION 9

Software test automation - Skills - Scope - Design and architecture for automation - Requirements for a test tool - Challenges in automation – Automated desktop application testing tools: Sikuli Script -web testing tools: Wind Mill and SOAPUI- GUI testing tools: Test Complete, Test Studio and eggplant – Android application testing tools: Robotium, Ranorex and Appium.

TOTAL : 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- An insight to Software Testing will be obtained
- Have knowledge about the role of software tester and aware of automated testing tools
- Emphasis on maintaining documentation for testing will be understood

TEXT BOOKS

1. Paul C. Jorgensen, “Software Testing: A Craftsman's Approach”, Fourth Edition, CRC Press, 2013.
2. Dorothy Graham, Mark Fewster, “Experiences of Test Automation: Case Studies of Software Test Automation”, Pearson Education, 2012.

REFERENCES:

1. Glenford J.Myers, Tom Badgett, Corey Sandler, “The Art of Software Testing”,3rd edition, John Wiley & Sons publication, 2012.
2. Srinivasan Desikan, Gopalaswamy Ramesh, “Software testing- Principles and Practices”, Pearson education, 2009.
3. Boris Beizer, “Software testing techniques”, Dream Tech Press, 2009.
4. Mauro Pezze, Michal Young, “Software Testing and Analysis Process Principles and Techniques”, Wiley India, 2008.

IT7022 VISUALIZATION TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:

- To learn about the importance of data visualization.
- To know the different types of visualization techniques.
- To create various visualizations

UNIT I INTRODUCTION 9

Introduction – Issues – Data Representation – Data Presentation – Common Mistakes in design.

UNIT II FOUNDATIONS FOR DATA VISUALIZATION 9

Visualization stages – Experimental Semiotics based on Perception Gibson‘s Affordance theory – A Model of Perceptual Processing – power of visual perception-Types of Data-visualization and data objects.

UNIT III COMPUTER VISUALIZATION 9

Non-Computer Visualization – Computer Visualization: Exploring Complex Information Spaces – Fisheye Views – Applications – Comprehensible Fisheye views – Fisheye views for 3D data – Interacting with visualization

UNIT IV MULTIDIMENSIONAL VISUALIZATION 9

One Dimension – Two Dimensions – Three Dimensions – Multiple Dimensions – Trees – Web Works – Data Mapping: Document Visualization – Workspaces.

UNIT V CASE STUDIES 9

Small interactive calendars – Selecting one from many – Web browsing through a key hole – Communication analysis – Archival analysis

TOTAL : 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Compare various visualization techniques.
- Design creative visualizations.
- Apply visualization over different types of data.

TEXT BOOKS:

1. Colin Ware, “Information Visualization Perception for Design” Margon Kaufmann Publishers, 2004, 2nd edition.
2. Robert Spence “Information visualization – Design for interaction”, Pearson Education, 2 nd Edition, 2007
3. Stephen Few, “Information Dashboard Design-The Effective Visual Communication of Data”: O'Reilly Media Publisher,1st Edition 2006

REFERENCE:

1. Stuart.K.Card, Jock.D.Mackinlay and Ben Shneiderman, “Readings in Information Visualization Using Vision to think”, Morgan Kaufmann Publishers.

IT7023 WIRELESS SENSOR AND MESH NETWORKS L T P C
3 0 0 3

OBJECTIVES:

- To learn about the issues in the design of wireless sensor and mesh networks
- To learn about the working of protocols in different layers of sensor and mesh networks
- To expose the students to different aspects in sensor and mesh networks

UNIT I FUNDAMENTALS OF WSN AND WMN 9

Introduction and overview of WSN-Basic wireless sensor technology-Operating systems for WSN-Applications of WSN-Comparison between Ad hoc and mesh networks-Challenges and design issues in wireless mesh networks-Applications of WMNs.

UNIT II TRANSMISSION LAYER AND MAC LAYER FOR WSN 9

Wireless channel and communication fundamentals-Physical layer and transceiver design considerations in WSNs- Fundamentals of MAC protocols-Performance Requirements-MAC Protocols for WSNs- Schedule based Protocols- Random access based Protocols.

UNIT III ROUTING AND TRANSPORT LAYER IN WSN 9

Data dissemination and gathering- Routing challenges and routing strategies in WSNs- Routing strategies in WSN-Transport layer and QoS in wireless sensor networks-Coverage and deployment-Reliable data transport-Single packet delivery-Block delivery-Congestion control and rate control.

UNIT IV TRANSMISSION LAYER AND MAC LAYER FOR WMN 9

Adaptive coding/modulation and link adaptation-Cooperative diversity and cooperative communications-Multichannel systems-Advanced radio technologies- Design objective and challenges-Advanced MAC protocols for WMNs.

UNIT V ROUTING AND TRANSPORT LAYER IN WMN 9

Routing in WMN-Special properties-General concepts-Routing metrics and routing protocols in WMN-TransportLayerProtocolsforWMNs-TransportProtocolsbasedonHop-by-HopControl-datagram Congestion Control Protocol (DCCP) for WMNs.

TOTAL:45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Identify different issues in wireless sensor and mesh networks
- To analyze the protocols developed for sensor and mesh networks

TEXT BOOKS:

1. KazemSohraby, Daniel Minoli, TaiebZnati, “Wireless Sensor Networks-Technology, Protocols, and Applications”, John Wiley & Sons, 2007.
2. Ian F. Akyildiz ,Xudong Wang , “Wireless Mesh Networks”, John Wiley & Sons, 2009.

REFERENCES:

1. Holger Karl, Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley & Sons, 2005.
2. Yan Zhang, JijunLuo, Honglin Hu, “Wireless Mesh Networking-Architectures, Protocols and Standards”, Auerbach Publications, 2007.
3. Robert Faludi, " Building Wireless Sensor Networks", O’Reilly Media, 2011.
4. Timothy Kolaya , " Advances in Wireless Mesh Networks " , Clanrye International, 2015.

IT7071 DIGITAL IMAGE PROCESSING L T P C
3 0 0 3

OBJECTIVES:

- To learn about the basic concepts of digital image processing and various image transforms.
- To familiarize the student with the image enhancement techniques
- To expose the student to a broad range of image processing techniques and their applications.
- To appreciate the use of current technologies those are specific to image processing systems.
- To expose the students to real-world applications of image processing.

UNIT I FUNDAMENTALS OF IMAGE PROCESSING 9

Introduction – Applications of Image Processing - Steps in image processing Applications - Digital imaging system- Sampling and Quantization - Pixel connectivity – Distance measures - Color fundamentals and models - File Formats, Image operations.

UNIT II IMAGE ENHANCEMENT AND IMAGE RESTORATION 9

Image Transforms: Fast Fourier Transform and Discrete Fourier Transform. Image Enhancement in Spatial and Frequency domain - Gray level transformations - Histogram processing - Spatial filtering - Smoothing and sharpening - Frequency domain: Filtering in frequency domain. Image Restoration - Image degradation model - Noise modeling – Blur – Order statistic filters – Image restoration algorithms.

UNIT III MULTI RESOLUTION ANALYSIS AND COMPRESSION 9

Multi Resolution analysis: Image pyramids - Multi resolution expansion - Wavelet transforms Image compression : Fundamentals - Models - Elements of information theory - Error free compression - Lossy compression - Compression standards

UNIT IV IMAGE SEGMENTATION AND FEATURE EXTRACTION 9

Image Segmentation - Detection of discontinuities - Edge operators - Edge linking and boundary Detection - Thresholding - Region based segmentation. Image Features and Extraction – Image Features – Types of Features – Feature extraction - Texture - Feature reduction algorithms – PCA – Feature Description.

UNIT V IMAGE CLASSIFICATION AND APPLICATIONS OF IMAGE PROCESSING 9

Image classifiers – Bayesian Classification, nearest neighborhood algorithms - Support Vector Machines - Image Clustering Algorithms – Hierarchical and Partitional clustering algorithms. Case Studies in Image Security - Steganography and Digital watermarking - Visual effects and Digital compositing - Case studies in Medical Imaging and remote sensing.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Implement basic image processing algorithms
- Design an application that uses different concepts of Image Processing
- Apply and develop new techniques in the areas of image enhancement- restoration-segmentation- compression-wavelet processing and image morphology.
- Critically analyze different approaches to different modules of Image Processing.

TEXT BOOKS:

1. Rafael C.Gonzalez and Richard E.Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2009.
2. S.Sridhar, “Digital Image Processing”, Oxford University Press, 2011.

REFERENCES:

1. Milan Sonka, Vaclav Hlavac and Roger Boyle, “Image Processing, Analysis and Machine Vision”, Second Edition, Thompson Learning, 2007.
2. Anil K.Jain, “Fundamentals of Digital Image Processing”, PHI, 2011.
3. Sanjit K. Mitra, & Giovanni L. Sicuranza, “Non Linear Image Processing”, Elsevier, 2007.

IT7072 TCP/IP DESIGN AND IMPLEMENTATION L T P C
3 0 0 3

OBJECTIVES:

- To learn about the design of TCP/IP Protocol structure
- To learn about the implementation of TCP and IP functionalities in the form of data structures
- To learn about how TCP handles input and output with synchronization
- To learn about the importance of timers and how it is managed in a TCP communication.
- To learn about the functionality of ICMP error processing routines.

UNIT I FUNDAMENTALS 9

Internetworking concepts - IP and datagram forwarding - TCP services - Interactive data flow - Timeout and retransmission - Bulk data flow - Persist timer – Keep-alive timer

UNIT II ARP AND IP 9

Structure of TCP/IP in OS - Data structures for ARP - Cache design and management - IP software design and organization - Sending a datagram to IP

UNIT III IP ROUTING IMPLEMENTATION 9

Routing table - Routing algorithms - Fragmentation and reassembly - Error processing (ICMP) - Multicast Processing (IGMP)

UNIT IV TCP I/O PROCESSING AND FSM 9

Data structure and input processing - Transmission control blocks - Segment format - Comparison - Finite state machine implementation - Output processing - Mutual exclusion - Computing TCP data length

UNIT V TCP TIMER AND FLOW CONTROL 9

Timers - Events and messages - Timer process - Deleting and inserting timer event - Flow control and adaptive retransmission - Congestion avoidance and control - Urgent data processing and push function

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Learn the fundamentals of internetworking
- Have knowledge on the data structures of ARP ,IP and TCP software design
- Analyze the routing of packets by routers using its table contents

TEXT BOOKS:

1. Douglas E. Comer, “Internetworking with TCP/IP Principles, Protocols and Architecture”, Vol. 1 Sixth edition, Pearson Education Asia, 2013.
2. Douglas E. Comer, “Internetworking with TCP/IP - Design, Implementation and Internals”, Vol. 2 Third edition, Pearson Education Asia, 1999.

REFERENCE:

1. W. Richard Stevens, “TCP/IP illustrated-The Protocols”, Volume 1, Pearson Education, 2012.

MA7359 ALGEBRA AND NUMBER THEORY L T P C
4 0 0 4

OBJECTIVES :

- To introduce the basic notions of groups, rings, fields which will then be used to solve related problems.
- To examine the key questions in the Theory of Numbers.
- To give an integrated approach to number theory and abstract algebra, and provide a firm basis for further reading and study in the subject.

UNIT I GROUPS AND RINGS 12

Groups: Definition - Properties - Homomorphism - Isomorphism - Cyclic groups - Cosets - Lagrange's theorem. Rings: Definition - Sub rings - Integral domain - Field - Integer modulo n - Ring homomorphism.

UNIT II FINITE FIELDS AND POLYNOMIALS 12

Polynomial rings - Irreducible polynomials over finite fields - Factorization of polynomials over finite fields.

UNIT III DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS 12

Division algorithm- Base-b representations – Number patterns – Prime and composite numbers – GCD – Euclidean algorithm – Fundamental theorem of arithmetic – LCM.

UNIT IV DIOPHANTINE EQUATIONS AND CONGRUENCES 12

Linear Diophantine equations – Congruence’s – Linear Congruence’s - Applications: Divisibility tests - Modular exponentiation - Chinese remainder theorem – 2x2 linear systems.

UNIT V CLASSICAL THEOREMS AND MULTIPLICATIVE FUNCTIONS 12

Wilson’s theorem – Fermat’s Little theorem – Euler’s theorem – Euler’s Phi functions – Tau and Sigma functions.

TOTAL: 60 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
- Demonstrate accurate and efficient use of advanced algebraic techniques.
- The students should be able to demonstrate their mastery by solving non-trivial problems related to the concepts, and by proving simple theorems about the, statements proven by the text.

TEXT BOOKS:

1. Grimaldi,R.P and Ramana, B.V., "Discrete and Combinatorial Mathematics", Pearson Education, 5th Edition, New Delhi, 2007.
2. Thomas Koshy, “Elementary Number Theory with Applications”, Elsevier Publications, New Delhi, 2002.

REFERENCES:
1. San Ling and Chaoping Xing, “Coding Theory – A first Course”, Cambridge Publications, Cambridge, 2004.
2. Niven.I, Zuckerman.H.S., and Montgomery, H.L.,“An Introduction to Theory of Numbers” , John Wiley and Sons, Singapore, 2004.
3. Lidl.R., and Pitz. G, "Applied Abstract Algebra", Springer-Verlag, New Delhi, 2nd Edition, 2006.

MA 7354 NUMERICAL METHODS L T P C
4 0 0 4

OBJECTIVES:
- To provide the mathematical foundations of numerical techniques for solving linear system, eigenvalue problems, interpolation, numerical differentiation and integration and the errors associated with them;
- To demonstrate the utility of numerical techniques of ordinary and partial differential equations in solving engineering problems where analytical solutions are not readily available.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 12

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton-Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss-Jordan methods – Iterative methods of Gauss-Jacobi and Gauss-Seidel - Matrix Inversion by Gauss-Jordan method - Eigen values of a matrix by Power method and by Jacobi’s method.

UNIT II INTERPOLATION AND APPROXIMATION 12

Interpolation with unequal intervals - Lagrange interpolation – Newton’s divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton’s forward and backward difference formulae – Least square method - Linear curve fitting.

UNIT III NUMERICAL DIFFERENTATION AND INTEGRATION 12

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson’s 1/3 and Simpson’s 3/8 rules – Romberg’s method - Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson’s rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12

Single step-methods - Taylor’s series method - Euler’s method - Modified Euler’s method - Fourth order Runge-Kutta method for solving first and second order equations - Multi-step methods - Milne’s and Adams-Bashforth predictor-corrector methods for solving first order equations.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 12

Finite difference methods for solving two-point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace’s and Poisson’s equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Grewal, B.S. and Grewal,J.S., “Numerical methods in Engineering and Science”, Khanna Publishers, New Delhi, 9th Edition, 2007.
2. Sankara Rao . K, " Numerical Methods for Scientists and Engineers" PHI Learning Pvt Ltd. New Delhi, 2007.

REFERENCES:

1. Brian Bradie, “A Friendly Introduction to Numerical Analysis”, Pearson Education Asia, New Delhi, 1st Edition, 2007.
2. Gerald, C.F. and Wheatley, P.O., “Applied Numerical Analysis”, Pearson Education Asia, New Delhi, 6th Edition, 2006.
3. Laurene V. Fausett, “Applied Numerical Analysis using MATLAB”, Pearson Education, New Delhi, 1st print, 2nd Edition, 2009.
4. S. R. K. Iyengar, R. K. Jain, Mahinder Kumar Jain, "Numerical Methods for Scientific and Engineering Computation", 6th Edition, New Age International Publishers, New Delhi, 2012.