

**RAJALAKSHMI ENGINEERING COLLEGE**  
(An Autonomous Institution Affiliated to Anna University Chennai)  
**DEPARTMENT OF INFORMATION TECHNOLOGY**

**CURRICULUM AND SYLLABUS- REGULATIONS 2017**  
**B.Tech. INFORMATION TECHNOLOGY**

**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)**

**PEO I**

To provide essential background in science, basic electronics and applied mathematics

**PEO II**

To prepare the students with fundamental knowledge in programming languages and to develop applications

**PEO III**

To develop skill in understanding the complexity in networking, security, data mining, web technology and mobile communication so as to develop innovative applications and projects in these areas for the betterment of society, as well as to enable them to pursue higher education

**PEO IV**

To enable the students as full-fledged professionals by providing opportunities to enhance their analytical and communication skills along with organizing abilities

**PEO V**

To familiarize the students with the ethical issues in engineering profession, issues related to the worldwide economy, nurturing of current job related skills and emerging technologies

**PROGRAMME OUTCOMES (POs)**

The graduates in Information Technology will:

- a. Demonstrate the knowledge of Mathematics, Science and Engineering.
- b. Able to analyze a problem and define the computing requirements.
- c. Design a system, component or process to meet desired needs within economic, environmental, social, health & safety and sustainability.
- d. Demonstrate basic knowledge in fundamentals of Information Technology and related programming technologies.
- e. Comprehend and apply software engineering methodologies in project work to solve complex problems.
- f. Understand the emerging technologies and apply the working knowledge of software and hardware tools.

- g. Have the knowledge of professional and ethical responsibilities in the corporate sectors.
- h. Be able to interact professionally with peers and clients with diverse cultures and medium of communication located in geographically disperse locations in the context of computing and software engineering.
- i. Able to communicate effectively in both verbal and written form.
- j. Groom them in continuing professional development to the requirements of corporate challenges.

**PROGRAMME SPECIFIC OUTCOMES (PSO's)**

- A. To comprehend and analyse user requirements to design IT based solutions.
- B. To Identify and assess current technologies and review their applicability to address individual and organizational needs
- C. To engage in the computing profession by working effectively and utilizing professional skills to make a positive contribution to society.
- D. Take on positions as promoters in business and embark on a research career in the field.

**CURRICULUM****SEMESTER I**

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	HS17151	Communicative English	HS	3	3	0	0	3
2.	MA17151	Engineering Mathematics I	BS	5	3	2	0	4
3.	PH17151	Engineering Physics	BS	3	3	0	0	3
4.	CY17151	Engineering Chemistry	BS	3	3	0	0	3
5.	GE17151	Problem Solving and Python Programming	ES	3	3	0	0	3
6.	GE17152	Engineering Graphics	ES	6	2	0	4	4
<b>PRACTICALS</b>								
7.	GE17161	Problem Solving and Python Programming Laboratory	ES	4	0	0	4	2
8.	GE17162	Physics and Chemistry Laboratory	BS	4	0	0	4	2
<b>TOTAL</b>				<b>31</b>	<b>17</b>	<b>2</b>	<b>12</b>	<b>24</b>

**SEMESTER II**

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	HS17251/ HS17252	Technical English/Professional English Communication	HS	3	3	0	0	3
2.	MA17251	Engineering Mathematics II	BS	5	3	2	0	4
3.	PH17254	Physics for Information Science	BS	3	3	0	0	3
4.	CS17201	Data Structures	PC	3	3	0	0	3
5.	IT17201	Information Technology Essentials	PC	3	3	0	0	3
6.	IT17202	Digital Principles and System Design	ES	3	3	0	0	3
<b>PRACTICALS</b>								
7.	GE17261	Engineering Practices Laboratory	ES	4	0	0	4	2
8.	CS17211	Data Structures Laboratory	PC	4	0	0	4	2
9.	IT17211	Digital Lab	ES	4	0	0	4	2
<b>TOTAL</b>				<b>32</b>	<b>18</b>	<b>2</b>	<b>12</b>	<b>25</b>

**SEMESTER III**

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	MA17354	Discrete Mathematics	BS	5	3	2	0	4
2.	CS17302	Object Oriented Programming	PC	3	3	0	0	3
3.	CS17304	Database Management Systems	PC	3	3	0	0	3
4.	IT17301	Computer Organization	PC	3	3	0	0	3
5.	EC17351	Microprocessors and Microcontrollers	ES	3	3	0	0	3
<b>PRACTICALS</b>								
6.	CS17311	Object Oriented Programming Laboratory	PC	4	0	0	4	2
7.	CS17312	Database Management Systems Laboratory	PC	4	0	0	4	2
8.	EC17361	Microprocessors and Microcontrollers Laboratory	ES	4	0	0	4	2
9.	HS17361	Interpersonal Skills - Listening and Speaking	EEC	2	0	0	2	1
<b>TOTAL</b>				<b>31</b>	<b>15</b>	<b>2</b>	<b>14</b>	<b>23</b>

**SEMESTER IV**

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	MA17353	Probability and Statistics	BS	5	3	2	0	4
2.	CS17401	Operating Systems	PC	3	3	0	0	3
3.	CS17402	Software Engineering	PC	3	3	0	0	3
4.	EC17451	Analog and Digital Communication	ES	3	3	0	0	3
5.	CS17301	Design and Analysis of Algorithms	PC	3	3	0	0	3
6.	CY17251	Environmental Science and Engineering	HS	3	3	0	0	3
<b>PRACTICALS</b>								
7.	CS17411	Operating Systems Laboratory	PC	4	0	0	4	2
8.	IT17411	Information Systems Analysis and Design Laboratory	PC	4	0	0	4	2
9.	HS17461	Advanced Reading and Writing Skills	EEC	2	0	0	2	1
<b>TOTAL</b>				<b>30</b>	<b>18</b>	<b>2</b>	<b>10</b>	<b>24</b>

**SEMESTER V**

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	IT17501	Automata Theory and Compiler Design	PC	5	3	2	0	4
2.	CS17403	Computer Networks	PC	3	3	0	0	3
3.	CS17501	Distributed Systems	PC	3	3	0	0	3
4.	IT17502	Web Technology	PC	3	3	0	0	3
5.	IT17503	Embedded Programming	PC	3	3	0	0	3
6.		Open Elective I	OE	3	3	0	0	3
<b>PRACTICALS</b>								
7.	CS17412	Computer Networks Laboratory	PC	4	0	0	4	2
8.	IT17511	Web Technology Laboratory	PC	4	0	0	4	2
9.	IT17512	Embedded Programming Laboratory	PC	4	0	0	4	2
<b>TOTAL</b>				<b>32</b>	<b>18</b>	<b>2</b>	<b>12</b>	<b>25</b>

**SEMESTER VI**

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	IT17601	Computational Intelligence	PC	4	4	0	0	4
2.	CS17504	Cryptography and Network Security	PC	3	3	0	0	3
3.	IT17602	Mobile Communication	PC	3	3	0	0	3
4.	IT17603/ CS17E62	Agile Methodologies	PC	3	3	0	0	3
5.	CS17601	Game Programming	PC	3	3	0	0	3
6.		Professional Elective I	PE	3	3	0	0	3
<b>PRACTICALS</b>								
1.	CS17511	Cryptography and Network Security Laboratory	PC	4	0	0	4	2
2.	IT17611	Mobile Application Development Laboratory	PC	4	0	0	4	2
3.	IT17612	Mini Project	EEC	4	0	0	4	2
<b>TOTAL</b>				<b>31</b>	<b>19</b>	<b>0</b>	<b>12</b>	<b>25</b>

**SEMESTER VII**

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	CS17702	Cloud Computing	PC	3	3	0	0	3
2.	IT17701	Data Analytics	PC	3	3	0	0	3
3.		Open Elective II	OE	3	3	0	0	3
4.		Professional Elective II	PE	3	3	0	0	3
5.		Professional Elective III	PE	3	3	0	0	3
<b>PRACTICALS</b>								
6.	IT17711	Data Analytics Lab	PC	4	0	0	4	2
7.	CS17711	Cloud computing Laboratory	PC	4	0	0	4	2
<b>TOTAL</b>				<b>23</b>	<b>15</b>	<b>0</b>	<b>8</b>	<b>19</b>

**SEMESTER VIII**

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.		Professional Elective IV	PE	3	3	0	0	3
2.		Professional Elective V	PE	3	3	0	0	3
<b>PRACTICALS</b>								
3.	IT17811	Project Work	EEC	20	0	0	20	10
<b>TOTAL</b>				<b>26</b>	<b>6</b>	<b>0</b>	<b>20</b>	<b>16</b>

**TOTAL NO. OF CREDITS: 181**

**LANGUAGE ELECTIVES (HS)  
SEMESTER II**

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	HS17251	Technical English	HS	3	3	0	0	3
2.	HS17252	Professional English Communication	HS	3	3	0	0	3

**PROFESSIONAL ELECTIVES (PE)  
SEMESTER VI  
ELECTIVE – I**

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	IT17E61	Graph Theory and Applications	PE	3	3	0	0	3
2.	IT17E62	Data Warehousing & Data Mining	PE	3	3	0	0	3
3.	IT17E63	Advanced Java Programming	PE	3	3	0	0	3
4.	CS17E63	C# and .Net Programming	PE	3	3	0	0	3
5.	IT17E64	Multimedia Systems	PE	3	3	0	0	3

**SEMESTER VII  
ELECTIVE - II**

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	CS17E83	Cyber Forensics	PE	3	3	0	0	3
2.	IT17E71	Wireless Sensor Networks	PE	3	3	0	0	3
3.	IT17E72	Virtual Reality	PE	3	3	0	0	3
4.	IT17E73	Information Retrieval Techniques	PE	3	3	0	0	3
5.	IT17E76	Comprehension	PE	3	3	0	0	3

**SEMESTER VII  
ELECTIVE - III**

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	IT17E74	Design Thinking	PE	3	3	0	0	3
2.	GE17E51	Human values and Professional Ethics	PE	3	3	0	0	3
3.	IT17E75	Software Project Management	PE	3	3	0	0	3
4.	GE17451	Total Quality Management	PE	3	3	0	0	3

**SEMESTER VIII****ELECTIVE - IV**

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	IT17E81	Service Oriented Architecture	PE	3	3	0	0	3
2.	CS17E75	Human Computer Interaction	PE	3	3	0	0	3
3.	IT17E82	Internet of Things	PE	3	3	0	0	3
4.	IT17E83	Social Network Analysis	PE	3	3	0	0	3

**SEMESTER VIII****ELECTIVE - V**

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MG17E81	Lean Startup Management	PE	3	3	0	0	3
2.	IT17E84	Software Testing and Quality Assurance	PE	3	3	0	0	3
3.	CS17E72	Foundation Skills in Integrated Product Development	PE	3	3	0	0	3
4.	OGE1702	Intellectual Property Rights	PE	3	3	0	0	3

**\*Professional Electives are grouped according to elective number as was done previously.**

**EMPLOYABILITY ENHANCEMENT COURSES (EEC)**

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	HS17361	Interpersonal Skills-Listening and Speaking	EEC	2	0	0	2	1
2.	HS17461	Advanced Reading and Writing	EEC	2	0	0	2	1
3.	IT17612	Mini Project	EEC	4	0	0	4	2
4.	IT17811	Project Work	EEC	20	0	0	20	10



**OPEN ELECTIVES Offered by IT**

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	OIT1701	Data Science	OE	3	3	0	0	3
2.	OIT1702	Advanced Python Programming	OE	3	3	0	0	3
3.	OIT1703	Business Intelligence	OE	3	3	0	0	3
4.	OIT1704	Computer Vision	OE	3	3	0	0	3
5.	OIT1705	Cyber Security	OE	3	3	0	0	3
6.	OIT1706	Machine Learning and R Programming	OE	3	3	0	0	3

**LIST OF OPEN ELECTIVES FOR IT STUDENTS**

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	OBM1703	Fundamentals of Medical Instrumentation	OE	3	3	0	0	3
2.	OBT1701	Basic Bioinformatics	OE	3	3	0	0	3
3.	OBT1703	Food and Nutrition	OE	3	3	0	0	3
4.	OBT1704	Medical Sciences for Engineers	OE	3	3	0	0	3
5.	OCS1701	Web Design and Management	OE	3	3	0	0	3
6.	OCE1701	Disaster Management	OE	3	3	0	0	3
7.	OCE1706	Global Warming and Climate Change	OE	3	3	0	0	3
8.	OEC1701	MEMS and its applications	OE	3	3	0	0	3
9.	OEC1702	Consumer Electronics	OE	3	3	0	0	3
10.	OEC1703	Digital Image Processing and its applications	OE	3	3	0	0	3
11.	OEE 1701	Renewable Power Generation Systems	OE	3	3	0	0	3

12.	OEE1702	Electrical Safety and Quality Assurance	OE	3	3	0	0	3
13.	OMT17095	Mobile Robotics	OE	3	3	0	0	3
14.	OME1705	Supply chain and Logistics Management	OE	3	3	0	0	3
15.	OGE1701	Human Rights	OE	3	3	0	0	3
16.	OGE1702	Foreign Language-Japanese	OE	3	3	0	0	3
17.	OGE1703	Foreign Language-German	OE	3	3	0	0	3
18.	OGE1704	Foreign Language-French	OE	3	3	0	0	3

**DISTRIBUTION OF CREDITS**

Sl.No.	SUBJECT AREA	CREDITS AS PER SEMESTER								CREDIT TOTAL
		I	II	III	IV	V	VI	VII	VIII	
1	HS	3	3		3					9
2	BS	12	7	4	4					27
3	ES	9	7	5	3					24
4	PC		8	13	13	22	20	10		86
5	PE						3	6	6	15
6	OE					3		3		6
7	EEC			1	1		2		10	14
	TOTAL	24	25	23	24	25	25	19	16	181
	Non Credit/ Mandatory	0	0	0	0	0	0	0	0	0

HS – Humanities and Science

PC – Professional Core

PE – Professional Elective

EEC – Employability Enhancement Courses

BS – Basic Science

ES – Engineering Science

OE – Open Elective

**SYLLABUS****SEMESTER I****HS17151****COMMUNICATIVE ENGLISH****L T P C****Common to all branches of B.E. / B.Tech.programmes 3 0 0 3****OBJECTIVES:**

- To develop the basic reading and writing skills of first year engineering and technology students.
- To help learners develop their listening skills, which will enable them listen to lectures and comprehend them by asking questions; seeking clarifications.
- To help learners develop their speaking skills and speak fluently in real contexts.
- To help learners develop vocabulary of a general kind by developing their reading skills

**UNIT I SHARING INFORMATION RELATED TO ONESELF/FAMILY& FRIENDS 9**

Reading- short comprehension passages, practice in skimming-scanning and predicting. Writing-completing sentences- developing hints. Listening- short texts- short formal and informal conversations. Speaking- introducing oneself - exchanging personal information- Language development- WhQuestions- asking and answering yes or no questions.Subject-Verb agreement – regular and irregular verbs. Vocabulary development- prefixes- suffixes- articles.

**UNIT II GENERAL READING AND FREE WRITING 9**

Reading - comprehension-pre-reading-post reading- comprehension questions (multiple choice questions and /or short questions/ open-ended questions)-inductive reading- short narratives and descriptions from newspapers including dialogues and conversations (also used as short Listening texts)- register. Writing – paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures. Listening- telephonic conversations. Speaking – sharing information of a personal kind—greeting – taking leave. Language development – prepositions, conjunctions. Vocabulary development- guessing meanings of words in context.

**UNIT III GRAMMAR AND LANGUAGE DEVELOPMENT 9**

Reading- short texts and longer passages (close reading).Writing- understanding text structure- use of reference words and discourse markers-coherence-jumbled sentences. Listening – listening to longer texts and filling up the table- product description- narratives from different sources. Speaking- asking about routine actions and expressing opinions. Language development- degrees of comparison-pronouns- direct vs indirect questions. Vocabulary development – single word substitutes- adverbs.

**UNIT IV READING AND LANGUAGE DEVELOPMENT 9**

Reading- comprehension-reading longer texts- reading different types of texts- magazines. Writing- letter writing, informal or personal letters-emails-conventions of personal email. Listening- listening to dialogues or conversations and completing exercises based on them. Speaking- speaking about oneself- speaking about one's friend. Language development- Tenses- simple present-simple past-present continuous and past continuous. Vocabulary development- synonyms-antonyms- phrasal verbs.

**UNITV EXTENDED WRITING 9**

Reading- longer texts- close reading. Writing- brainstorming -writing short essays – developing an outline- identifying main and subordinate ideas- dialogue writing. Listening – listening to talks-conversations. Speaking – participating in conversations- short group conversations. Language development-modal verbs- present/ past perfect tense. Vocabulary development-functional uses of tenses.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**At the end of the course, learners will be able to:**

1. Read articles of a general kind in magazines and newspapers.
2. Participate effectively in informal conversations; introduce themselves and their friends and express opinions.
3. Comprehend conversations and short talks delivered in English
4. Express ideas about oneself freely
5. Write short essays of a general kind and personal letters and emails in English.

**TEXT BOOKS:**

1. Board of Editors. Using English A Coursebook for Undergraduate Engineers and Technologists. Orient BlackSwan Limited, Hyderabad: 2015.
2. Richards, C. Jack. Interchange Students' Book-2 New Delhi: CUP, 2015.

**REFERENCES:**

1. Bailey, Stephen. Academic Writing: A practical guide for students. New York: Rutledge, 2011.
2. Means, L. Thomas and Elaine Langlois. English & Communication For Colleges. Cengage Learning, USA: 2007
3. Redston, Chris & Gillies Cunningham Face2Face (Pre-intermediate Student's Book & Workbook) Cambridge University Press, New Delhi: 2005
4. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, Cambridge: Reprint 2011
5. Dutt P. Kiranmai and Rajeevan Geeta. Basic Communication Skills, Foundation Books: 2013

**MA17151**

**ENGINEERING MATHEMATICS I**  
**Common to all branches of B.E. / B.Tech programmes**

**LT P C**  
**3 2 0 4**

**OBJECTIVES:**

- To learn the basics and concepts of traditional calculus.
- To provide the basic tools of calculus mainly for the purpose of modelling the engineering problems mathematically and obtaining solutions.
- To understand the concepts of single variable and multivariable calculus that plays an important role in the field of science, engineering & technology.

**UNIT I      MATRICES****15**

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      DIFFERENTIAL CALCULUS****15**

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.

**UNIT III      FUNCTIONS OF SEVERAL VARIABLES****15**

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

**UNIT IV INTEGRAL CALCULUS 15**

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

**UNIT V MULTIPLE INTEGRALS 15**

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.

**TOTAL : 75 PERIODS****OUTCOMES :****On completion of the course students will be able to:**

1. Apply the concept of Eigenvalues and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices for solving problems
2. Use the techniques of differentiation to differentiate functions and to apply the concept of differentiation to solve maxima and minima problems.
3. To apply the concept of Partial differentiation for functions two or more variables and use different techniques for solving problems.
4. Solve problems involving integration using different methods such as substitution, partial fractions, by parts .
5. Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.

**TEXT BOOKS :**

1. Grewal B.S., —Higher Engineering Mathematics|, Khanna Publishers, New Delhi, 43<sup>rd</sup> Edition, 2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7<sup>th</sup> Edition, New Delhi, 2015.

**REFERENCES :**

1. Anton, H, Bivens, I and Davis, S, "Calculus", Wiley, 10<sup>th</sup> Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., —Advanced Engineering Mathematics|, Narosa Publications, New Delhi, 3<sup>rd</sup> Edition, 2007.
3. Narayanan, S. and Manicavachagom Pillai, T. K., —Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
4. Srimantha Pal and Bhunia, S.C, "Engineering Mathematics" Oxford University Press, 2015.
5. Weir, M.D and Joel Hass, "Thomas Calculus", 12<sup>th</sup> Edition, Pearson India, 2016.
6. T. Veerarajan, Engineering Mathematics I & II, McGraw Hill Education, 3<sup>rd</sup> Edition, 2012.

**PH 17151 ENGINEERING PHYSICS L T P C**  
**Common to all branches of B.E. / B.Tech.programmes 3 0 0 3**

**OBJECTIVE:**

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

**UNIT I PROPERTIES OF MATTER 9**

Elasticity – Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment -

bending of beams –area moment of inertia - bending moment – cantilever - applications – uniform and non-uniform bending- I-shaped girders - stress due to bending in beams.

## **UNIT II WAVES AND OPTICS 9**

Oscillatory motion – forced and damped oscillations: differential equation and its solution – plane progressive waves – wave equation. Lasers: population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) –CO<sub>2</sub> laser - Semiconductor lasers: homojunction and heterojunction – Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibers (material, refractive index, mode) – losses associated with optical fibers - fiber optic sensors: pressure and displacement.

## **UNIT III THERMAL PHYSICS 9**

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conduction, convection and radiation –rectilinear heat flow – thermal conductivity - Forbe's and Lee's disc method: theory and experiment - conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters.

## **UNIT IV QUANTUM PHYSICS 9**

Black body radiation – Planck's theory (derivation) – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box – tunneling (qualitative) – electron microscope – scanningtunneling microscope.

## **UNIT V CRYSTAL PHYSICS 9**

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances -reciprocal lattice - coordination number and packing factor for SC, BCC, FCC, and HCP –Polymorphism and allotropy: diamond and graphite structures - crystal imperfections: point defects, line defects – Burger vectors, stacking faults – role of imperfections in plastic deformation - growth of single crystals: solution and melt growth techniques.

**TOTAL: 45 PERIODS**

### **OUTCOMES:**

#### **On completion of the course students will be able to**

1. Apply the knowledge of basic properties of matter and its applications in Engineering and Technology.
2. Use the concepts of waves and optical devices and their applications in fiber optics.
3. Use the concepts of thermal properties of materials and their applications in heat exchangers.
4. Use the advanced physics concepts of quantum theory and its applications in electron microscope and material sciences.
5. Apply the basic knowledge of crystallography in materials preparation and device fabrication.

### **TEXT BOOKS:**

1. Bhattacharya, D.K. &Poonam, T. —Engineering Physics|. Oxford University Press, 2015.
2. Gaur, R.K. & Gupta, S.L. —Engineering Physics|. DhanpatRai Publishers, 2012.
3. Pandey, B.K. &Chaturvedi, S. —Engineering Physics|. Cengage Learning India, 2012.

### **REFERENCES:**

1. Halliday, D., Resnick, R. & Walker, J. —Principles of Physics|. Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. —Physics for Scientists and Engineers|. Cengage Learning, 2010.
3. Tipler, P.A. &Mosca, G. —Physics for Scientists and Engineers with Modern Physics', W.H.Freeman, 2007.

4. Arthur Besier and S. RaiChoudhury, Concepts of Modern Physics (SIE), 7th edition, McGraw-Hill Education, 1994.
5. R. Murugesan and KiruthigaSivaprasath, Modern Physics, S.Chand, 2015.

**CY17151****ENGINEERING CHEMISTRY****L T P C****3 0 0 3****OBJECTIVES:**

- To acquire knowledge on characteristics of boiler feed water and water treatment techniques.
- To develop an understanding on surface chemistry and its applications
- To develop an understanding of the basic concepts of phase rule and its applications towards alloying
- To acquire knowledge on different types of fuels and its characteristics.
- To obtain knowledge on batteries and fuel cell.

**UNIT I WATER AND ITS TREATMENT****9**

Hardness of water – types – expression of hardness – units– boiler troubles (scale and sludge) – treatment of boiler feed water – Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) - External treatment – ion exchange process, zeolite process – potable water treatment – break point chlorination - desalination of brackish water - Reverse Osmosis – UASB process (Upflow Anaerobic Sludge Blanket).

**UNIT II SURFACE CHEMISTRY AND CATALYSIS****9**

Adsorption - types of adsorption – adsorption of gases on solids – adsorption of solute from solutions – adsorption isotherms – Freundlich’s adsorption isotherm – Langmuir’s adsorption isotherm – contact theory – Preparation and applications of activated carbon (up flow and down flow process) - applications of adsorption on pollution abatement. Catalysis – types of catalysis – criteria – autocatalysis – catalytic poisoning and catalytic promoters - acid base catalysis – applications (catalytic convertor) – enzyme catalysis– Michaelis – Menten equation.

**UNIT III PHASE RULE, ALLOYS AND COMPOSITES****9**

Phase rule - introduction, definition of terms with examples, one component system -water system - reduced phase rule - thermal analysis and cooling curves - two component systems - lead-silver system - Pattinson process. Alloys - definition- properties of alloys- significance of alloying- functions and effect of alloying elements- nichrome and stainless steel (18/8) – heat treatment of steel. Composites- polymer matrix composites -metal matrix composites-ceramic matrix composites.

**UNIT IV FUELS AND COMBUSTION****9**

Fuels - classification of fuels - coal - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum - manufacture of synthetic petrol (Bergius process) - knocking - octane number - diesel oil - cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gas (LPG) - power alcohol and biodiesel. Combustion of fuels - introduction - calorific value - higher and lower calorific values- theoretical calculation of calorific value - ignition temperature - spontaneous ignition temperature - explosive range.

**UNIT V ENERGY SOURCES AND STORAGE DEVICES****9**

Batteries - components – Characteristics – voltage , current , capacity, electrical storage density, energy density, discharge rate – types of batteries – primary battery (dry cell)- secondary battery (lead acid battery, Ni- Cdbattery,lithium-ion-battery) .Fuel cells – H<sub>2</sub>-O<sub>2</sub>fuel cell, methanol oxygen fuel cell, Proton exchange membrane fuel cell – SOFC and Biofuel cells.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**On completion of the course students will be able to**

1. Get familiarized on water treatment techniques.
2. Apply adsorption phenomena on various fields.
3. Analyse alloying composition based on phase rule concept.
4. Apply the role of fuels in day today applications.
5. Design batteries and fuel cells.

**TEXT BOOKS:**

1. P. C. Jain and Monika Jain, —Engineering Chemistry I 17<sup>th</sup> edition, Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015
2. S. Vairam, P. Kalyani and Suba Ramesh, —Engineering Chemistry I, Wiley India PVT, LTD, New Delhi, 2013

**REFERENCES:**

1. Friedrich Emich, —Engineering Chemistry I, Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, —Engineering Chemistry I, Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, —Engineering Chemistry-Fundamentals and Applications I, Cambridge University Press, Delhi, 2015.
4. S. S. Dara and S. S. Umare, —A Textbook of Engineering Chemistry I, 12<sup>th</sup> edition, S. Chand & Company LTD, New Delhi, 2015.

**GE17151      PROBLEM SOLVING AND PYTHON PROGRAMMING      L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- To develop an understanding of algorithmic problem solving
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures — lists, tuples, dictionaries.
- To do input/output with files in Python.

**UNIT I      ALGORITHMIC PROBLEM SOLVING      9**

Introduction to computers - characteristics - basic organization of a computer – algorithms - building blocks of algorithms (instructions/statements, state, control flow, functions) - notation (pseudo code, flow chart, programming language) - algorithmic problem solving - simple strategies for developing algorithms (iteration, recursion).

**UNIT II      DATA, EXPRESSIONS, STATEMENTS AND CONTROL FLOW      9**

Python interpreter and interactive mode - values and types - data types – variables – keywords - expressions and statements - python I/O - operators - precedence of operators – comments. Conditionals: conditional (if) - alternative (if-else) - chained conditional (if-elif-else) – nested conditional. Iteration: while – for - break – continue – pass. Illustrative programs: exchange the values of two variables - circulate the values of n variables - test for leap year.

**UNIT III      FUNCTIONS      9**

Function calls – type conversion – math function – composition - definition and use - flow of execution - parameters and arguments. Fruitful functions: return values – parameters - scope: local and global - recursion. Strings: string slices – immutability - string functions and methods - string comparison. Illustrative programs: square root – GCD – exponentiation - sum the array of numbers - linear search - binary search.



**UNIT IV COMPOUND DATA: LISTS, TUPLES AND DICTIONARIES 9**

Lists - list operations - list slices - list methods - list loop – mutability – aliasing - cloning lists - list parameters. Tuples – immutable - tuple assignment - tuple as return value. Dictionaries: operations and methods – dictionaries and tuples – dictionaries and lists. Advanced list processing - list comprehension. Illustrative programs: Sorting.

**UNIT V FILES, MODULES AND PACKAGES 9**

Files and exception: file operation - text files - reading and writing files - format operator- command line arguments - errors and exceptions - handling exceptions – writing modules – packages. Illustrative programs: word count - copy file – case studies.

**TOTAL: 45 PERIODS****OUTCOMES**

Upon completion of the course, students will be able to

1. Develop algorithmic solutions to simple computational problems.
2. Structure simple Python programs for solving problems.
3. Decompose a Python program into functions.
4. Represent compound data using Python lists, tuples and dictionaries.
5. Read and write data from/to files in Python programs.

**TEXT BOOK:**

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist‘‘, 2<sup>nd</sup> edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016 (<http://greenteapress.com/wp/think-python/>)

**REFERENCES:**

1. Anita Goel, Ajay Mittal, –Computer Fundamentals and programming in C, Pearson India Publisher, First edition, 2013.
2. John V Guttag, —Introduction to Computation and Programming Using Python‘‘, Revised and expanded Edition, MIT Press , 2013
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, –Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
4. Timothy A. Budd, —Exploring Python, Mc-Graw Hill Education (India) Private Ltd. 2015.
5. Kenneth A. Lambert, —Fundamentals of Python: First Programs, CENGAGE Learning, 2012.
6. Charles Dierbach, —Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
7. The Python Tutorial, <https://docs.python.org/2.7/tutorial/>

**GE17152****ENGINEERING GRAPHICS****L T P C****2 0 4 4****OBJECTIVES:**

- To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products.
- To expose them to existing national standards related to technical drawings.
- To study different type of projections, and practice him on free hand sketching.

**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 FREEHAND SKETCHING 7+12**

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- Construction of helical curve. Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects

**UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE 6+12**

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 traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

**UNIT III PROJECTION OF SOLIDS 5+12**

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

**UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES**

**5+12**

Sectioning of above 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 6 + 12**

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

**TOTAL: 90 PERIODS**

**OUTCOMES:**

**On Completion of the course, the student will be able to**

1. Perform freehand sketching of basic geometrical constructions and multiple views of objects.
2. Do the conic curves and special curves.
3. Do orthographic projection of lines and plane surfaces.
4. Draw projections, solids, and development of surfaces.
5. Prepare isometric and perspective sections of simple solids.

**TEXT BOOK:**

1. Bhatt N.D. and Panchal V.M., —Engineering Drawingl, Charotar Publishing House, 50th Edition, 2010.
2. Natrajan K.V., —A text book of Engineering Graphicsl, Dhanalakshmi Publishers, Chennai, 2009.

**REFERENCES:**

1. BasantAgarwal and Agarwal C.M., —Engineering Drawingl, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
2. Gopalakrishna K.R., —Engineering Drawingl (Vol.I&II combined), Subhas Stores, Bangalore, 2007.
3. Luzzader, Warren.J. and Duff,John M., —Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
4. Venugopal K. and Prabhu Raja V., —Engineering Graphicsl, New Age International (P) Limited, 2008.
5. Shah M.B., and Rana B.C., —Engineering Drawingl, Pearson, 2nd Edition, 2009.

**Publication of Bureau of Indian Standards:**

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing 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 end semester 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

**GE17161 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY****L T P C****0 0 4 2****OBJECTIVES:**

- Be familiar with the use of office package, exposed to presentation and visualization tools.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples and dictionaries.
- Read and write data from/to files in Python.

**LIST OF PROGRAMS**

1. Search, generate, manipulate data using Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem Solving using Algorithms and Flowcharts
4. Compute the GCD of two numbers.
5. Find the square root of a number (Newton's method)
6. Exponentiation (power of a number)
7. Linear search and Binary search
8. First n prime numbers
9. Find the maximum of a list of numbers
10. Sorting
11. Removing all the duplicate elements in a list
12. Multiply matrices
13. Programs that take command line arguments (word count)
14. Find the most frequent words in a text read from a file
15. Mini Project

**TOTAL: 60 PERIODS****PLATFORM NEEDED**

Python 3 interpreter for Windows/Linux

**OUTCOMES:**

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

1. Develop documentation, presentation and visualization charts.
2. Implement Python programs with conditionals and loops.
3. Develop Python programs step-wise by defining functions and calling them.
4. Use Python lists, tuples and dictionaries for representing compound data.
5. Read and write data from/to files in Python

**GE17162 PHYSICS AND CHEMISTRY LABORATORY**

**L T P C**  
**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.

**LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)**

1. Determination of rigidity modulus – Torsion pendulum
2. Determination of Young's modulus by non-uniform bending method
3. (a) Determination of wavelength, and particle size using Laser  
(b) Determination of acceptance angle in an optical fiber.
4. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
5. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
6. Determination of wavelength of mercury spectrum – spectrometer grating
7. Determination of thickness of a thin wire – Air wedge method

**TOTAL: 30 PERIODS**

**OUTCOMES:**

**On completion of the course, students will be able to**

- Apply the principle of elasticity viz Young's modulus & rigidity modulus of Engineering materials.
- Apply the principle elasticity in determining compressibility of liquids using ultrasonic waves
- Apply the principle of optics in fiber optical communication.
- Apply thermal properties of various insulating materials in engineering applications.
- Use the basic instruments like vernier caliber, micrometer and microscope for various basic measurements.

**CHEMISTRY LABORATORY: (Any seven experiments to be conducted)****OBJECTIVES:**

- To acquire practical skills in the determination of water quality parameters.
- To gain the knowledge about spectrophotometer and flame photometer.
- To acquire knowledge on the determination of corrosion rate.

**LIST OF EXPERIMENTS: CHEMISTRY LABORATORY (Any 7 Experiments)**

1. Estimation of HCl using  $\text{Na}_2\text{CO}_3$  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. Determination of strength of given hydrochloric acid using pH meter.
6. Estimation of iron content of the given solution using potentiometer.

7. Conductometric titration of strong acid vs strong base.
8. Determination of strength of acids in a mixture of acids using conductivity meter.
9. Estimation of copper content of the given solution by Iodometry.
10. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline / thiocyanate method).
11. Estimation of sodium and potassium present in water using flame photometer.
12. Corrosion experiment-weight loss method.

**TOTAL: 30 PERIODS**

### OUTCOMES:

On completion of the course, students will be able to

1. Apply the quantitative chemical analysis of water quality related parameters.
2. Analyse characteristics of water.
3. Measure the corrosion rate in metals.
4. Apply instrumentation skills in analysing metallic elements in water.
5. Analyse quantitatively the strength of acids and bases in water.

### TEXTBOOK:

1. Vogel's Textbook of Quantitative Chemical Analysis (8<sup>TH</sup> edition, 2014)

## SEMESTER II

<b>HS17251</b>	<b>TECHNICAL ENGLISH</b>	<b>L T P C</b>
	<b>Common to all branches of B.E. /B. Tech. Programmes</b>	<b>3 0 0 3</b>

### OBJECTIVES:

**The student should be able to:**

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations, participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialization.

### UNIT I            INTRODUCTION TECHNICAL ENGLISH            9

Listening- listening to talks mostly of a scientific/technical nature and completing information-gap exercises. Speaking –asking for and giving directions. Reading – reading short technical texts from journals- newspapers. Writing- purpose statements – extended definitions – issue- writing instructions – checklists-recommendations. Vocabulary Development- technical vocabulary. Language Development –subject verb agreement - compound words.

### UNIT II            READING AND STUDY SKILLS            9

Listening- listening to longer technical talks and completing exercises based on them. Speaking – describing a process. Reading – reading longer technical texts- identifying the various transitions in a text- paragraphing. Writing- interpreting charts, graphs. Vocabulary Development-vocabulary used in formal letters/emails and reports. Language Development- impersonal passive voice, numerical adjectives.

### UNIT III            TECHNICAL WRITING AND GRAMMAR            9

Listening- listening to classroom lectures/ talks on engineering/technology. Speaking – introduction to technical presentations. Reading – longer texts both general and technical, practice in speed reading. Writing-Describing aprocess, use of sequence words. Vocabulary Development- sequence words. Misspelled words. Language Development- embedded sentences

**UNIT IV REPORT WRITING****9**

Listening- listening to documentaries and making notes. Speaking – mechanics of presentations. Reading – reading for detailed comprehension. Writing- email etiquette- job application – cover letter. Résumé preparation( via email and hard copy)- analytical essays and issue based essays. Vocabulary Development- finding suitable synonyms-paraphrasing. Language Development- clauses- if conditionals.

**UNIT V GROUP DISCUSSION AND JOB APPLICATIONS****9**

Listening- TED talks; Speaking –participating in a group discussion. Reading– reading and understanding technical articles. Writing– writing reports- minutes of a meeting- accident and survey. Vocabulary Development- verbal analogies, foreign words and phrases Language Development- reported speech, common errors in English.

**TOTAL: 45 PERIODS****OUTCOMES:****At the end of the course, the students will be able to:**

- Read technical texts and write area- specific texts effortlessly.
- Listen and comprehend lectures and talks in their area of specialisation successfully.
- Speak appropriately and effectively in varied formal and informal contexts.
- Write reports and winning job applications.
- Write error free language.

**TEXT BOOKS:**

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

**REFERENCES:**

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

Students can be asked to read Tagore and Chetan Bhagat for supplementary reading.

**HS17252 PROFESSIONAL ENGLISH COMMUNICATION****L T P C****3 0 0 3****OBJECTIVES:**

- To prepare students to be competent in a global business environment.
- To think accurately, clearly and deeply in communicative contexts.
- To improve career opportunities – get English language skills that are needed to be successful.

**UNIT I CRITICAL/ INFORMATIONAL LISTENING****9**

Short conversations or Monologues – Listening for specific information- Conversations or Monologues with factual information- listen to fill up missing information- business related discussions or interview(two or more speakers).

**UNIT II CONVERSATIONAL/ PRESENTATION SKILLS 9**

Speak about oneself - Face-to-face speaking for real-life context – pick and talk - personal opinion on business related topics- mini presentations on a business theme- discussion with another candidate on business related topics.

**UNIT III INTENSIVE/ EXTENSIVE READING AND INTERPRETING 9**

Short texts (signs, messages, emails, labels and notes) -Short descriptions-graph or chart. Reading to find factual information- decision making from a written text- a leaflet or a newspaper- magazine or article- reading to understand correct grammar, contextually- reading to understand the structure of a text-read and transfer information from memos, advertisements, notices.

**UNIT IV FORMAL COMMUNICATION 9**

Business Correspondence - writing business letters to people outside the company. Internal Company Communication- a note, a message, a memo or an email.

**UNIT V VERBAL ABILITY/ FUNCTIONAL GRAMMAR 9**

Grammar – tenses – concord- prepositions – articles- punctuations. Vocabulary – advanced vocabulary – synonyms and antonyms. Sentence correction – sentence completion - cloze passage - verbal reasoning: analogies, meaning - usage match.

**TOTAL : 45 PERIODS****OUTCOMES:**

On completion of the course students will be able to:

1. Listen to, understand and give opinions in meetings.
2. Apply for new jobs and develop their career.
3. Write short business messages and reports.
4. Use language in both official and unofficial contexts.
5. Speak effectively in business communication.

**TEXT BOOKS:**

1. Board of Editors. Sure Outcomes. A Communication Skills Course for Undergraduate Engineers and Technologists. Orient Black Swan Limited, Hyderabad, 2013.

**REFERENCES:**

1. Hartley, Mary. —The Power of Listening,|| Jaico Publishing House; First Edition (2015).
2. Chambers, Harry. —Effective Communication Skills for Scientific and Technical Professionals,|| Persues Publishing, Cambridge, Massachusetts, 2000.
3. Lesikar V. Raymond, Flatley E. Marie, Rentz, Kathryn and Pande, Neerja. —Business Communication,|| Eleventh Edition, Tata McGraw Hill Education Private Limited.

<b>MA17251</b>	<b>ENGINEERING MATHEMATICS – II</b>	<b>L T P C</b>
	<b>Common to all branches of B.E.B.Tech. programmes</b>	<b>3 2 0 4</b>

**OBJECTIVES:**

- To handle practical problems arising in the field of engineering and technology.
- To solve problems using the concept of Differential Equation, Vectors calculus, Complex analysis, Laplace transforms.

**UNIT I DIFFERENTIAL EQUATIONS 15**

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

**UNIT II VECTOR CALCULUS****15**

Gradient and directional derivative – Divergence and curl - Vector identities – 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 (cubes and parallelepipeds).

**UNIT III ANALYTIC FUNCTIONS****15**

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function - Conformal

$$w = z + c, cz, \frac{1}{z}, z^2$$

mapping – Mapping by functions

- Bilinear transformation.

**UNIT IV COMPLEX INTEGRATION****15**

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 semi circular contour.

**UNIT V LAPLACE TRANSFORMS****15**

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 second order ordinary differential equations with constant coefficients.

**TOTAL: 75 PERIODS****OUTCOMES:**

**On completion of the course students will be able to:**

1. Apply various techniques in solving differential equations.
2. Use the concept of Gradient, divergence and curl of a vector point function and related identities in different areas of Engineering.
3. Evaluate line, surface and volume integrals using Gauss, Stokes and Green's theorems and their verification.
4. Use the concept of Analytic functions, conformal mapping and complex integration for solving problems.
5. Use Laplace transform and inverse transform techniques in solving differential equations.

**TEXT BOOKS :**

1. Grewal B.S., —Higher Engineering Mathematics, Khanna Publishers, New Delhi, 43<sup>rd</sup> Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10<sup>th</sup> Edition, New Delhi, 2016.

**REFERENCES :**

1. Bali N., Goyal M. and Watkins C., —Advanced Engineering Mathematics, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7<sup>th</sup> Edition, 2009.
2. Jain R.K. and Iyengar S.R.K., — Advanced Engineering Mathematics I, Narosa Publications, New Delhi , 3<sup>rd</sup> Edition, 2007.
3. O'Neil, P.V. —Advanced Engineering Mathematics, Cengage Learning India Pvt., Ltd, New Delhi, 2007.
4. Sastry, S.S, —Engineering Mathematics", Vol. I & II, PHI Learning Pvt. Ltd, 4<sup>th</sup> Edition, New Delhi, 2014.
5. Wylie, R.C. and Barrett, L.C., —Advanced Engineering Mathematics -Tata McGraw Hill Education Pvt. Ltd, 6<sup>th</sup> Edition, New Delhi, 2012.
6. T. Veerarajan, Engineering Mathematics I & II, McGraw Hill Education, 3<sup>rd</sup> Edition, 2012.



**PH17254****PHYSICS FOR INFORMATION SCIENCE  
Common to B.E. CSE and B.Tech. IT****L T P C  
3 0 0 3****OBJECTIVES:**

- 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 - electrons in metals – 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 SEMICONDUCTOR 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 and P-type semiconductors – Variation of carrier concentration with temperature – variation of Fermi level with temperature and impurity concentration – Carrier transport in Semiconductor: random motion, drift, mobility and diffusion – Hall effect and devices – Ohmic contacts – Schottky diode.

**UNIT III MAGNETIC PROPERTIES OF MATERIALS 9**

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 hard disc (GMR sensor).

**UNIT IV OPTICAL PROPERTIES OF MATERIALS 9**

Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and semiconductors (concepts only) - photo current in a P-N diode – solar cell - LED – Organic LED – Laser diodes – Optical data storage techniques.

**UNIT V NANO DEVICES 9**

Electron density in bulk material – Size dependence of Fermi energy – Quantum confinement – Quantum structures – Density of states in quantum well, quantum wire and quantum dot structure - Band gap of nanomaterials – Tunneling: single electron phenomena and single electron transistor – Quantum dot laser. Conductivity of metallic nanowires – Ballistic transport – Quantum resistance and conductance – Carbon nanotubes: Properties and applications.

**TOTAL : 45 PERIODS****OUTCOMES:****On completion of the course, students will be able to**

1. Apply conducting properties of metals and energy band structures.
2. Apply the basics of semiconductor physics in electronic devices.
3. Analyze the magnetic properties of materials for data storage devices.
4. Analyze the properties of optical materials for optoelectronics.
5. Use the basics of quantum behavior in nano electronic devices.

**TEXT BOOKS:**

1. Jasprit Singh, —Semiconductor Devices: Basic Principles, Wiley 2012.
2. Kasap, S.O. —Principles of Electronic Materials and Devices, McGraw-Hill Education, 2007.
3. Kittel, C. —Introduction to Solid State Physics, Wiley, 2005.

**REFERENCES**

1. Garcia, N. & Damask, A. —Physics for Computer Science Students, Springer Verlag, 2012.
2. Hanson, G.W. —Fundamentals of Nanoelectronics, Pearson Education, 2009.
3. Rogers, B., Adams, J. & Pennathur, S. —Nanotechnology: Understanding Small Systems, CRC Press, 2014.
4. S. O. Pillai, Solid state physics, New Age International, 2015.

**CS17201****DATA STRUCTURES****L T P C****3 0 0 3****OBJECTIVES:****The student should be made to:**

- To recognize and distinguish the applications of various linear and non linear data structures.
- To demonstrate the understanding of stacks, queues and their applications.
- To apply the concepts of List ADT.
- To analyze the concepts of tree and graph data structures.
- To be able to incorporate various searching and sorting techniques in real time scenarios.

**UNIT I BASIC DATA STRUCTURES****9**

Introduction to Data Structure - Classes and Objects in Python – Stack – ADT - Stack Applications - Balancing symbols -Evaluating the Postfix expressions – Queue - ADT – Queue Applications - Dequeue - Circular Queue

**UNIT II LINKED LIST****9**

Linked List Implementation - Singly Linked List- Circular Linked List - Doubly Linked List – All operation (Insertion, Deletion, Merge, Traversal) - Applications of lists – Polynomial Manipulation

**UNIT III TREES****9**

Basic Tree Terminologies- Binary Tree, Representation of Trees, Tree Traversal, Binary Search Tree – Operations, Implementation. Binary Heap- Properties, Heap Operations.

**UNIT IV GRAPHS****9**

Graph Terminologies, Graph ADT, Traversal- BFS, DFS, Directed Acyclic Graph- Topological Sorting, Shortest Path- Dijkstra's Algorithm.

**UNIT V SEARCHING AND SORTING****9**

Searching- Linear search, Binary search, Hashing- Hash function, Collision resolution techniques- Linear probing, Separate chaining. Sorting- Bubble sort, Selection sort, Insertion sort, Shell sort, Merge sort, Quick sort.

**TOTAL: 45 PERIODS****OUTCOMES:****At the end of the course, the student will be able to:**

1. Analyze the various data structure concepts.
2. Apply data structures to solve various problems.
3. Understand non-linear data structures.
4. Correlate the uses of graphs in real life scenarios
5. Apply different Sorting, Searching and Hashing algorithms.



4. Develop information system
5. 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. Behrouz A Forouzan, —Data Communication and Networkingl, Fourth Edition, Tata McGraw-Hill,2011.

**REFERENCES:**

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

**IT17202****DIGITAL PRINCIPLES AND SYSTEM DESIGN****L T P C  
3 0 0 3****OBJECTIVE:**

- Learn how to design digital circuits, by simplifying the Boolean functions. Also, gives an idea about designs using PLDs, and writing codes 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 and Tabulation Methods – 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 and Demultiplexers – Introduction to HDL – HDL Models of Combinational circuits.

**UNIT III SYNCHRONOUS SEQUENTIAL LOGIC****9**

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

**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 – Programmable Logic Array– Programmable Array Logic -Sequential Programmable Devices – Application Specific Integrated Circuits.

**TOTAL: 45 PERIODS****OUTCOMES**

On completion of this course student will be able to:

1. Perform arithmetic operations in any number system.
2. Simplify the Boolean expression using K-map and Tabulation methods.
3. Use Boolean simplification techniques to design a combinational hardware circuit.

4. Design and analyze a given digital circuit – combinational and sequential.
5. Design digital systems using PLD.

**TEXT BOOK:**

1. Morris Mano M. and Michael D. Ciletti, —Digital Design, IV Edition, Pearson Education, 2008.

**REFERENCES:**

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

**GE17261****ENGINEERING PRACTICES LABORATORY****L T P C  
0 0 4 2****OBJECTIVE:**

- 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 & MECHANICAL)****I CIVIL ENGINEERING PRACTICE****15****Buildings:**

(a) Study of plumbing and carpentry components of residential and industrial buildings.

Safety aspects.

**Plumbing Works:**

(a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.

(b) Study of pipe connections requirements for pumps and turbines.

(c) Preparation of plumbing line sketches for water supply and sewage works.

(d) Hands-on-exercise:

Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

(e) Demonstration of plumbing requirements of high-rise buildings.

**Carpentry using Power Tools only:**

(a) Study of the joints in roofs, doors, windows and furniture.

(b) Hands-on-exercise:

Wood work, joints by sawing, planing and cutting.

**II MECHANICAL ENGINEERING PRACTICE****15****Welding:**

(a) Preparation of arc welding of butt joints, lap joints and tee joints.

(b) Gas welding practice

**Basic Machining:**

(a) Simple Turning and Taper turning

(b) Drilling Practice

**Sheet Metal Work:**

(a) Forming & Bending:

(b) Model making – Trays, funnels, etc.

(c) Different type of joints.

**Machine assembly practice:**

(a) Study of centrifugal pump

(b) Study of air conditioner

**Demonstration on:**

(a) Smithy operations, upsetting, swaging, setting down and bending. Example – 18 Exercise – Production of hexagonal headed bolt.

(b) Foundry operations like mould preparation for gear and step cone pulley.

(c) Fitting – Exercises – Preparation of square fitting and vee – fitting models.

**GROUP B (ELECTRICAL & ELECTRONICS)**

**III ELECTRICAL ENGINEERING PRACTICE**

**15**

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of resistance to earth of an electrical equipment.

**IV ELECTRONICS ENGINEERING PRACTICE**

**15**

1. Study of Electronic components and equipment's – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EOR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

**TOTAL: 60 PERIODS**

**OUTCOMES:**

1. Ability to fabricate carpentry components
2. Ability to fit pipe connections including plumbing works.
3. Ability to use welding equipment's to join the structures.
4. Ability to fabricate electrical circuits.
5. Ability to fabricate electronics circuits.

**REFERENCES:**

1. Jeyachandran K., Natarajan S. & Balasubramanian S., —A Primer on Engineering Practices Laboratory, Anuradha Publications, 2007.
2. Jeyapooan T., Saravanapandian M. & Pranitha S., —Engineering Practices Lab Manual, Vikas Publishing House Pvt.Ltd, 2006.
3. Bawa H.S., —Workshop Practicel, Tata McGraw – Hill Publishing Company Limited, 2007.
4. Rajendra Prasad A. & Sarma P.M.M.S., —Workshop Practicel, SreeSai Publication, 2002.

**CS17211**

**DATA STRUCTURES LABORATORY**

**L T P C**

**0 0 4 2**

**OBJECTIVES:**

**The student should be made to:**

- To learn and implement the various linear and non linear data structures.
- To understand the tree and graph traversal methods.
- To apply searching and sorting techniques for practical scenarios.

**LIST OF EXPERIMENTS**

1. Basics of classes and objects
2. Stack implementation and its applications
3. Queue implementation
4. Linked List Operations

5. Binary Search Tree
6. Tree Traversals
7. Graph Traversals
8. Sorting Techniques
9. Searching Techniques
10. Mini Project on Application of Data Structures  
(Printing Tasks, Hot Potato Game, Palindrome Checker, Push Down Automata)

**TOTAL: 60 PERIODS**

**OUTCOMES:**

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

1. Design and implement stacks, queues and linked lists.
2. Work with various data structures and map its applications to appropriate scenarios.
3. Apply good programming design methods for program development.
4. Design and implement trees and graph concepts.
5. Idealize new sorting and searching algorithms.

**PLATFORM NEEDED:** Python 3 interpreter for Windows/Linux

**IT17211          DIGITAL LABORATORY**

**L T P C**  
**0 0 4 2**

**OBJECTIVES:**

The student should be made to:

- Understand the various logic gates.
- Be familiar with various combinational circuits.
- Understand the various components used in the design of digital computers.
- Be exposed to sequential circuits
- Learn to use HDL

**LIST OF EXPERIMENTS:**

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
  - Magnitude Comparator
  - Application Using Multiplexers
4. Design And Implementation Of Sequential Circuits:
  - Shift –Registers
  - Synchronous And Asynchronous Counter
5. Coding Combinational / Sequential Circuits Using HDL
6. Design and Implementation of a Simple Digital System (Mini Project).

**TOTAL: 45 PERIODS**

**OUTCOMES:**

1. Students will be able to use Boolean simplification techniques to design a combinational hardware circuit.
2. Ability to Design and Implement combinational and sequential circuits.
3. Students will be able to analyze a given digital circuit – combinational and sequential.
4. Ability to design the different functional units in a digital computer system
5. Students will be able to design and Implement a simple digital system.

**LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS HARDWARE:**

1. Digital trainer kits 30
2. Digital ICs required for the experiments in sufficient numbers

**SOFTWARE:**

1. HDL simulator.

**SEMESTER III****MA17354****DISCRETE MATHEMATICS****L T P C****3 2 0 4****OBJECTIVES:**

- To extend student's Logical and Mathematical maturity and ability to deal with abstraction.
- To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.

**UNIT I****MATHEMATICAL LOGIC****15**

Propositional Logic – Propositional equivalences – Rules of inference – normal forms.

**UNIT II****PREDICATE CALCULUS****15**

Predicates and quantifiers-Nested Quantifiers-Rules of inference-introduction to Proofs-Proof Methods and strategy.

**UNIT III****COMBINATORICS****15**

Mathematical inductions-Strong induction -The basics of counting-The pigeonhole principle – Permutations and combinations-Recurrence relations-Solving Linear recurrence relations-generating functions-inclusion and exclusion principle and applications.

**UNIT IV****GRAPHS****15**

Graphs -Graph terminology and special types of graphs-Representation of graphs - graph isomorphism -connectivity-Euler and Hamilton paths.

**UNIT V****GROUPS AND BOOLEAN ALGEBRA****15**

Algebraic systems-Groups-Subgroups and homomorphisms-Cosets and Lagrange's theorem- Posets-Lattices-Boolean Algebra.

**TOTAL : 75 PERIODS****OUTCOMES:****On completion of the course students will be able to**

1. Apply the concepts of logic to test the validity of a program.
2. Arrive at inferences on logical structures.
3. Use the counting principles in implementing various programmes.



4. Handle a class of functions which transform a finite set into another finite set which relates to input and output functions in computer science.
5. Apply the concepts and properties of algebraic structures such as groups.

**TEXT BOOKS:**

1. Kenneth H. Rosen, —Discrete Mathematics and its Applications, Special Indian edition, Tata McGraw-Hill Pub. Co. Ltd., New Delhi, (2007).
2. Veerarajan. T, —Discrete Mathematics: with graph theory and combinatorics, McGrawHill Education (India) Pvt.Ltd. 2007.
3. Bernard Kolman, Robert C. Busby and Sharon Ross., Discrete Mathematical Structures., 3<sup>rd</sup> edition, Prentice Hall, Upper Saddle River, New Jersey 1996.

**REFERENCES:**

1. Tremblay J.P and Manohar R, —Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw–Hill Pub. Co. Ltd, New Delhi, 30<sup>th</sup> Re-print (2007).
2. Ralph. P. Grimaldi, —Discrete and Combinatorial Mathematics: An Applied Introduction, Fourth Edition, Pearson Education Asia, Delhi, (2002).
3. Thomas Koshy, |Discrete Mathematics with Applications, Elsevier Publications, (2006).
4. Seymour Lipschutz and Mark Lipson, |Discrete Mathematics, Schaum’s Outlines, Tata McGraw-Hill Pub. Co. Ltd., New Delhi, Second edition, (2007).

**CS17302****OBJECT ORIENTED PROGRAMMING****L T P C  
3 0 0 3****OBJECTIVES:****The student should be made to:**

- Be familiar in Object Oriented Programming Concepts of C++
- Understanding the purpose of Inheritance and Exception Handling
- Understand and exercise the Class and Objects in JAVA
- Acquire the knowledge of Exception handling and Generic Programming
- Establish the connection between Database and Java using JDBC

**UNIT I OBJECT ORIENTED PROGRAMMING FUNDAMENTALS 9**

Object-Oriented Approach – C++ Programming Basics- Objects - Classes- Inheritance – Reusability - Polymorphisms and overloading- Constructors – Destructor - Functions – Passing Arguments to Functions - Returning values - Reference arguments - overloaded function – Recursion - Inline functions - Default arguments.

**UNIT II OBJECT ORIENTED PROGRAMMING CONCEPTS 7**

Operator overloading - Overloading binary operators - Inheritance - Virtual Functions - Friend functions - Static functions - Function Templates - Class Templates – Exceptions - Introduction to Files and Operation on File.

**UNIT III INTRODUCTION TO JAVA 9**

Introduction to Classes, Objects – Instance variable - Static Members and Methods – Access modifiers - Garbage collection – Arrays – Passing Arrays to methods – Pass-By-Value – Pass-By-Reference - Variable-Length Argument lists - Command Line Arguments Inheritance - Polymorphism – Abstract classes – Final methods and classes- Interface.

**UNIT IV EXCEPTIONS AND COLLECTIONS 9**

Exception Handling – Exception hierarchy-Chained Exceptions - Files – Sequential-Access Text Files - String- Class String and StringBuilder - Generic Collections – Type -Wrapper Classes-

Autoboxing and Auto-Unboxing- Lists - Collection methods – Sets – Maps - Synchronized Collections.

## **UNIT V MULTITHREADING AND JDBC**

**11**

Generic Classes and Methods – Implementation and Compile-Time Translation - Overloading Generic Methods - Generic Classes – Raw types- Wildcards in Methods - Concurrency – Thread States and Life Cycle- Thread Synchronization- GUI Components – Using menus with Frames- Layout management- Accessing Databases with JDBC – Manipulating Database with JDBC.

**TOTAL: 45 PERIODS**

### **OUTCOMES:**

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

1. Design problem solutions using Object Oriented Techniques.
2. Apply the concepts of Encapsulation, Polymorphism and Inheritance.
3. Apply the concepts of Interface and Abstract Classes.
4. Design problem solutions using Generic Collections and Exception Handling.
5. Create a Database Connectivity using the JDBC.

### **TEXTBOOKS:**

1. Robert Lafore —Object Oriented Programming in C++| 4<sup>th</sup> Edition SAMS Publishing ,2002
2. Paul Dietel, Harvey Dietel –Java How to Program (Early Objects)| 10<sup>th</sup> Edition 2014

### **REFERENCES:**

1. K.R.Venugopal, B.Rajkumar and T.Ravishankar –Mastering C++| 2<sup>nd</sup> Edition Tata McGraw Hill 2013.
2. Bjarne Stroustrup, –The C++ Programming Language|, 4th Edition, Addison-Wesley Professional, 2013
3. Bhushan Trivedi —Programming with ANSI C++| 2<sup>nd</sup> Edition Oxford University Press 2013
4. Herbert Schildt –Java The complete Reference| 10<sup>th</sup> Edition Oracle Press 2017

## **CS17304 DATABASE MANAGEMENT SYSTEMS**

**L T P C**

**3 0 0 3**

### **OBJECTIVES:**

**The student should be made to:**

- Understand the role of a database management system, relational data model and successfully apply logical database design principles, including E-R diagrams database.
- Construct simple and moderately advanced database queries using Structured Query Language (SQL).
- Know the importance of functional dependency and normalization, and what role it plays in the database design process.
- Understand the concept of a database transaction including concurrency control, backup and recovery, and data object locking and handling deadlocks.
- Describe and discuss selected advanced database topics, such as distributed database systems and some frequently used databases along with their.

## **UNIT I INTRODUCTION TO DATABASE SYSTEMS**

**10**

Introduction – Purpose of Database Systems - View of Data –Database Architecture - Relational Databases – Database Schema – Keys – Codd’s Rule – Relational Algebra – Data Models – Entity Relationship Model – Constraints – Entity Relationship Diagram Design Issues of ER Model – Extended ER Features – Relational Query Languages – Relational Algebra – Basic Operations with Examples and Exercises.

**UNIT II SQL AND QUERY PROCESSING 10**  
 SQL: Data Definition – Basic domain types – Basic structure of SQL Queries Modifications of the database – Set Operations – Aggregate Functions – Null Values – Nested Sub queries – Complex Queries – Views – Joined relations – Complex Queries – PL/SQL: Functions, Procedures, Triggers, Cursors -Embedded SQL – Query Processing – Heuristics for Query Optimization.

**UNIT III DEPENDENCIES AND NORMAL FORMS 8**  
 Motivation for Normal Forms – Functional dependencies – Armstrong’s Axioms for Functional Dependencies – Closure for a set of Functional Dependencies – Definitions of 1NF-2NF-3NF and BCNF – Multivalued Dependency 4NF - Joint Dependency- 5NF.

**UNIT IV TRANSACTIONS 7**  
 Transaction Concept – State – ACID Properties – Concurrency control - Serializability – Recoverability – Locking based protocols –Timestamp Based Protocol - Deadlock handling.

**UNIT V ADVANCED DATABASES 10**  
 Data Classification-Threats and risks – Database access Control – Types of Privileges - Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Mobile Transaction Models: HiCoMo, Moflex, Kangaroo - Mobile Database Recovery – Introduction to NoSQL – Aggregate Data Models – Schemaless Database.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

1. Use the Relational model, ER diagrams.
2. Make modification to a Database.
3. Apply concurrency control and recovery mechanisms for practical problems.
4. Design the Query Processor and Transaction Processor.
5. Apply security concepts to databases

**TEXT BOOKS:**

1. Abraham Silberschatz, Henry F. Korth and S. Sudharshan, —Database System Concepts, Sixth Edition, Tata McGraw Hill, 2011.
2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
3. Vijay Kumar —Mobile Database Systems, John Wiley & Sons, 2006.

**REFERENCES:**

1. RamezElmasri and Shamkant B. Navathe, —Fundamentals of Database Systems, Fifth Edition, Pearson Education, 2008.
2. C.J.Date, A.Kannan and S.Swamynathan, —An Introduction to Database Systems, Eighth Edition, Pearson Education, 2006.
3. AtulKahate, —Introduction to Database Management Systems, Pearson Education, New Delhi, 2006.

**IT17301 COMPUTER ORGANIZATION L T P C  
3 0 0 3**

**OBJECTIVES**

- To make students understand the basic structure and operation of digital computer and to understand the hardware-software interface.
- To familiarize the students with functioning of arithmetic Logical Unit, Control Unit.
- To expose the students to the concept of pipelining.
- To familiarize the students with hierarchical memory system including cache memories and virtual memory.
- To expose the students with different ways of communicating with I/O devices and standard I/O interfaces.

**UNIT I BASIC STRUCTURE OF COMPUTERS** **9**

Functional units – Basic operational concepts – Bus structures – Performance and metrics – Instructions and instruction sequencing – Hardware – Software Interface – Instruction set architecture – Addressing modes – RISC – CISC. ALU design – Fixed point and floating point operations.  
( Text Book-1: Chapters 1, 2 and 6 )

**UNIT II BASIC PROCESSING UNIT** **9**

Fundamental concepts – Execution of a complete instruction – Multiple bus organization – Hardwired control – Micro programmed control – Nano programming.  
( Text Book-1: Chapter 7 )

**UNIT III PIPELINING** **9**

Basic concepts – Data hazards – Instruction hazards – Influence on instruction sets – Data path and control considerations – Performance considerations – Exception handling - Case study.  
( Text Book-1: Chapter 8 and Case study on Processor families )

**UNIT IV MEMORY SYSTEM** **9**

Basic concepts – Semiconductor RAM – ROM – Speed – Size and cost – Cache memories – Improving cache performance – Virtual memory – Memory management requirements – Associative memories – Secondary storage devices.  
( Text Book-1: Chapter 5 )

**UNIT V I/O ORGANIZATION** **9**

Accessing I/O devices – Programmed Input/Output -Interrupts – Direct Memory Access – Buses – Interface circuits – Standard I/O Interfaces (PCI, SCSI, USB), I/O devices and processors.  
( Text Book-1: Chapter 4 )

**TOTAL : 45 PERIODS****OUTCOMES**

Upon successful completion of this course, Students shall be able to

1. Comprehend the basic structure and operation of digital computer system.
2. Design arithmetic and logic unit.
3. Design and analyse pipelined control units.
4. Evaluate performance of memory systems.
5. Understand the IO devices organization.

**TEXT BOOK:**

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, —Computer Organization, Fifth Edition, Tata McGraw Hill, 2002.

**REFERENCES:**

1. David A. Patterson and John L. Hennessy, —Computer Organization and Design: The Hardware / Software interface, Third Edition, Elsevier, 2005.
2. William Stallings, —Computer Organization and Architecture – Designing for Performance, Sixth Edition, Pearson Education
3. John P. Hayes, —Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 1998.
4. V.P. Heuring, H.F. Jordan, —Computer Systems Design and Architecture, Second Edition, Pearson Education, 2004.

**EC17351      MICROPROCESSORS AND MICROCONTROLLERS      L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- Infer the programming concept by illustrating and elucidating the basic functionalities of 8085
- Infer the programming concept by illustrating and elucidating the basic functionalities of 8086
- Peruse the knowledge of peripherals and interface various devices with the processor.
- Infer the programming concept by illustrating and elucidating the basic functionalities of 8051
- Peruse the knowledge of microcontroller to interface various devices with it.

**UNIT I                      THE 8085 MICROPROCESSOR                      9**  
 8085 Architecture - Pin configuration - Instruction Set - Addressing modes – Interrupts - Timing diagram – Assembly Language Programming.

**UNIT II                    THE 8086 MICROPROCESSOR                      9**  
 Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming –8086 signals – Maximum mode and minimum mode- Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations.

**UNIT III                 PERIPHERALS & INTERFACING                      9**  
 Parallel communication interface (8255) – Serial communication interface (8251) – D/A and A/D Interface – Programmable Timer controller (8254) – Keyboard /display controller (8279) – Programmable Interrupt controller (8259) – DMA controller (8237).

**UNIT IV                 MICROCONTROLLER                      9**  
 Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports- Timers – Interrupts – Serial communication - Instruction set - Addressing modes - Assembly language programming.

**UNIT V                 INTERFACING MICROCONTROLLER                      9**  
 Interfacing – LCD & Keyboard Interfacing – RTC and EEPROM interface using I2C protocol- Stepper Motor, Traffic Light Controller

**TOTAL: 45 PERIODS**

**OUTCOMES:**

1. Design and implement the programs of 8085
2. Design and implement the programs of 8086
3. Assess various interfacing devices interfaced with the processor to adapt an application.
4. Design and implement the programs of 8051
5. Assess various interfacing devices interfaced with the controller to adapt an application.

**TEXT BOOKS:**

1. Ramesh S. Gaonkar, "Microprocessor Architecture, Programming and Applications with 8085". Sixth edition, Penram International Publishing, 2012.
2. A.K. Ray, K.M. Bhurchandi, —Advanced Microprocessor and Peripherals, Second edition, Tata McGraw-Hill, 2010.
3. Barry B. Brey, The Intel Microprocessors Architecture, Programming and Interfacing, Pearson
4. Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinley, "The 8051 Microcontroller and Embedded Systems", Second Edition, Pearson Education 2008. Fifth impression 2011.

**REFERENCES:**

1. Douglas V. Hall, "Microprocessor and Interfacing, Programming and Hardware". Revised second Edition 2006, eleventh reprint 2010. Tata McGraw Hill.
2. Kenneth J. Ayala., The 8051 Microcontroller, 3rd Edition, Thompson Delmar Learning,
3. Krishna Kant, Microprocessor and Microcontroller Architecture, programming and system design using 8085, 8086, 8051 and 8096, PHI, 2007, Seventh Reprint, 2011.
4. Barry B. Brey, The Intel Microprocessors Architecture, Programming and Interfacing, Pearson Education, 2007. Second impression 2010.

**CS17311 OBJECT ORIENTED PROGRAMMING LABORATORY****L T P C  
0 0 4 2****OBJECTIVES:****The student should be made to:**

- Be familiarized with good programming design methods.
- Getting exposure in implementing the concepts of C++ and JAVA.
- Understand and exercise the Generic Programming

**LIST OF EXPERIMENTS:****C++**

1. Develop a program to perform arithmetic operations using class and objects.
2. Design a program to count the no of objects created and destroyed using constructor and destructor.
3. Design different classes to apply types of inheritance using Father and Child relationship.
4. Design a class to find the area of a square, triangle and rectangle using function overloading.
5. Implement the Class Templates and Function Templates using stack and queue.
6. Develop a program to handle the runtime exception using Exception Handling Mechanism.

**JAVA**

1. Develop Rational number class in Java. Use JavaDoc comments, Your implementation should use efficient representation for a rational number, i.e. (500 / 1000) should be represented as (1/2).
2. Develop Date class in Java similar to the one available in java.util package.
3. Design a Java interface for ADT Stack. Develop two different classes that implement this interface, one using array and the other using linked-list. Provide necessary exception handling in both the implementations.
4. Design a Vehicle class hierarchy in Java. Write a test program to demonstrate polymorphism.
5. Design classes for Currency, Rupee, and Dollar. Write a program that randomly generates Rupee and Dollar objects and write them into a file using object serialization. Write another program to read that file, convert to Rupee if it reads a Dollar, otherwise read as Rupee.
6. Develop a program to find the largest of a list using command line arguments.
7. Design a scientific calculator using event-driven programming paradigm of Java.
8. Develop a simple student database management system using even-driven and concurrent programming paradigms of Java. Use JDBC to connect to a back-end database.

9. Develop multi-threaded echo server and a corresponding GUI client in Java.
10. Develop any one Mini-Project in the given topics using JDBC and GUI Components.
  - a) Library System Management
  - b) Airline Reservation System.
  - c) Banking Application
  - d) Doctor-Patient System

**TOTAL: 60 PERIODS**

**OUTCOMES:**

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

1. Gain the basic knowledge on Object Oriented concepts.
2. Apply good programming design methods for program development.
3. Ability to develop applications using Object Oriented Programming Concepts.
4. Ability to implement features of object oriented programming to solve real world problems.
5. Ability to write, debug and document well-structured Java application.

**PLATFORM NEEDED:** Standalone desktops with C++ compiler and Java for Windows / Linux

**CS17312 DATABASE MANAGEMENT SYSTEMS LABORATORY**

**L T P C**  
**0 0 4 2**

**OBJECTIVES:**

**The student should be made to:**

- Learn to create and use a database
- Get familiarized with Sequential Query Language.
- Write codes on Procedures, Functions, Cursors and Triggers.
- Be exposed to advanced databases.
- Gain knowledge on Advanced Databases.

**Section - 1**

**SQL :**

1. Creation of tables and simple queries
2. Implementation of Key Constraints (DDL: CREATE, ALTER, DROP)
3. Manipulating the database (DML: INSERT, UPDATE, DELETE, TRUNCATE)
4. Implementation of Arithmetic / logical Operations, Sorting and Grouping.
5. Nested Queries
6. Manage transactions in a database (TCL: COMMIT, ROLLBACK, SAVEPOINT)
7. Control Privileges in a database (DCL: GRANT, REVOKE)
8. Joins
9. Built-in functions
10. Update Operations
11. Indexes, Sequences, Synonyms and Views.

**Section - 2**

**PL/SQL:**

1. Simple PL/SQL Procedure
2. PL/SQL Functions
3. PL/SQL Cursors
4. PL/SQL Triggers
5. Exception Handling

**Section – 3**

**Advanced Databases:**

1. NoSQL ( Basic Operations)

**Section – 4**

**Mini Project:**

1. Mini Project on any application from the databases discussed along with a report.

**TOTAL: 60 PERIODS**

**OUTCOMES:**

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

1. Design and implement a database schema for a given problem-domain
2. Populate and query a database
3. Create and maintain tables using PL/SQL.
4. Apply the skills learnt by implementing them in a project.
5. Prepare reports.

**TEXT BOOKS:**

1. —SQL Fundamentals I Exam Guidel, John Watson – PoopeshRamklass, McGrawHill, 2008.

**SOFTWARE:**

Front end: VB/VC ++ or Equivalent

Back end: Oracle / SQL / MySQL/ PostGress / DB2 or Equivalent

**EC17361 MICROPROCESSORS AND MICROCONTROLLERS LABORATORY**

**L T P C**  
**0 0 4 2**

**OBJECTIVES:**

- Introduce ALP concepts and features
- Write ALP for arithmetic and logical operations in 8086 and 8051
- Differentiate Serial and Parallel Interface
- Interface different I/Os with Microprocessors
- Be familiar with MASM

**List of Experiments**

**Cycle 1: Microprocessor – 8085/8086**

1. Arithmetic and logical operations

- a. Addition, Subtraction, Multiplication using 8085
- b. Division, square and cube using 8086
- c. Logical AND, OR using 8085
- d. Logical XOR, 1's and 2's complement using 8086

2. Code conversion and Matrix operations

- a. BCD to HEX, Hex to BCD using 8085
- b. Matrix Addition, Subtraction and Multiplication using 8086

3. Searching and Sorting operations

- a. Largest and Smallest number in an array using 8085
- b. Ascending and Descending order using 8086

4. String manipulation operations using 8086



- a. Search find and replace
- b. Compare two strings

**Cycle 2: Microcontroller – 8051**

- 1. Basic arithmetic operations
  - a. Addition, Subtraction, Multiplication, Division
- 2. Logical operations
  - a. AND, OR, XOR, 1's complement, 2's complement
- 3. Unpacked BCD to ASCII conversion

**Cycle 3: Interfacing**

- 1. Serial interfacing using 8085
- 2. Timer interfacing using 8085
- 3. Parallel interfacing using 8086
- 4. Keyboard and Display interfacing using 8086
- 5. ADC and DAC interfacing using 8086
- 6. Stepper motor interfacing using 8051
- 7. Traffic light control using 8051

**TOTAL: 60 PERIODS**

**OUTCOMES:**

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

- 1. Write ALP Programmes for fixed and Floating Point and Arithmetic
- 2. Interface different I/Os with processor
- 3. Generate waveforms using Microprocessors
- 4. Execute Programs in 8051
- 5. Explain the difference between simulator and Emulator

**LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

**HARDWARE:**

- 8086 development kits - 30 nos
- Interfacing Units - 10 nos(each)
- Microcontroller - 30 nos

**SOFTWARE:**

- Intel Desktop Systems with MASM - 30 nos
- 8086 Assembler
- 8051 Cross Assembler

**HS17361      INTERPERSONAL AND SKILLS- LISTENING SPEAKING      L T P C**  
**(Common to CSE, ECE, IT, MECH, BT, AUTO,      0 0 2 1**  
**CIVIL, MCT& BME)**

**OBJECTIVES:**

**The student should be able to:**

- Upgrade the the students' listening and speaking skills for educational purposes.
- Enhance the employability skills of the the students with a special focus on listening and speaking skills.

**UNIT I      INTRODUCTION**

**6**

Importance of listening and Types of Listening – listening to TED Talks, lectures, etc. Speaking: group discussions on general topics like how to grow organic potted plants, to furnish an apartment inexpensively, etc.– Phonetics

**UNIT II APPRECIATIVE LISTENING AND IMPROMPTU 6**  
Listening- Listening to motivational speeches, music and poetry. Speaking–pick and talk, short talks on any event on topics- a trip to remember, a job I’d love to have, etc. – Vocabulary: Collocation.

**UNIT III INFORMATIVE LISTENING AND PERSUASIVE SPEAKING 6**  
Listening–Listening- to gather information such as facts, directions, news or instructions. Speaking – Persuasive speaking- convincing the audience with the speaker’s view on the topics- food additives and unhealthiest, financial education is important in today’s world, etc. – Vocabulary: Idioms and Phrases.

**UNIT IV CRITICAL LISTENING AND SPEAKING ON SPECIAL OCCASION 6**  
Listening– Critical Listening- listening to examine and evaluate the message for logic and truth - televised debate, election campaign. Speaking –speech to commemorate a person or an event- speech of Introduction, etc. – Vocabulary: Foreign Words and Phrases.

**UNIT V EMPATHETIC LISTENING AND DEMONSTRATIVE SPEAKING 6**  
Listening– Empathetic Listening – paying attention to another person with empathy – listening to problems and issues (videos).Speaking – Demonstrative speaking – Demonstrate a process using visual aids (charts, graphs, maps, pictures, etc.) – Grammar: Different types of Questions.

**TOTAL: 30 PERIODS**

**OUTCOMES:**

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

- Identify the different types of listening and speaking for effective interpersonal communication.
- Discuss and respond to content of a listening passage.
- Comprehend and answer questions based on the texts/passages given.
- Understand different genres of texts and comprehend the materials to improve their vocabulary and are familiar with new words, phrases, sentence structures and ideas.
- Make inferences and predictions about spoken discourse.

**REFERENCES:**

1. Meenakshi Raman and Sangeetha Sharma, Technical Communication – Principles and Practice, Second Edition, Oxford University Press, December, 2011.
2. Henry Lee, Interpersonal Skills: How to develop Interpersonal Skills for work and home, Kindle Edition
3. Erik Palmer, Teaching the Core Skills of Listening and Speaking , Kindle Edition

**SEMESTER IV**

**MA 17353 PROBABILITY AND STATISTICS L T P C**  
**Common to Chemical, Biotech , BME & IT 3 2 0 4**

**OBJECTIVES**

- To provide the required skill to apply the statistical tools in Engineering problems.

**UNIT I RANDOM VARIABLES 15**  
Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

**UNIT II TWO DIMENSIONAL - RANDOM VARIABLES 15**  
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem

<b>UNIT III</b>	<b>TESTING OF HYPOTHESIS</b>	<b>15</b>
Statistical hypothesis - Large sample test based on Normal distribution for single mean and difference of means -Tests based on t, F and Chi-square - Contingency table (testfor independent) - Goodness of fit.		
<b>UNIT IV</b>	<b>DESIGN OF EXPERIMENTS</b>	<b>15</b>
One way and Two way classifications - Completely randomized design – Randomized block design – Latin square design.		
<b>UNIT V</b>	<b>STATISTICAL QUALITY CONTROL</b>	<b>15</b>
Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.		

**TOTAL :75 PERIODS**

### OUTCOMES

On completion of the course students will be able to

1. Characterize standard probability distribution by employing basic techniques and methods of probability mass function and probability density function for discrete and continuous random variables
2. Develop skills to solve problems on correlation and regression
3. Obtain statistical data from experiments and able to analyze the same using statistical test.
4. Design experiments using suitable ANOVA techniques and draw conclusions.
5. Use control charts to study, analyze and interpret problems in statistical quality control.

### TEXT BOOKS:

1. T. Veerarajan, ‘Probability, Statistics and Random Processes with Queueing Theory and Queueing Networks’, Mc Graw Hill, 2016.
2. Johnson. R.A. and Gupta. C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 7th Edition, 2007.

### REFERENCES:

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2012.
2. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8th Edition, 2007.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2004.
4. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.

<b>CS17401</b>	<b>OPERATING SYSTEMS</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

### OBJECTIVES:

**The student should be made to:**

- To study the basic concepts and functions of operating systems.
- To learn about Processes, Threads, Scheduling algorithms and Deadlocks.
- To study various Memory Management schemes.

- To learn I/O Management and File Systems.
- To learn the basics of Linux, Windows 7 and Android OS.

**UNIT I INTRODUCTION 9**

Operating Systems Overview – Computer system architecture – OS Structure and Operations – Virtualization - System Calls – Types of System Calls- System Programs-System Boot Process – BIOS – POST- Bootstrap loader

**UNIT II PROCESS MANAGEMENT 9**

Process -Concepts – Scheduling - Operations – Interprocess Communication Threads - Overview – Multithreading Models and Issues - CPU Scheduling - Process Synchronization - Critical Section Problem – Peterson’s solution – Synchronization hardware –Semaphores- Classic Problems of Synchronization – Monitors – Deadlocks - Models - Prevention – Avoidance – Detection - Recovery

**UNIT III MEMORY MANAGEMENT 9**

Main Memory - Swapping – Contiguous Memory Allocation – Paging – Structure of a page table – Segmentation - Virtual Memory - Demand Paging – Copy –on-Write – Page Replacement – Allocation of Frames – Thrashing.

**UNIT IV I/O MANAGEMENT 9**

File System Interface -Concepts – Access Methods – Directory Structure – Mounting – Protection – Access Control -File System Implementation -Structure – Directory – Allocation Methods – Free-Space Management - Mass Storage Structure -Disk Scheduling – Disk Management – Swap-Space Management .

**UNIT V CASE STUDY 9**

The Linux System – Design Principles – Kernel Modules – Process Management – Scheduling – Memory Management – File Systems – Security - Windows7 - Design Principles –System Components - Android - Architecture and Security Model.

**TOTAL: 45 PERIODS**

**OUTCOMES**

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

1. Understand the concepts and structures of Operating Systems.
2. Design various Scheduling algorithms and methods to avoid Deadlock.
3. Compare and contrast various memory management schemes.
4. Implement a prototype file systems.
5. Understand the principles and issues of various operating systems.

**TEXT BOOKS:**

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, —Operating System Concepts, 9<sup>th</sup>Edition, John Wiley and Sons Inc., 2012.

**REFERENCES:**

1. NikolayElenkov, —Android Security Internals : An In-Depth Guide to Android’s Security Architecture, No Starch Press,2015.
2. William Stallings, —Operating Systems – Internals and Design Principles, 7th Edition, Pearson, 2013.
3. Andrew S. Tanenbaum, —Modern Operating Systems, Second Edition, Addison Wesley, 2001.
4. Charles Crowley, —Operating Systems: A Design-Oriented Approach, Tata McGraw Hill Education, 1996.
5. D M Dhamdhare, —Operating Systems: A Concept-Based Approach, Second Edition, Tata McGraw-Hill Education, 2007.

**CS17402****SOFTWARE ENGINEERING****L T P C  
3 0 0 3****OBJECTIVES:****The student should be made to:**

- Understand the software development process
- Determine requirements to develop software
- Apply modeling and modeling languages
- Develop correct and robust software products
- Understand Advanced Engineering Concepts

**UNIT I INTRODUCTION 9**

Introduction to Software Engineering-Software Process - Perspective and Specialized Process models– Rational unified process-Agile methods- Extreme Programming.

**UNIT II REQUIREMENTS ENGINEERING 9**

Software Requirements - Functional and Non-Functional requirements - User Requirements, System Requirements -Requirement Specification Documentation - Requirements elicitation and analysis- Requirement Discovery- Developing scenario and use case- Requirements Validation and Management

**UNIT III DESIGN AND CODING 9**

System Modelling – Context – Interaction – Structural –Behavioural - Model Driven models-Architectural patterns - Design patterns – Modelling Data – Data Flow Diagrams-Software Implementation Techniques-Coding Practices-Refactoring.

**UNIT IV TESTING AND QUALITY MANAGEMENT 9**

Software Testing – Software testing strategies – Testing Conventional applications – OO Testing - Development testing - Test-driven development - Release testing - User testing - Software maintenance - Software reengineering- Quality management-Software Standards-CMM -ISO 9000 - Six Sigma-Software measurement and metrics.

**UNIT V ADVANCE SOFTWARE ENGINEERING 9**

Software Reuse – Component Based Software Engineering- Distributed Software Engineering - Aspect Oriented Software Engineering

**TOTAL: 45 PERIODS****OUTCOMES:****At the end of the course, the student should be able to:**

1. Understand the concepts of software life cycle models
2. Identifying and Writing functional and non functional requirements
3. Design and implement software project
4. Testing the developed product
5. Understanding reusability and distributed software engineering.

**TEXT BOOKS:**

1. —Software Engineeringl, Ian Sommerville, 9<sup>th</sup> edition, 2010, Pearson Education.

**REFERENCES:**

1. —Software Engineering – A Practitioner’s Approachl, Roger SPressman, seventh edition, 2010.
2. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Developmentl, Third Edition, Pearson Education, 2005.

**PRACTICE LAB**

Writing Requirement Specification –Writing Use case- Designing Project - Object Oriented design with UML: Modeling Concepts and Diagrams - Use Case Diagrams - Class Diagrams -Interaction Diagrams - State chart Diagrams - Activity Diagrams - Package Diagrams -Component Diagrams – Deployment Diagrams - Component, Deployment Level Design Elements. Mapping Design to code – Reverse Engineering-Testing -Implementing Mini Project -Documentation.

**SOFTWARE:**

- IBM Rational Rose / AGRO UML / STAR UML
- Selenium/ ( any testing automated software)

**EC17451 ANALOG AND DIGITAL COMMUNICATION****L T P C**  
**3 0 0 3****OBJECTIVES:**

The student should be able to:

- Understand analog communication techniques.
- Acquire knowledge in digital communication techniques.
- Learn data and pulse communication techniques.
- Be familiarized with source and Error control coding.
- Gain knowledge on multi-user radio communication.
- 

**UNIT I ANALOG COMMUNICATION****9**

Noise: Source of Noise - External Noise- Internal Noise- Noise Calculation. Introduction to Communication Systems: Modulation – Types - Need for Modulation. Theory of Amplitude Modulation - Evolution and Description of SSB Techniques - Theory of Frequency and Phase Modulation – Comparison of various Analog Communication System (AM – FM – PM).

**UNIT II DIGITAL COMMUNICATION****9**

Amplitude Shift Keying (ASK) – Frequency Shift Keying (FSK) Minimum Shift Keying (MSK) – Phase Shift Keying (PSK) – BPSK – QPSK – 8 PSK – 16 PSK - Quadrature Amplitude Modulation (QAM) – 8 QAM – 16 QAM – Bandwidth Efficiency– Comparison of various Digital Communication System (ASK – FSK – PSK – QAM).

**UNIT III DATA AND PULSE COMMUNICATION****9**

Data Communication: History of Data Communication - Standards Organizations for Data Communication- Data Communication Circuits - Data Communication Codes - Error Detection and Correction Techniques - Data communication Hardware - serial and parallel interfaces. Pulse Communication: Pulse Amplitude Modulation (PAM) – Pulse Time Modulation (PTM) – Pulse code Modulation (PCM) - Comparison of various Pulse Communication System (PAM – PTM – PCM).

**UNIT IV SOURCE AND ERROR CONTROL CODING****9**

Entropy, Source encoding theorem, Shannon fano coding, Huffman coding, mutual information, channel capacity, channel coding theorem, Error Control Coding, linear block codes, cyclic codes, convolution codes, viterbi decoding algorithm.

**UNIT V MULTI-USER RADIO COMMUNICATION****9**

Advanced Mobile Phone System (AMPS) - Global System for Mobile Communications (GSM) - Overview of Multiple Access techniques-FDMA, TDMA, CDMA – Cellular Concept and Frequency Reuse - Channel Assignment and Handoff. Bluetooth.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

1. Attain knowledge in Analog communication techniques
2. Apply digital communication techniques in tele-communication.
3. Use data and pulse communication techniques.
4. Analyze Source and Error control coding.
5. Utilize multi-user radio communication.

**TEXT BOOK:**

1. Wayne Tomasi, —Advanced Electronic Communication Systems, 6th Edition, Pearson Education, 2009.

**REFERENCES:**

1. Simon Haykin, —Communication Systems, 4th Edition, John Wiley & Sons, 2004
2. Rappaport T.S, "Wireless Communications: Principles and Practice", 2nd Edition, Pearson Education, 2007
3. H.Taub, D.L.Schilling and G Saha, —Principles of Communication, 3rd Edition, Pearson Education, 2007.
4. B. P.Lathi, —Modern Analog and Digital Communication Systems, 3rd Edition, Oxford University Press, 2007.
5. Blake, —Electronic Communication Systems, Thomson Delmar Publications, 2002.
6. Martin S.Roden, —Analog and Digital Communication System, 3rd Edition, Prentice Hall of India, 2002.
7. B.Sklar, —Digital Communication Fundamentals and Applications, 2nd Edition, Pearson Education 2007.

**CS17301 DESIGN AND ANALYSIS OF ALGORITHMS**

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

**The student should be made to:**

- Learn the basic ideas of algorithm and analysis techniques.
- Understand the behaviour of various computer algorithms.
- Become familiar with the different algorithm design techniques.
- Learn to apply the design techniques in solving various kinds of problems.
- Understand the limitations of Algorithm power.

**UNIT I ANALYSIS OF ALGORITHMS****9**

Introduction - Algorithm Specification - Performance Analysis: Space Complexity - Time Complexity - Asymptotic Notations - Practical Complexities - Solving Recurrence Relations.

**UNIT II BRUTE FORCE AND DIVIDE-AND-CONQUER****9**

Brute Force: Exhaustive Search - Travelling Salesman Problem - Knapsack Problem - Assignment problem - Divide and Conquer: General Method - Binary search - Finding Minimum and Maximum Problem - Merge sort - Quick sort - Strassen's Matrix Multiplication.

**UNIT III GREEDY TECHNIQUE AND DYNAMIC PROGRAMMING****9**

Greedy: General Method - Container Loading - Knapsack - Huffman Codes - Dynamic Programming: General Method - OBST - String Editing - 0/1 Knapsack - Travelling Salesman Problem.

**UNIT IV BACKTRACKING AND BRANCH & BOUND****9**

Backtracking: General Method - 8 Queen's Problem - Sum of Subsets Problem - Graph Colouring - Hamiltonian Circuit Problem - Branch and Bound: FIFO - LC branch and bound - 0/1 Knapsack - Travelling Salesman Problem - Assignment Problem.

**UNIT V STRING MATCHING AND NP COMPLETE & NP HARD PROBLEMS****9**

String Matching: Naive String Matching - Rabin Karp - Knuth Morris Pratt - NP Hard and NP Complete Problems: Basic Concepts - Non Deterministic Algorithms - Class of NP Hard and NP Complete - Approximation for NP Hard Problems: Travelling Salesman problem.

**TOTAL: 45 PERIODS****OUTCOMES:****At the end of the course, the student should be able to:**

1. Prove the correctness and analyze the running time of the basic algorithms for those classic problems in various domains.
2. Analyze the time and space complexity of various algorithms.
3. Ability to compare algorithms with respect to complexities.
4. Apply design strategies and Synthesize algorithms for various computing problems.
5. Modify existing algorithms to improve efficiency.

**TEXT BOOKS:**

1. Ellis Horowitz, Shani, SanguthevarRajasekaran, "Computer Algorithms / C++" Universities Press, Second Edition 2008.
2. AnanyLevitin, —Introduction to the Design and Analysis of Algorithmsl, Third Edition, Pearson Education, 2012.

**REFERENCES:**

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, —Introduction to Algorithmsl, Third Edition, PHI Learning Private Limited, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, —Data Structures and Algorithmsl, Pearson Education, Reprint 2006.
3. Donald E. Knuth, -The Art of Computer Programmingl, Volumes 1& 3 Pearson Education, 2009.
4. Sara Baase Allen Van Gelder, "Computer Algorithms - Introduction to Analysis" Pearson Education Asia, 2010
5. Michael T. Goodrich , Roberto Tamassia , Michael H. Goldwasser, —Data Structures and Algorithms in Pythonl, John Wiley & Sons,2013.

**CY17251 ENVIRONMENTAL SCIENCE AND ENGINEERING****L T P C****3 0 0 3****OBJECTIVES:**

- To find the scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To study the importance of environment by assessing its impact on the human world.
- 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****12**

Definition, scope and importance of Risk and hazards; Chemical hazards, Physical hazards, Biological hazards in the environment – concept of an ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the forest ecosystem - grassland ecosystem - desert ecosystem - aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – Significance of medicinal plants - 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.

**UNIT II ENVIRONMENTAL POLLUTION****10**

Definition - causes, effects and control measures of Air pollution (Atmospheric chemistry - Chemical composition of the atmosphere; Chemical and photochemical reactions in the atmosphere - formation of smog, PAN, acid rain, oxygen and ozone chemistry- Mitigation procedures - Control of particulate and gaseous emission, Control of SO<sub>2</sub>, NO<sub>x</sub>, CO and HC) - Water pollution : Physical and chemical properties of terrestrial and marine water and their environmental significance - Water quality parameters – physical, chemical and biological; absorption of heavy metals - Water treatment processes. Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes – Marine pollution - Noise pollution - Thermal pollution - Nuclear hazards– e-Waste – toxic substances in e-waste – risks related to toxic substances – role of an individual in prevention of pollution – pollution case studies.

**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 overutilization of surface and ground 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 - energy production from waste materials. Energy Conversion processes – Biogas – production and uses, anaerobic digestion; 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. Introduction to Environmental Biochemistry: Proteins –Biochemical degradation of pollutants, Bioconversion of pollutants.

**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 – Principles of green chemistry - nuclear accidents and holocaust, case studies – wasteland reclamation – consumerism and waste products – environment protection act – Air act – Water act – Wildlife protection act – Forest conservation act – The Biomedical Waste (Management and Handling) Rules; 1998 and amendments- scheme of labelling of environmentally friendly products (Ecomark). Enforcement machinery involved in environmental legislation- central and state pollution control boards - disaster management: floods, earthquake, cyclone and landslides. Public awareness and case studies.

**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 – Dengue fever- Swine flu – women and child welfare – Environmental impact analysis (EIA)- GIS-remote sensing - role of information technology in environment and human health – Case studies. Effect of Radiation from computing devices.

**TOTAL: 45 PERIODS****OUTCOMES:**

On completion of the course students will be able to

1. Solve problems that cannot be solved by mere laws.
2. Get familiarized with ecological balance.
3. Get public awareness of environment at infant stage.
4. Find ways to protect the environment and play proactive roles.
5. Develop and improve the standard of better living.

**TEXTBOOKS:**

1. Benny Joseph, \_Environmental Science and Engineering‘, 2<sup>nd</sup> edition, Tata McGraw-Hill, New Delhi,2008.
2. Gilbert M.Masters, \_Introduction to Environmental Engineering and Science‘, 2<sup>nd</sup> edition, Pearson Education, 2004.

**REFERENCES :**

1. Dharmendra S. Sengar, \_Environmental law‘, Prentice hall of India Pvt Ltd, New Delhi, 2007.
2. Erach Bharucha, –Textbook of Environmental Studies|, 3<sup>rd</sup> edition, Universities Press(I) Pvt, Ltd, Hyderabad, 2015.
3. G. Tyler Miller and Scott E. Spoolman, —Environmental Sciencel, 15<sup>th</sup> edition, Cengage Learning India PVT, LTD, Delhi, 2014.
4. Rajagopalan, R, \_Environmental Studies-From Crisis to Cure‘, 3<sup>rd</sup> edition,Oxford University Press,2015.

**CS17411 OPERATING SYSTEMS LABORATORY****L T P C  
0 0 4 2****OBJECTIVES:**

**The student should be made to:**

- To Learn basic Linux commands and Shell scripts.
- To implement IPC and various System Calls.
- To implement CPU scheduling algorithms, Deadlock avoidance and Semaphore.
- To design various Page replacement and File Allocation strategies.
- To learn the installation and configuration of Linux OS.

**List of Experiments**

1. Installation and Configuration of Linux in a Virtual Machine.
2. Basic Linux commands
3. Shell Scripting.
4. Demonstrate the use of awk scripts to extract data.
5. File System related System Calls.(Learn to create, open, read, write, close files; Open, read, write, search, close directories).

6. Process Management – Operation on Processes.
7. Inter-process communication using Shared Memory.
8. Inter-process communication using message queues or pipes.
9. CPU Scheduling algorithms.
10. Implementation of Producer Consumer problem using Semaphore.
11. Deadlock Avoidance algorithm.
12. Contiguous Memory Allocation Strategies
13. Implementation of File Allocation Strategies.
14. Page Replacement Algorithms.
15. Customization of Linux Kernel.
16. Mini Project.

**TOTAL: 60 PERIODS**

**OUTCOMES:**

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

1. Apply Linux commands and design shell scripts.
2. Create processes and implement IPC.
3. Compare the performance of various CPU Scheduling Algorithms.
4. Analyze the performance of the various page replacement algorithms.
5. Configure and perform Customization of Linux Kernel.

**REFERENCES:**

<http://spoken-tutorial.org>

**SOFTWARE:**

Standalone desktops with C / Python / Equivalent compiler.

**IT17411 INFORMATION SYSTEMS ANALYSIS AND DESIGN LABORATORY**

**L T P C**

**3 0 0 3**

**OBJECTIVES:**

- Introduce the students to the traditional practices of specification, analysis, design, implementation, evaluation of design and operation of information systems.
- Identify the functional and non functional needs of the system.
- Practice different techniques of analysis, design and implementation.
- Practice design of various types of information systems.
- Learn the tools of Project Management.

To develop Information Systems which is elaborated as an outcome of analysis and design as listed below:

1. Project identification and initiation
2. Feasibility analysis
3. Analysis of business requirement
  - Business process modelling
  - Information requirement
  - Data collection methods
  - Methods for structuring and communicating requirements
  - Formal specification and verification
4. System design and development strategies
  - use cases and develop the use case model - elaborated use case description
  - Design the business activities

- User interface design
  - Data flow diagram(DFD)
  - Entity relationship diagram(ER)
  - Draw the partial layered, logical architecture diagram with UML package diagram notation
  - Design class diagram, sequence diagram, behavioral state machine diagram
5. Implement the technical services layer.
  6. Implement the domain objects layer.
  7. Implement the user interface layer.
  8. Draw component and deployment diagrams
  9. Project management tool
    - Pert
    - Gantt chart

Suggested domains for information system mini-project development

1. Executive support system(ESS)
2. Management information system(MIS)
3. Decision support system(DSS)
4. Automation system(AS)
5. Transaction processing system(TPS)

**TOTAL: 60 PERIODS**

#### **OUTCOMES:**

By the end of the course the students will be able to

1. Use various techniques of analysis and design to specify the information system as a whole.
2. Understand analysis and design to design the system better knowing various tacit needs of information systems.
3. Understand the purpose and use of CASE tools.
4. Develop various viewpoints and much detailed design for variety of information systems.
5. Identify current industry standards and practices for information systems and their development and management.

#### **LAB EQUIPMENTS FOR A BATCH OF 30 STUDENTS:**

##### **SUGGESTED SOFTWARE TOOLS:**

Rational Suite (or) Argo UML (or) equivalent  
Smart Draw tool for DFD, ER Diagrams

##### **SOFTWARE TOOLS**

30 user License Rational Suite Open Source Alternatives: ArgoUML

<b>HS17461</b>	<b>ADVANCED READING AND WRITING</b>	<b>L T P C</b>
	<b>(COMMON TO CSE, IT, MECH, BT, CIVIL &amp; AUTO)</b>	<b>0 0 2 1</b>

#### **OBJECTIVES:**

**The student should be made to:**

- Enhance the employability skills of the the students with a special focus on critical thinking, reading and writing.
- Enhance proficiency in the language and the ability to write compare and contrast essays effectively.

<b>UNIT I</b>	<b>PRIMITIVE READING AND FREE WRITING</b>	<b>6</b>
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Reading – Primitive Reading: Reading stories. Skimming: browse through a book or a long passage, understand the gist of a text. Writing: Free writing – writing about oneself/ family/ native/ hobbies/ festivals, etc. Grammar: Sentence Structure.

<b>UNIT II</b>	<b>SCANNING AND EXPOSITORY WRITING</b>	<b>6</b>
Reading - Scanning: Guessing meaning from the context, surveying the text. Writing – Narrative Writing: Narrating a story, incident or past events. Grammar – Imperative Sentences.		
<b>UNIT III</b>	<b>INTENSIVE READING AND DESCRIPTIVE WRITING</b>	<b>6</b>
Reading – Intensive Reading: Drawing inferences from the text, responding critically to the text. Writing – Descriptive Writing: an incident, place, person, process, etc. Grammar – Different kinds of adjectives.		
<b>UNIT IV</b>	<b>EXTENSIVE READING AND COMPARATIVE WRITING</b>	<b>6</b>
Reading – Extensive Reading: Reading wide range of articles for better understanding, etc. Writing – Compare and Contrast: two things/ places/ persons/ ideas, etc. Grammar – Connectives.		
<b>UNIT V</b>	<b>INFERENTIAL WRITING AND ARGUMENTATIVE/ PERSUASIVE WRITING</b>	<b>6</b>
Reading – Inferential Reading: draw upon prior knowledge, draw conclusions and make inferences. Writing – Argumentative and Persuasive Writing: establishing facts, forming and stating conclusions. Grammar – Conjunctions, Cohesive Devices		
<b>TOTAL: 30 PERIODS</b>		

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

1. Skim through columns and magazines and write on simple topics with proper sentence structures.
2. Read comprehensively and understand the thoughts of the writer and report clearly in detail about the happenings around.
3. Comprehend and answer questions based on the texts/passages given and write descriptive essays.
4. Read different genres of texts and comprehend the materials to improve their vocabulary and are familiar with new words, phrases, sentence structures and ideas.
5. Read between lines, draw conclusions with their prior knowledge on the subject and persuade their readers with their flawless writing skills.

**REFERENCES:**

1. Bridge to College Success – Intensive Academic Preparation for Advanced Students – Robertson.
2. Source Work – Academic Writing from Sources Second Edition - Dellahite, Haun, Heinle / Cengage Learning, 2012.
3. Aebersold, Jo Ann and Field M. L. 1997, From Reader to Reading teacher, Cambridge, Cambridge University Press, Anderson, R. C. 1996.
4. Bamford, Julian and Day, R. R. 1997, Extensive Reading: What is it? Why Bother? Language Teacher Online.



4. Steven S. Muchnick, —Advanced Compiler Design and Implementation, —Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.
5. Keith D Cooper and Linda Torczon, —Engineering a Compiler, Morgan Kaufmann Publishers Elsevier Science, 2004.
6. Charles N. Fischer, Richard. J. LeBlanc, —Crafting a Compiler with Cl, Pearson Education, 2008.

**CS 17403****COMPUTER NETWORKS****L T P C  
3 0 0 3****OBJECTIVES:****The student should be made to:**

- Make on understanding the principles of computer networking.
- Be exposed on the required functionality at each layer.
- To understand the Routing mechanisms.
- Learn the connection and congestion control mechanisms.
- Acquire knowledge of SDN and its operations.

**UNIT I FUNDAMENTALS AND DATA LINK LAYER 9**

Building a network – Requirements – Topologies – OSI Model – TCP/IP architecture – Performance - Link layer Services - Framing – Error Detection and Correction - Flow control

**UNIT II MEDIA ACCESS AND INTERNETWORKING 9**

Media Access Protocols – CSMA/CA/CD – ALOHA - Ethernet –Gigabit Ethernet - Wireless LANs - 802.11- Bluetooth -Switching and bridging – Basic Internetworking- IP Service Model - Global Addresses – Sub netting – CIDR – ARP - DHCP - ICMP

**UNIT III ROUTING 9**

Routing – Distance Vector – Link State – Global Internet – Inter Domain Routing –IPv4 - IPv6 – Multicast routing - DVMRP- PIM

**UNIT IV TRANSPORT AND APPLICATION LAYER 9**

Overview of Transport layer – UDP – TCP - Segment Format – Connection Management – TCP Congestion control – SMTP- POP3- IMAP - MIME – HTTP – DNS

**UNIT V SOFTWARE DEFINED NETWORKS 9**

Introduction to SDN - Control and Data Planes - SDN Controllers – VMWare - Data Center - Multi Tenant Data Centre - Network Function Virtualization - Virtualization and Data Plane I/O.

**TOTAL: 45 PERIODS****OUTCOMES:****At the end of the course, the student should be able to:**

1. Study the Principles of Networking
2. Understand the layering functionality in network design
3. Understand the routing mechanisms in networks
4. Use an appropriate tools to design and implement network systems
5. Abstract the control plane and analyze the network functions virtualization.

**TEXT BOOKS:**

1. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers, 2011.
2. Thomas D. Nadeau & Ken Gray , SDN - Software Defined Networks , O'Reilly, 2013.

**REFERENCES:**

1. Behrouz A. Forouzan, Data communication and Networking, Fourth Edition, Tata McGraw – Hill, 2011.
2. Andrew S. Tanenbaum, Computer Networks, Fourth Edition, Prentice Hall of India, 2003.
3. James F. Kurose, Keith W. Ross, Computer Networking – A Top-Down Approach Featuring the Internet , Pearson Education, New Delhi, 2009.
4. William Stallings, Data and Computer Communication, Sixth Edition, Pearson Education, 2000.

**CS17501****DISTRIBUTED SYSTEMS****L T P C****3 0 0 3****OBJECTIVES:****The students should be made to:**

- Explain the goals and types of Distributed Systems.
- Describe distributed OS and Communications.
- Learn about Distributed objects and File System.
- Emphasize the benefits of using Distributed Transactions and Concurrency.
- Learn issues related to developing fault-tolerant systems and Security.

**UNIT I INTRODUCTION****9**

Introduction to Distributed systems – Design Goals - Types of Distributed Systems - Architectural Styles – Middleware - System Architecture – Centralized and Decentralized organizations – Peer-to-Peer System – Case Study: Skype and Bittorrent

**UNIT II OPERATING SYSTEMS AND COMMUNICATIONS****9**

Process – Threads – Virtualization – Client-Server Model - Case Study: Apache Web server -Code Migration- Communication: Fundamentals - Remote Procedure Call – Stream oriented communication – Message oriented communication – Multicast communication

**UNIT III DISTRIBUTED OBJECTS AND FILE SYSTEM****9**

Remote Invocation – Request Reply Protocol - Java RMI - Distributed Objects - CORBA - Introduction to Distributed File System - File Service architecture – Andrew File System, Sun Network File System - Introduction to Name Services- Name services and DNS - Directory and directory services - Case Study: Google File System

**UNIT IV DISTRIBUTED TRANSACTIONS AND CONCURRENCY****9**

Clock Synchronization – Logical Clocks – Global States – Mutual Exclusion - Election Algorithms– Data-Centric Consistency Models – Client-Centric Consistency Models – Distribution Protocol – Consistency Protocol

**UNIT V FAULT TOLERANCE AND SECURITY****9**

Introduction to Fault Tolerance – Process Resilience – Reliable Communications – Distributed Commit – Recovery – Introduction to Security – Secure Channels – Access Control – Secure Naming - Security Management.

**TOTAL: 45 PERIODS****OUTCOMES:****At the end of the course, should be able to:**

1. Discuss trends in Distributed Systems.
2. Apply network virtualization.
3. Apply remote method invocation and objects.
4. Design process and resource management systems.



5. Discuss security issues in Distributed Systems.

**TEXT BOOKS:**

1. Tanenbaum, A. and van Steen, M., Distributed Systems: Principles and Paradigms, Second Edition, Prentice Hall, 2007.
2. Coulouris, G, Dollimore, J., and Kindberg, Distributed Systems: Concepts and Design, Fourth Edition, Addison-Wesley, 2006.

**REFERENCES:**

1. Pradeep K Sinha Distributed Operating Systems, Prentice-Hall of India, First Edition, New Delhi, 2001.
2. Jean Dollimore, Tim Kindberg, George Coulouris, Distributed Systems -Concepts and Design, Pearson Education, Fourth edition, 2005.
3. M.L. Liu Distributed Computing Principles and Applications, Pearson Education, First edition, 2004.
4. Hagit Attiya and Jennifer Welch Distributed Computing: Fundamentals, Simulations and Advanced Topics, Wiley, First edition, 2004.

**IT17502 WEB TECHNOLOGY****L T P C  
3 0 0 3****OBJECTIVES:**

- To learn about HTML5 & CSS3 Concepts.
- To be familiar with Client side validation.
- Understand the emerging technologies in Server-Side Programming using Servlets and JSP's.
- To know the concepts of PHP and AJAX to develop web pages
- To expose knowledge about XML and web service.

**UNIT I MARKUP LANGUAGE & CSS****8**

HTML5–Introduction-Elements-RelativeURLs-Lists-Tables-Frames-Forms-Canvas-Graphics and Media.CSS:CSS3-Introduction-Properties-Background,Fonts,Text,Image,Link, 2d transform,3d transform,Animation-Box Model-Multicolumn Layout.

**UNIT II SCRIPTING****10**

Client-Side Scripting: Introduction to JavaScript-Syntax-Variables and Data Types-Statements-Operators-Literals-Functions-Objects-Arrays-Built-inObjects.DOM-Introduction-Nodes & Trees-Traversing & Modifying a DOM Tree-DOM Collections.

**UNIT III SERVLET****9**

Server-Side Programming: Java Servlets-Life cycle of a Servlet- The Servlet API-Handling HTTP Request and Response using Cookie and Session Tracking.Connecting with Database.

**UNIT IV JSP & PHP****10**

JSP Introduction-Life cycle of JSP-JSP API-Scripting elements-Directive elements-Implicit objects-Action Elements-Exception Handling-MVC in JSP-Connecting with Database. AJAX introduction-XMLHttpRequest- Methods,Properties.

Hypertext Preprocessor: Introduction,Syntax,Variables,Control Statement,Arrays,Strings-Connecting with Database-PHP & AJAX.

**UNIT V XML & WEB SERVICES****8**

XML: Basic-Document Type Definition-XML Schema-XSL and XSLT. Web services-Architecture-WSDL introduction-WSDL Elements-SOAP-Application using Web Services.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

At the end the student will be able to

1. Create and publish a web page using HTML5 & CSS3.
2. Build dynamic page with Client side validation using Java script.
3. Develop 2 tier or n tier web application using Servlets and JSP.
4. Design interactive web page using PHP and AJAX.
5. Build SOA based application using XML and web service.

**TEXTBOOKS:**

1. Harvey & Paul Deitel & Associates, Harvey Deitel and Abbey Deitel, —Internet and World Wide Web - How To Program, Fifth Edition, Pearson Education, 2011.
2. Robin Nixon, „Learning PHP, MySQL & Javascript“, Fourth Edition, 2015.

**REFERENCES:**

1. Jeffrey C. Jackson, –Web Technologies-- A Computer Science Perspective, Pearson Education, 2011.
2. Robert W. Sebesta, —Programming the World Wide Web, Addison-Wesley, Sixth Edition, 2010.
3. Uttam K. Roy, —Web Technologies, Oxford University Press, 1st Edition, 2010.

**IT7503****EMBEDDED PROGRAMMING****L T P C  
3 0 0 3****OBJECTIVES:**

- To teach the fundamentals of Embedded processor Modeling , Bus Communication in processors
- To make the students familiar with Input/output interfacing
- To introduce on processor scheduling algorithms , Basics of Real time operating system
- To discuss on aspects required in developing a new embedded processor, different Phases & Modeling of embedded system
- To involve Discussions/ Practice/Exercise onto revising & familiarizing the concepts acquired over the 5 Units of the subject for improved employability skills

**UNIT I INTRODUCTION TO EMBEDDED SYSTEMS****9**

Introduction to Embedded Systems – The build process for embedded systems- Structural units in Embedded processor , selection of processor & memory devices- DMA – Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock, In circuit emulator, Target Hardware Debugging.

**UNIT II EMBEDDED NETWORKING****9**

Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus communication protocols - RS232 standard – RS422 – RS485 - CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits(I2C)–need for device drivers.

**UNIT III EMBEDDED FIRMWARE DEVELOPMENT ENVIRONMENT****9**

Embedded Product Development Life Cycle- objectives, different phases of EDLC, Modelling of EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model, Sequential Program Model, concurrent Model, object oriented Model.

**UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN****9**

Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task communication

shared memory, message passing-, Inter process Communication – synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance, comparison of Real time Operating systems: Vx Works, µC/OS-II, RT Linux.

## **UNIT V EMBEDDED SYSTEM APPLICATION DEVELOPMENT**

9

Case Study of Washing Machine- Automotive Application- Smart card System Application

**TOTAL : 45 PERIODS**

### **OUTCOMES:**

1. The learning process delivers insight into design & development of computational processors
2. Able to work with other peripherals.
3. Automated process with improved design strategies.
4. Knowledge up gradation on recent trends in embedded systems design.
5. Improved Employability and entrepreneurship capacity

### **TEXT BOOKS:**

1. Rajkamal, \_Embedded system-Architecture, Programming, Design\_, TMH, 2011.
2. Peckol, —Embedded system Design, John Wiley & Sons, 2010

### **REFERENCES:**

1. Lyla B Das, || Embedded Systems-An Integrated Approach ||, Pearson, 2013
2. Elicia White, || Making Embedded Systems ||, O'Reilly Series, SPD, 2011
3. Bruce Powel Douglass, || Real-Time UML Workshop for Embedded Systems ||, Elsevier, 2011
4. Michael Blaha and James Rumbaugh, || Oriented Modeling and Design with UML ||
5. Jorgen Staunstrup, Wayne Wolf, —Hardware/Software Co-Design: Principles and Practice ||, Kluwer Academic Pub, 1997.
6. Shibu.K.V, —Introduction to Embedded Systems ||, Tata McGraw Hill, 2009
7. Tammy Noergaard, || Embedded System Architecture, A comprehensive Guide for Engineers and Programmers ||, Elsevier, 2006
8. Jonathan W. Valvano, || Embedded Microcomputer Systems, Real Time Interfacing ||, Cengage Learning, 3rd edition, 2012

**CS17412**

**COMPUTER NETWORKS LABORATORY**

**L T P C**

**0 0 4 2**

### **OBJECTIVES:**

**The student should be made to:**

- Understand the working of sockets in networks.
- Create the scenario and study the performance of various network protocols at different layers of a network hierarchy through simulation.
- Configure routers and switches which are principal components of a network.
- Understand network security issues.
- Know how the resource is efficiently allocated to various entities that participate in data communications.

### **LIST OF EXPERIMENTS:**

1. Configuration of Network in Linux
2. Assign IP Address
3. Subnet mask
4. Default Gateway
5. Primary and Secondary DNS
6. Testing server connectivity using PING
7. Design, Build & Configure Networks using Cisco Packet Tracer (Simulation Tool)
8. Study & Implement the different types of Network Cables (RS 232C)
9. Setup a Local Area Network (Switches) – Minimum 3 nodes and Internet

10. Write a socket program Remote Procedure Call using connection / connectionless oriented protocols
11. Create a socket to retrieve the weather data from a remote sensor
12. Write a Crawler program that can match patterns between the client & server
13. Create a socket to retrieve the meaning of words from an online dictionary server.
14. Identify the various port & its usage using NMAP
15. Create a socket to retrieve the meaning of words from an online dictionary server.
16. To capture, save, and analyze network traffic on TCP / UDP / IP / HTTP / ARP /DHCP /ICMP / DNS using Wireshark Tool.
17. Install and Configure DNS server in Linux.
18. Write a code using raw sockets to implement packet Sniffing.
19. Perform a case study using OPNET / NS3 about the different routing algorithms to select the network path with its optimum and economical during data transfer.
20. Link State routing
21. Distance Vector Routing
22. Analyze the different types of servers using Webalizer

**TOTAL: 60 PERIODS**

**OUTCOMES:**

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

1. Acquire knowledge of using simulators for different connections.
2. Deploy Operate and Troubleshoot network layers.
3. Monitor the traffic within the network & analyse the transfer of packets.
4. Use IP addressing and apply routing algorithms to find shortest paths.
5. Use networking tools to observe and analyze behaviours of networking protocols.

**LEARNING RESOURCES:**

1. Dr. M. O. FaruqueSarker& Sam Washington, Learning Python Network Programming : Packt Publishing,2015
2. Dr. M. O. FaruqueSarker, Python Network Programming Cookbook : Packet Publishing,2015
3. Kurose and Ross, Computer Networking: A Top-Down Approach Featuring the Internet (Sixth edition), Addison Wesley (recommended)
4. Wireshark packet sniffer available at<http://www.wireshark.org>

**SOFTWARE:**

- C / Python 3
- Network simulator like NS3 / OPNET / CISCO Packet Tracer / NMAP /Webalizer

**IT17511      WEB TECHNOLOGY LABORATORY**

**L T P C  
0 0 4 2**

**OBJECTIVES:**

The student should be able to:

- Be familiar with Web page design using HTML / DHTML and style sheets.
- Be exposed to validate the Web page.
- Learn to create dynamic web pages using server side scripting.
- Learn to write PHP database functions.
- Be exposed to implement web service for simple application.

**LIST OF EXPERIMENTS**

1. Write a html program for Creation of web site with forms, frames, links, tables etc
2. Design a web site using HTML and DHTML. Use Basic Text Formatting, Images etc.

3. Create a web page with the following using HTML5 (i) To embed an image map in a web page (ii) To fix the hot spots (iii) Show all the related information when the hot spots are clicked.
4. Create a web page with all types of Cascading style sheets.
5. Design a Scientific calculator using Java script.
6. Design a Registration form and validate.
7. Create a script that collects numbers from a page and then adds them up and prints them to a blank field on the page.
8. Simple Program using JSP and Servlet.
9. Write programs in Java using Servlets -To invoke servlets from HTML forms.
10. Write programs in Java to create three-tier applications using JSP and Databases for conducting on-line examination for displaying student mark list. Assume that student information is available in a database which has been stored in a database server.
11. Design a web page to calculate the factorial of a given number using PHP.
12. Program using PHP database functions.
13. Create a web page to perform arithmetic operation using PHP
14. Programs using XML – Schema – XSLT/XSL.
15. Create a simple XMLHttpRequest, and retrieve data from a TXT file.
16. Write a program to implement web service for calculator application.
17. Consider a case where we have two web Services- an airline service and a travel agent and the travel agent is searching for an airline. Implement this scenario using Web Services and Database.

**TOTAL:60 PERIODS**

**Requirement for a batch of 30 students**

**1.Hardware:**

Standalone desktops 30

**2.Software:**

Windows /Linux operating system  
JDK 1.6(or above)  
Oracle 9i(or above version) / Mysql  
Apache Server or Equivalent  
access30 user license

**OUTCOMES:**

At the end the student will be able to

1. Design Web pages using HTML/DHTML and style sheets.
2. Design and Implement Client- Side Validation.
3. Develop an application using AJAX.
4. Create dynamic web pages using server side scripting.
5. Built a simple application using web service.

**IT17512 EMBEDDED PROGRAMMING LABORATORY****L T P C  
0 0 4 2****OBJECTIVES:**

- To introduce about the basic functions of embedded systems
- To enable the students to understand the basic structure of embedded systems
- To make the Students familiar with the basic concepts of embedded systems
- Introduce students to embedded systems design tools and hardware programmers
- To make the students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

**LIST OF EXPERIMENTS**

1. Study of ARM evaluation system
2. Interfacing ADC and DAC.
3. Interfacing LED and PWM.
4. Interfacing real time clock and serial port.
5. Interfacing keyboard and LCD.
6. Interfacing GSM module
7. Mailbox.
8. Interrupt performance characteristics of ARM and FPGA.
9. Flashing of LEDS.
10. Interfacing stepper motor and temperature sensor.
11. Implementing zigbee protocol with ARM.

**TOTAL: 60 PERIODS****Hardware Requirements(Sciencetech Make):**

1. ARM kit-PICOIMX6S10R512SDBW – 4 numbers
2. I<sup>2</sup>C ADC AND DAC MODULE – 8NUMBERS
3. Display module- 4 numbers
4. Real time clock module – 4 numbers
5. Computer interface module- 4 number
6. Zigbee module- 4 numbers
7. GSM Module- 4 numbers
8. Sensor Module- 4 numbers
9. Stepper motor module with motor – 4 numbers
10. LEDS- 100 numbers of different colours

**OUTCOMES:**

1. Experience with a set of tools for embedded systems programming and debugging.
2. Experience with implementing several embedded systems with particular focus on the interaction between multiple devices
3. Design products using microcontrollers and various analog and digital ICs
4. Can read the datasheet for any embedded system, understand how it works.
5. Develop existing embedded systems by formulating the system design problem including the design constraints, create a design that satisfies the constraints, implement the design in hardware and software, and measure performance against the design constraints.

**SEMESTER VI****IT17601****COMPUTATIONAL INTELLIGENCE****L T P C  
4 0 0 4****OBJECTIVES:**

- To understand the fundamental concepts of computational Intelligence.
- To know the fundamentals of rule based systems and fuzzy expert systems.
- To acquire the knowledge of artificial neural networks.
- To understand the concepts of evolutionary computations.
- To expose the concepts of hybrid intelligent systems.

**UNIT I INTRODUCTION****9**

Introduction to Computational Intelligence - Intelligence machines - Computational intelligence paradigms: Artificial Neural Networks, Evolutionary Computation, Swarm Intelligence, Artificial Immune Systems, Fuzzy Systems. -Short history.

(Text Book 1: Chapter 1, Text Book 2: Chapter 1)

**UNIT II RULE-BASED EXPERT SYSTEMS AND FUZZY EXPERT SYSTEMS****9**

Rule-based expert systems - Uncertainty management in rule-based expert systems- Fuzzy expert systems: Fuzzy sets and operations of fuzzy sets - Fuzzy rules and fuzzy inference - Case Studies.

(Text Book 2: Chapter 2-4)

**UNIT III ARTIFICIAL NEURAL NETWORKS****9**

The Artificial Neuron – Supervised Learning Neural Networks – Unsupervised Learning Neural Networks-Performance Issues (Supervised Learning)

(Text Book 1: Chapter 2-4, 7)

**UNIT IV EVOLUTIONARY COMPUTATION****9**

Introduction to Evolutionary Computation-Genetic Algorithms: Canonical Genetic Algorithm, Crossover, Mutation, Control Parameters, Genetic algorithm variants-Genetic Programming-Evolution Strategies- Case studies

(Text Book 1: Chapter 8-10, 12) (Text Book 2: Chapter 7)

**UNIT V HYBRID INTELLIGENT SYSTEMS****9**

Hybrid Intelligent Systems - Neural expert systems - Neuro-fuzzy systems - Evolutionary neural networks-fuzzy evolutionary systems

(Text Book 2: Chapter 8)

**TOTAL: 45 PERIODS****TEXT BOOKS:**

1. A.P. Engelbrecht, Computational Intelligence: An Introduction, 2nd Edition, John Wiley & Sons, 2012.
2. M. Negnevitsky, Artificial Intelligence: A Guide to Intelligent Systems, 3rd Edition, Pearson/Addison Wesley, 2011.

**REFERENCES:**

1. H.K. Lam, S.S.H. Ling, and H.T. Nguyen, Computational Intelligence and Its Applications: Evolutionary Computation, Fuzzy Logic, Neural Network and Support Vector Machine, Imperial College Press, 2011.
2. E. Turban, J. E. Aronson, T.-P. Liang, Decision Support Systems and Intelligent Systems, 8th Ed., Pearson Prentice Hall, 2012.
3. E. Cox, The Fuzzy Systems Handbook, Boston: AP Professional, 1998
4. S. Russell and P. Norvig. Artificial Intelligence – A Modern Approach, Prentice Hall, 2010.

**OUTCOMES:**

Upon successful completion of this course, Students shall be able to

1. Apply the fundamental concepts of computational Intelligence.
2. Develop rule based systems and fuzzy expert systems
3. Implement the concepts of artificial neural networks.
4. Analyze how evolutionary computations are employed to various applications.
5. Design hybrid intelligent systems.

**CS17504 CRYPTOGRAPHY AND NETWORK SECURITY**

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

**The student should be made to:**

- Basics of encryption and Number Theory.
- Methods of public key encryption.
- Authentication and hash functions.
- Techniques of system level securities.
- Current trends on wireless security.

**UNIT I INTRODUCTION & NUMBER THEORY 9**

Services, Mechanisms and attacks-the OSI security architecture-Network security model-Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography)-Finite Fields and Number Theory: Modular arithmetic- Euclid's algorithm-Finite fields- Polynomial Arithmetic –Prime numbers-Fermat's and Euler's theorem- Testing for primality - The Chinese Remainder theorem- Discrete logarithms.

**UNIT II BLOCK CIPHERS & PUBLIC KEY CRYPTOGRAPHY 9**

Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES. Public key cryptography: Principles of public key cryptosystems-The RSA algorithm-Key management-Attacks on RSA - Diffie Hellman Key exchange- Elliptic curve arithmetic-Elliptic curve cryptography - Side channel analysis- side channel attacks.

**UNIT III HASH FUNCTIONS AND DIGITAL SIGNATURES 9**

Authentication requirement – MAC – Hash function – MD5 - SHA - HMAC –Digital signature and authentication protocols – DSS– Blockchain - Case Study: Bitcoin – Ethereum – Zcash.

**UNIT IV SECURITY PRACTICE & SYSTEM SECURITY 8**

Kerberos – X.509 - Firewall types and design - SET - Intrusion detection system – Malicious software- Antivirus: introduction - signatures - current trends in antivirus protection

**UNIT V E-MAIL, IP, WEB & WIRELESS LAN SECURITY 10**

E-mail Security: Pretty Good Privacy-S/MIME. IPSecurity: Overview of IPsec - IP and IPv6- Authentication Header-Encapsulation Security Payload (ESP)-Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding). Web Security: SSL/TLS Basic Protocol-computing the keys- client authentication- Wireless LAN Security: Wi-Fi Protected Access (WPA) .

**TOTAL: 45 PERIODS**



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

1. The methods of conventional encryption and Number Theory.
2. The concepts of Public Key Encryption.
3. Methodology for Authentication and Hashing.
4. Comprehending System Level Securities.
5. Perceiving Wireless Security.

**TEXT BOOKS:**

1. William Stallings , Cryptography and Network Security-Principles and Practices, Seventh Edition, Pearson Education, 2017
2. Christo Paar and Jan Pelzl ,Understanding Cryptography: A Textbook for Students and Practioners, First Edition, Springer, 2010
3. Joxean Koret and Elias Bachaalany, The Antivirus Hackers Handbook, First Edition, Wiley, 2015

**REFERENCES:**

1. Yehuda Lindell and Jonathan Katz, Introduction to Modern Cryptography, Second Edition, CRC Press, 2015
2. Bruce Schneier , Applied Cryptography: Protocols, Algorithms and Source Code in C, Special Edition, Wiley, 2015
3. Atul Kahaet, Cryptography and Network Security, Third Edition, Tata McGraw-Hill, 2013
4. Imran Bashir, Mastering Blockchain: Deeper insights into decentralization, cryptography, bitcoin and popular Blockchain frameworks, First Edition, Packt, 2017

**IT17602 MOBILE COMMUNICATION****L T P C  
3 0 0 3****OBJECTIVES:**

- Understand the basic concepts of mobile computing
- Be familiar with the network protocol stack
- Learn the basics of mobile telecommunication
- Be exposed to Ad-Hoc networks
- Gain knowledge about different mobile platforms and application development

**UNIT I WIRELESS COMMUNICATION****7**

Cellular systems- Frequency Management and Channel Assignment- types of handoff and their characteristics, dropped call rates & their evaluation -MAC – SDMA – FDMA –TDMA – CDMA – Cellular Wireless Networks

**UNIT II WIRELESS NETWORKS****9**

Wireless LAN – IEEE 802.11 Standards – Architecture – Services – Mobile Ad hoc Networks- WiFi and WiMAX - Wireless Local Loop

**UNIT III MOBILE COMMUNICATION SYSTEMS****11**

GSM-architecture-Location tracking and call setup- Mobility management- Handover-Security-GSM SMS –International roaming for GSM- call recording functions-subscriber and service data mgt – Mobile Number portability -VoIP service for Mobile Networks –GPRS –Architecture-GPRS procedures-attach and detach procedures-PDP context procedure-combined RA/LA update procedures-Billing

**UNIT IV MOBILE NETWORK AND TRANSPORT LAYERS 9**

Mobile IP – Dynamic Host Configuration Protocol-Mobile Ad Hoc Routing Protocols–Multicast routing-TCP over Wireless Networks – Indirect TCP – Snooping TCP – MobileTCP – Fast Retransmit / Fast Recovery – Transmission/Timeout Freezing-SelectiveRetransmission – Transaction Oriented TCP- TCP over 2.5 / 3G wireless Networks

**UNIT V APPLICATION LAYER 9**

WAP Model- Mobile Location based services -WAP Gateway –WAP protocols – WAPuser agent profile- caching model-wireless bearers for WAP - WML – WMLScripts - WTA- iMode-SyncML.

**TOTAL : 45 PERIODS****1. OUTCOMES:**

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

1. Explain the basics of mobile telecommunication system
2. Choose the required functionality at each layer for given
3. application Identify solution for each functionality at each layer
4. Use simulator tools and design Ad hoc networks
5. Develop a mobile application.

**TEXT BOOKS:**

1. Jochen Schiller, —Mobile Communications, Second Edition, Pearson Education, 2003.
2. William Stallings, –Wireless Communications and Networks, Pearson Education,2002.

**REFERENCES:**

1. Yi Bing Lin Inrich chlamta Wireless and mobile network architecture, John Wiley & Sons,2001.
2. Ivan Stojmenovic Handbook Of Wireless Network And Mobile Computing, John Wiley & Sons,2002.
3. William C..Y. Leel Mobile Cellular Telecommunications, McGraw-Hill, 1989.

**IT17603/CS17E62****AGILE METHODOLOGIES****L T P C  
3 0 0 3****OBJECTIVES:****The student should be made to:**

- Understand the background and driving forces for taking an Agile approach to software development
- Understand the business value of adopting Agile approaches
- Understand the Agile development practices
- Apply design principles and refactoring to achieve Agility
- Drive development with unit tests using Test Driven Development

**UNIT I FUNDAMENTALS OF AGILE 9**

The Genesis of Agile- Introduction and background Agile Manifesto and Principles- Overview of Scrum- Extreme Programming- Feature Driven development- Lean Software Development- Agile project management- Design and development practices in Agile projects- Test Driven Development- Continuous Integration- Refactoring- Pair Programming- Simple Design- User Stories- Agile Testing- Agile Tools

**UNIT II AGILE SCRUM FRAMEWORK 9**

Introduction to Scrum- Project phases- Agile Estimation- Planning game- Product backlog- Sprint backlog- Iteration planning- User story definition- Characteristics and content of user stories- Acceptance tests and Verifying stories- Project velocity- Burn down chart- Sprint planning and

retrospective- Daily scrum- Scrum roles – Product Owner- Scrum Master- Scrum Team- Scrum case study- Tools for Agile project management

**UNIT III AGILE TESTING 8**

The Agile lifecycle and its impact on testing- Test-Driven Development (TDD)- xUnit framework and tools for TDD- Testing user stories - acceptance tests and scenarios- Planning and managing testing cycle- Exploratory testing- Risk based testing- Regression tests- Test Automation- Tools to support the Agile tester

**UNIT IV AGILE SOFTWARE DESIGN AND DEVELOPMENT 10**

Agile design practices- Role of design Principles including Single Responsibility Principle- Open Closed Principle- Liskov Substitution Principle- Interface Segregation Principles- Dependency Inversion Principle in Agile Design- Need and significance of Refactoring- Refactoring Techniques- Continuous Integration- Automated build tools- Version control

**UNIT V INDUSTRY TRENDS 9**

Market scenario and adoption of Agile- Agile ALM- Roles in an Agile project- Agile applicability- Agile in Distributed teams- Business benefits- Challenges in Agile- Risks and Mitigation- Agile projects on Cloud- Balancing Agility with Discipline- Agile rapid development technologies.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

1. Develop Agile Process
2. Drive development with unit tests using Test Driven Development
3. Apply design principles and refactoring to achieve Agility
4. Deploy automated build tools, version control and continuous integration
5. Perform testing activities within an Agile project

**TEXT BOOKS:**

1. KenSchawber, Mike Beedle, Agile Software Development with Scrum, First edition, 2004,Pearson.
2. Lisa Crispin, Janet Gregory, Agile Testing: A Practical Guide for Testers and Agile Teams,First Edition, 2009, Addison Wesley.

**REFERENCE:**

1. Robert C. Martin , Agile Software Development, Principles, Patterns and Practices, First edition, Prentice Hall

**CS17601 GAME PROGRAMMING L T P C  
3 0 0 3**

**OBJECTIVES:**

**The student should be made to:**

- Have an introduction into the Game programming and rendering..
- To learn the principles, mechanics and logics of Game Design.
- Learn the various Game Development process and its design attributes.
- To gain working knowledge in various game platforms.
- Learn to design games using python.

**UNIT I INTRODUCTION 9**

Elements of Game Play – Artificial Intelligence – Getting Input from the Player - Sprite Programming – Sprite Animation - Multithreading – Importance of Game Design – Game Loop, Software and Hardware Rendering.

**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. Game Engine Design: Rendering, Controller based animation, collision detection, standard objects, and physics.

**UNIT III      GAME DEVELOPMENT      9**

Game development: Developing 2D and 3D interactive games using OpenGL, DirectX – Puzzle games, Single / Multi-player games-Games using HTML and Java Script, Scratch 2.0

**UNIT IV      GAMING PLATFORMS AND FRAMEWORKS      9**

Basics of Augmented Reality, Virtual Reality and Mixed Reality- Flash, DirectX, OpenGL, Java, Python, XNA with Visual Studio, Mobile Gaming for the Android, iOS, Game engines - Adventure Game Studio, DX Studio, and Unity.

**UNIT V      GAME PROGRAMMING USING PYTHON      9**

Basic game objects, Getting started with cocos2d, Creating game assets, Implementing steering behaviours, Seek and flee, Arrival, Pursuit and evade Wander, Obstacle avoidance, Gravitation game, Pygame and 3D.

**TOTAL: 45 PERIODS****OUTCOMES:**

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

1. Identify the need for Game programming.
2. Have knowledge on the concepts and techniques used in Game design.
3. Design and model interactive game.
4. Understand the need for advanced game development platforms.
5. Design and develop games with open source components.

**TEXT BOOKS:**

1. Jeannie Novak, Game Development Essentials, Third Edition, Delmar Cengage Learning, ISBN-13: 978-1111307653, 2011.
2. Jim Thompson, Barnaby Berbank-Green, and Nic Cusworth, Game Design: Principles, Practice, and Techniques - The Ultimate Guide for the Aspiring Game, Designer, First edition, Wiley, ISBN 0471968943, 2007.
3. Joseph Howse, Alejandro Rodas de Paz, Python Game Programming by Example, Packt Publishing, First edition, 2015.

**REFERENCES:**

1. Jeremy Gibson, -Introduction to Game Design, Prototyping, and Development: From Concept to Playable Game with Unity and C#, Addison-Wesley Professional, 2 nd edition, 2016.
2. John Horton, —Learning Java by Building Android Games, Packt Publishing Limited, 1st edition, 2015.
3. Jorge Palacios, -Unity 5.x Game AI Programming Cookbook, Packt Publishing Limited, 1 st edition, 2016.

**CS17511 CRYPTOGRAPHY AND NETWORK SECURITY LABORATORY****L T P C  
0 0 4 2****OBJECTIVES:****The student should be made to:**

- Exposed to the different Cipher techniques
- To construe symmetric and asymmetric algorithms
- To accomplish digital signature schemes and hash algorithms
- To acquire skills to demonstrate network security tools
- Perform wireless audit and decrypting of WPA

**LIST OF EXPERIMENTS**

1. Implement the following Substitution and Transposition Techniques:
  - a) Caesar Cipher
  - b) Playfair Cipher
  - c) Hill Cipher
  - d) Vigenere Cipher
  - e) Rail fence – row & Column Transformation
  - f) Affine Cipher
2. Implement the following algorithms
  - a) DES
  - b) RSA Algorithm
  - c) Diffie-Hellman
  - d) MD5
  - e) SHA-1
3. Implement the Digital Signature Algorithm (DSA).
4. Implement Linux Privilege Escalation Checker.
5. Implement a Keylogger to record the keystrokes.
6. Develop a simple Block chain with SHA 256
7. Set up a honey pot and monitor the honeypot on network (Pentbox or Honeyd or any other equivalent s/w)
8. Perform wireless audit on an access point or a router and decrypt WPA keys (aircrack-ng)
9. Demonstrate Intrusion Detection System using any tool (snort or any other equivalent s/w)
10. Demonstrate various exploits of Windows OS using Metasploit framework.
11. Install and Configure Firewalls for variety of options (iptables or pfsense)
12. Demonstrate simple MITM attack (ettercap)

**TOTAL: 60 PERIODS****OUTCOMES:****At the end of the course, the student should be able to:**

1. Implement the traditional cipher techniques
2. Develop the various symmetric and asymmetric security algorithms
3. Develop the various digital signature and hash algorithms
4. Use different open source tools for network security and analysis
5. Perform wireless audit and decrypt WPA keys

**LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

<b>Hardware:</b>	TL-WN-722N Wi-Fi Adaptor
<b>Software:</b>	C/Python/ equivalent compiler, Pentbox or Honeyd
<b>OS:</b>	Kali Linux / Fedora

**IT17611 MOBILE APPLICATION DEVELOPMENT LABORATORY      LTPC  
0 0 4 2**

**OBJECTIVES:**

The student should be able to

- Know the components and structure of mobile application development frameworks for android and windows OS based mobiles.
- Understand how to work with various mobile application development frameworks.
- Learn the basic and important design concepts and issues of development of mobile applications.
- Understand the capabilities and limitations of mobile devices.
- Understand the working principle of Internal and External storage

**LIST OF EXPERIMENTS**

1. Develop an application to change the font and color of the text and display toast message when the user press the button
2. Develop an application to add two numbers(Read the input values in first and second text box) and display the result in third text box using EventManager and display the UI in Grid layout format
3. Develop a scientific calculator to perform arithmetic and mathematical functions using Math class. [Your scientific calculator should contain +,-,\*,/,=,cos,sin,tan,pow,sqrt,log,lan and mod].
4. Develop an android application to draw the circle,ellipse,rectangle and some text using Android Graphical primitives
5. Create a Database table with the following structure using SQLite:  
Student(Name, Rollno, Marks) Develop an android application to perform the following operation using SQLite developer classes 1.Insert student Details 2.Update the student Record 3.Delete the student record by Rollno 4.View the details
6. Create on-line recruitment form for XXX-InfoTech Company. The form should consist of First Name, Last Name, DOB, Phone No, Gender, Address, E-mail, Highest Qualification, Branch, Percentage of marks, Language Known, upload the image and provide with save and cancel button. All form controls should have appropriate validation.
7. Design an android activity with a text box (username) where the user can enter a name and another text box (ID) where the user enters only four digit ID. NO and a button —validate. Validate the entered username and ID field for the following using android code.
  - i) Both the fields should not be empty
  - ii) Name field should have alphabets
  - iii) ID field should have numeric
8. Develop an application to get the Latitude, Longitude of the current location using android LocationManager and also convert the Latitude/Longitude to address format using Geocoder Class.
9. Implement an application to write the name and marks to SD card in text file format
10. Implement an application to display the alert box message when your application receives the SMS

11. Write a mobile application to set the alarm using android AlarmManager class and also snooze the alarm after every 10 minutes
12. Develop an application to send and receive messages using SMSManager class
13. Develop an android application to take the screen shot while you shake your mobile phone
14. Create a Database table with the following structure using MySQL External Storage:Employee(Empno,Empname,Empid,Empsalary,Empaddress) Develop an android application to perform the following operation using MySQL developer classes
  - 1.Insert student Details
  - 2.Update the student Record
  - 3.Delete the student record by Rollno
  - 4.View the details
15. Develop an android application to display the information of the telephony services
16. Develop an android application to create Two activity named as StudentBasicDetailsActivity(name,age,address)and StudentMarkActivity(Marks,Total,Grade,Status). Write an android code to combine these two activity in single screen using android fragment
17. Develop an android application to conduct online-examination. Prepare the questions of your choice. The students should enter their name and register number before answering the questions. The online exam should contain at least five questions. Each question should be of multiple choices. The choice of selection should use radio buttons, for each correct answer one mark should be awarded. After attempting all questions, proceed with submit button. After clicking the submit button, display the result with register number, name of the student and marks in Toast button.
18. Develop an android application to display the button after 30s using Thread
19. Develop an android application to perform the following
  - i).Text to Speech
  - ii).Speech to Text
20. Develop an application to display the cricket scores of the ICC world cup matchYour application should update the scores automatically. Use RSS feed to implement this application.

**TOTAL: 60 PERIODS**

### **OUTCOMES:**

At the end the student will be able to

1. Learn the components of mobile application development
2. Gain the knowledge of how to work with various mobile application development frameworks.
3. Acquire the basic and important design concepts and issues of development of mobile applications.
4. Deploy applications to the hand held devices
5. Develop the mobile applications using Internal and External databases

### **LIST OF EQUIPMENTS**

- Stand alone desktops with windows or Android or iOS or Equivalent Mobile Application Development
- Tools with appropriate emulators and debuggers

**SEMESTER VII****CS17702****CLOUD COMPUTING****L T P C  
3 0 0 3****OBJECTIVES:****The student should be made to:**

- Learn the fundamentals of Cloud Computing and designing Private Cloud Environment.
- Learn the basic ideas and principles of Virtualization.
- Learn the programming models for Cloud.
- Gain knowledge on various cloud components mechanisms for data centre design and management.
- Understand the issues and solutions for cloud security.

**UNIT I INTRODUCTION 9**

Technology Innovations for Cloud Computing –Concepts and Terminologies, Cloud Architecture and its Characteristics- Cloud Delivery and Deployment Models, Broadband Network and Internet Architecture. Case Study: Design and Implementation of Public and Private Cloud Environments – Open Stack and AWS

**UNIT II VIRTUALIZATION 9**

Data center technology, Characteristics of Virtualized Environments, Virtualization Techniques and types, Implementation levels of virtualization, VM Provisioning, Managing and Migration. Case Study: Xen, KVM, VMWare, Docker Container.

**UNIT III DISTRIBUTED PROGRAMMING MODEL 9**

Design of HDFS, Concepts and Java Interface, Dataflow of File read & File write, Map Reduce, Input splitting, map and reduce functions, Specifying input and output parameters, Configuring and Running a Job. Hadoop Vs Spark. Case Study: Design and Implementation of Hive, Pig, HBase.

**UNIT IV CLOUD COMPUTING MECHANISM 9**

Cloud Infrastructure Mechanism: Cloud Storage and Usage Monitor, Resource Replication – Specialized Cloud Mechanism: Load Balancer, SLA Monitor, Pay-per-use Monitor, Audit Monitor, Failover System, Hypervisor, Resource Cluster, Multi Device Broker, State Management Database – Cloud Management Mechanism: Remote Administration System, Resource Management System, SLA Management System, Billing Management System.

**UNIT V CORE ISSUES AND ADVANCED CLOUD CONCPETS 9**

Cloud Security Threats – Cloud Security Mechanism: Encryption, Hashing, Digital Signature, Public Key Infrastructure, IAM, Single Sign-on, Trust in cloud, Clustering, Dynamic Failure Detection and Recovery, Bare-metal provisioning architecture, Mobile Cloud Computing, Edge and Fog Computing.

**TOTAL: 45 PERIODS****OUTCOMES:****At the end of the course, the student should be able to:**

1. Demonstrate the main concepts of cloud, its characteristics, advantages, key technologies and its various delivery and deployment models.
2. Articulate the strength of virtualization and outline its role in enabling the cloud computing system mode.
3. Recognize the scope of distributed file systems in cloud and their applications in industry.



4. Illustrate the fundamental cloud computing mechanism with which cloud data centres are managed and administered.
5. Analyse the core issue of cloud such as security, energy efficiency and interoperability, and provide an insight into future prospects of computing in the cloud.

**TEXT BOOKS:**

1. Thomas Erl, Zaigham Mahood, Ricardo Puttini —Cloud Computing, Concept, Technology and Architecture, Prentice Hall, First Edition, 2013.
2. Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet, First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.

**REFERENCES:**

1. Michael J. Kavis Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS), First Edition, Wiley.
2. Tom White, Hadoop: The Definitive Guide, Yahoo Press, 2014.
3. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, Mastering Cloud Computing, Tata McGraw Hill, 2013.
4. John W. Rittinghouse and James F. Ransome, Cloud Computing: Implementation, Management, and Security, CRC Press, 2010.

**IT17701****DATA ANALYTICS****L T P C****3 0 0 3****OBJECTIVES:****The student should be made to:**

- To introduce the concepts of Big Data and Hadoop
- To help understand HDFS and Mapreduce concepts
- To imbibe the Hadoop Eco System of NoSQL
- To describe the data stream analytics methodologies
- To narrate various data analysis techniques

**UNIT I INTRODUCTION TO BIG DATA AND HADOOP****6**

Introduction to Big Data, Types of Digital Data, Challenges of conventional systems - Web data, Evolution of analytic processes and tools, Analysis Vs reporting - Big Data Analytics, Introduction to Hadoop - Distributed Computing Challenges - History of Hadoop, Hadoop Eco System.

**UNIT II HDFS (HADOOP DISTRIBUTED FILE SYSTEM) AND MAP REDUCE****6**

Hadoop Overview – Use case of Hadoop – Hadoop Distributors – HDFS – Processing Data with Hadoop – Map Reduce - Managing Resources and Applications with Hadoop YARN – Interacting with Hadoop Ecosystem.

**UNIT III NOSQL DATABASES****12**

NoSQL - Pig - Introduction to Pig, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators - Hive - Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying – MongoDB - Needs-Terms-Data Types-Query Language – Cassandra -Introduction-Features-Querying Commands.

**UNIT IV 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 - Realtime Analytics Platform(RTAP) applications - case studies - real time sentiment analysis, stock market predictions.

**UNIT V DATA ANALYSIS AND VISUALIZATION****12**

Regression modelling, Multivariate analysis, Decision Trees, Support vector and kernel methods, Neural networks: learning and generalization, competitive learning, principal component analysis and neural networks; Clustering Techniques – Hierarchical – K- Means – Clustering high dimensional data – Frequent pattern based clustering methods – Clustering in Non-Euclidean space – Clustering for streams and Parallelism- Visualization - Time series analysis.

**TOTAL: 45 PERIODS****OUTCOMES:****At the end of the course, student will be able to:**

1. understand the usage scenarios of Big Data Analysis and Hadoop framework
2. Apply Mapreduce over HDFS
3. Make design decisions for choice of NoSQL platforms to build applications
4. Apply Stream Data Model
5. Use various data analysis techniques

**TEXT BOOKS:**

1. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley India; First Edition, 2015.
2. Anand Rajaraman and Jeffrey David Ulman, –Mining of Massive Datasets, Cambridge University Press, First Edition, 2012.
3. Jiawei Han, Micheline Kamber —Data Mining Concepts and Techniques, Second Edition, Elsevier, Reprinted 2008.
4. Michael Berthold, David J. Hand, "Intelligent Data Analysis, Second Edition, Springer, 2007.

**REFERENCES:**

1. Jay Liebowitz, —Big Data and Business Analytics, Auerbach Publications, CRC press First Edition, 2013.
2. Tom White — Hadoop: The Definitive Guide, Third Edition, O'Reilly Media, 2012.
3. Bill Franks, –Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, John Wiley & sons, First Edition, 2012.

**IT17711****DATA ANALYTICS LABORATORY****L T P C****0 0 4 2****OBJECTIVES:****The student should be made to:**

- Implement Map Reduce concept to process big data.
- Apply linear models to analyze big data.
- Analyze big data using machine learning techniques.
- Realize storage of big data using Hbase, MongoDB.
- Develop big data applications for streaming data using Apache Spark.

**LIST OF EXPERIMENTS**

1. Install, configure and run Hadoop and HDFS.
2. Implement word count/frequency programs using MapReduce.
3. Implement a MapReduce program to process a weather dataset.
4. Implement Linear and Logistic Regression.
5. Implement SVM/Decision tree classification techniques.
6. Implement clustering techniques – Hierarchical and K-Means.
7. Visualize data using any plotting framework.
8. Implement an application that stores big data in Hbase/MongoDB/Pig using Hadoop/R.
9. Install, Deploy & Configure Apache Spark Cluster. Run Apache Spark applications using Scala.

**TOTAL: 60 PERIODS****OUTCOMES:****At the end of the course, the student should be able to:**

1. Process big data using Hadoop framework.
2. Build and apply linear and logistic regression models.
3. Perform data analysis with machine learning methods.
4. Perform graphical data analysis.
5. Create applications for big data analytics.

**LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

**Hardware:** PC with 8 GB RAM, i3 Processor  
**Software:** Hadoop, R package, Hbase, MongoDB

**CS17711****CLOUD COMPUTING LABORATORY****L T P C  
0 0 4 2****OBJECTIVES:****The student should be made to:**

- Learn and understand Virtualization and run VMs of different configuration.
- Be familiar with current cloud technologies by creating applications and deploying it in public cloud.
- Learn to set up an enterprise level cloud infrastructure.
- To understand the programming models for distributed cloud management.
- To understand the issues and solutions by simulating a cloud data centre.

**Virtualization:**

1. Find procedure to run the virtual machine of different configuration using virt-manager.
2. Virtualize a machine and check how many virtual machines can be utilized at a particular time.
3. Create a VM Clone and attach virtual block to the cloned virtual machine and check whether it holds the data even after the release of the virtual machine.
4. Create a Snapshot of a VM at a given point in time and test the snapshot by restoring the VM to that time. (Note: Testing can be done by installing an application and then restore it.)
5. Perform Storage Virtualization by Installing a Storage controller and interact with it using open-source network-attached storage (NAS) software.

**Public Cloud:**

1. Develop a simple application to understand the concept of PAAS using GAE/Amazon Elastic Beanstalk/IBM Blue Mix and launch it.
2. Test how a SaaS applications scales in response to demand.

3. Find the procedure to launch a Cloud instance using a Public IaaS cloud like AWS/GCP.

**Private Cloud:**

1. Setup a Private Cloud by performing the procedure using a Single node OPENSTACK implementation.
2. Perform Creation, Management and Termination of a CirrOS instance in OPENSTACK.
3. Show the virtual machine migration based on certain conditions from one node to the other.

**Hadoop - Map Reduce:**

1. Setup a Single Node Hadoop cluster and show all the process through WEB UI.
2. Demonstrate the MAP REDUCE programming model by counting the number of words in a file.
3. Implement the procedure to interact with Hadoop API for Accessing HDFS from local file system.

**Cloud Simulators:**

1. Model and simulate a Cloud computing environment with Data Centers, Hosts and Cloudlets and perform VM provisioning using CloudSim.
2. Design a host with two CPU cores, which receives request for hosting two VMs, such that each one requires two cores and plans to host four tasks units. More specifically, tasks t1, t2, t3 and t4 to be hosted in VM1, while t5, t6, t7, and t8 to be hosted in VM2. Implement space-shared allocation policy and time-shared allocation policy. Compare the results.
3. Model a Cloud computing environment having Data centre that had 100 hosts. The hosts are to be modelled to have a CPU core (1000 MIPS), 2 GB of RAM and 1TB of storage. Consider the workload model for this evaluation including provisioning requests for 400 VMs, with each request demanding 1 CPU core (250 MIPS), 256 MB of RAM and 1 GB of storage. Each VM hosts a web-hosting application service, whose CPU utilization distribution was generated according to the uniform distribution. Each instance of a web hosting service required 150,000 MIPS or about 10 minutes to complete execution assuming 100% utilization.

**TOTAL: 60 PERIODS**

**OUTCOMES:**

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

1. Design and implement virtual machines and understand the need for resource utilization
2. Use public cloud infrastructure for deploying their applications.
3. Create a private cloud infrastructure
4. Understand the Mapreduce concept
5. Test how a cloud data centre would function using a simulator software

**LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

**Hardware:** Systems with Virtualization Enabled, dual core processor with 8 GB RAM.

**Software:** CentOS, VirtualBox, OpenStack, CirrOS, CloudSim.

**Internet:** For updating packages and for doing public cloud experiments. Public cloud requires accessing well know a cloud platform, which requires VISA/MASTER CARD for verification with zero cost.

**SEMESTER VI  
ELECTIVE - I**

**IT17E61      GRAPH THEORY AND APPLICATION**

**L T P C**

**3 0 0 3**

**OBJECTIVES:**

The student should be able to

- To develop an understanding the most fundamentals of Graphs, Sub graphs and Trees.
- To be familiar with the concept of Spanning trees, Cut sets, Isomorphism, Network flows and Planar graphs.
- To learn about Directed graphs & its types, Euler graphs.
- To understand the principle of permutations and combinations.
- To learn about how to generate functions, solving homogeneous and non-homogeneous recurrence relations.

**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.

(Ref. Book 1: Chapter 1-3)

**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 – Planar graphs – Different representation of a planer graph.

(Ref. Book 1: Chapter 3-5)

**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.

(Ref. Book 1: Chapter 8-9)

**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.

(Ref. Book 2: Chapter 1 & 8)

**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

(Ref. Book 1: Chapter 9 & 10)

**TOTAL: 45 PERIODS**

**OUTCOMES:**

At the end the student will be able to

1. Write precise and accurate mathematical definitions of objects in graph theory.
2. Use mathematical definitions to identify and construct examples and to distinguish examples from non-examples.

3. Validate and critically assess a mathematical proof.
4. Use a combination of theoretical knowledge and independent mathematical thinking in creative investigation of questions in graph theory.
5. Reason from definitions to construct mathematical proofs.

**REFERENCES:**

1. Narsingh Deo, —Graph Theory: With Application to Engineering and Computer Sciencell, Prentice Hall of India, 2003.
2. Grimaldi R.P. —Discrete and Combinatorial Mathematics: An Applied Introductionl, Addison Wesley, 1994.
3. Clark J. and Holton D.A, -A First Look at Graph Theoryl, Allied Publishers, 1995.
4. Mott J.L., Kandel A. and Baker T.P. —Discrete Mathematics for Computer Scientists and Mathematiciansl, Prentice Hall of India, 1996.
5. Liu C.L., —Elements of Discrete Mathematicsl, Mc Graw Hill, 1985.
6. Rosen K.H., —Discrete Mathematics and Its Applicationsl, Mc Graw Hill, 2007.

**IT17E62****DATA WAREHOUSING AND DATA MINING****L T P C  
3 0 0 3****OBJECTIVES: The student should be made to:**

- Learn the concepts of Data Warehousing and Business Analysis.
- Familiar with the concepts of Data Mining.
- Understand the concepts of Association and Correlations Algorithms.
- Understand the concepts of Classification Algorithms.
- Understand the concepts of Clustering and outlier Analysis.

**UNIT I DATA WAREHOUSING****9**

Data Warehouse: Basic Concepts, A Multitier Architecture, Data Warehouse Models, Metadata Repository- Data Warehouse Modelling: Data Cube and OLAP, Data Cube: A Multidimensional Data Model: Schemas-Concept Hierarchies-OLAP Operations.

(TB1-CH: 4)

**UNIT II DATA MINING AND VISUALIZATION****8**

Introduction: Kinds of Data, Kinds of Patterns- Data Objects and Attribute Types- Data Visualization: Pixel-Oriented, Geometric Projection, Icon-Based, Hierarchical, Visualizing Complex Data and Relations- Data Preprocessing.

(TB1-CH: 1&amp;2)

**UNIT III ASSOCIATIONS AND CORRELATIONS****9**

Basic Concepts: Frequent Itemsets , Closed Itemsets, and Association Rules - Frequent Item set Mining Methods: Finding Frequent Itemsets by Confined Candidate Generation , Growth Approach for Mining Frequent Itemsets , Mining Frequent Itemsets Using Vertical Data Format , Mining Closed and Max Patterns - Interesting Patterns: Pattern Evaluation Methods.

(TB1-CH: 6)

**UNIT IV CLASSIFICATION****9**

Basic Concepts- Decision Tree Induction: ID3- Bayes Classification Methods: Bayes' Theorem, Naive Bayesian Classification- Classification by Back propagation- Support Vector Machines- Techniques to improve classification accuracy-Prediction.

(TB1-CH: 8)

**UNIT V CLUSTER ANALYSIS AND DATA MINING APPLICATIONS 10**  
 Cluster Analysis- Partitioning Methods- Hierarchical Methods: Agglomerative versus Divisive Hierarchical Clustering- Density-Based Methods: DBSCAN- Grid-Based Methods: STING: Statistical Information Grid-Outlier Detection-Data Mining Applications: Science and Engineering- Data Mining Tools: Weka & R -Web Mining-Emerging Trends in Data Mining. (TB1-CH: 10)

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

1. Apply the Data Warehousing and Business Analytics concepts.
2. Apply the concepts of Data Mining to large data sets.
3. Make use of Association and Correlations Algorithms.
4. Compare and Contrast the various classifiers.
5. Apply Clustering and outlier Analysis and to solve Data Mining Case Studies.

**TEXT BOOK:**

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

**REFERENCES:**

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, —Introduction to Data Mining, Person Education, 2007.
2. K.P. Soman, Shyam Diwakar and V. Aja, —Insight into Data Mining Theory and Practice, Eastern Economy Edition, Prentice Hall of India, 2006.
3. G. K. Gupta, —Introduction to Data Mining with Case Studies, Eastern Economy Edition, Prentice Hall of India, 2006.
4. Daniel T.Larose, —Data Mining Methods and Models, Wiley-Interscience, 2006.
5. Alex Berson and Stephen J.Smith, —Data Warehousing, Data Mining and OLAP, Tata McGraw – Hill Edition, Thirteenth Reprint 2008.

**IT17E63**

**ADVANCED JAVA PROGRAMMING**

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

The student should be able to

- Gain knowledge on Java Fundamental basics
- Know the network programming in java
- Understand the Image processing using java
- Learn the Image manipulation using Java
- Learn the various cryptographic Library in java

**UNIT I JAVA FUNDAMENTALS**

**9**

Java Virtual Machine – Reflection – I/O Streaming – Filter and Pipe Streams – ByteCodes – Byte Code Interpretation – Dynamic Reflexive Classes – Threading – JavaNative Interfaces – GUI Applications.(Ref. Book 5: Chapter 2,11,13,19,21,22,23)

**UNIT II NETWORK PROGRAMMING IN JAVA 9**

Stream Customization – Sockets – Secure Sockets – Custom Sockets – UDP Datagrams– Multicast Sockets – URL Classes – Reading Data From The Server – Writing Data. (Ref. Book 1: Chapter 2,5,7,8,9,10,12)

**UNIT III IMAGE PROGRAMMING 9**

Introduction – image warping, wavelengths, motion blur – Digital images – voxel, pixel,Java – Images in Java – Java2D, Java Advanced Imaging, image processing.

**UNIT IV IMAGE MANIPULATION 9**

Grey level and colour enhancement – cumulative frequency – Java2D – deflationalgorithm – image compression.

**UNIT V CRYPTOGRAPHIC LIBRARY IN JAVA 9**

Introduction – Secure systems – Cryptography – Platform security – Key management –Encryption – Streams and blocks. (Ref. Book 2: Chapter 1,2,3,5,6)

**TOTAL: 45 PERIODS**

**OUTCOMES:**

At the end the student will be able to

1. Acquire knowledge on Java Fundamental basics
2. Categorize network programming in java
3. Define modeling techniques for Image processing using java
4. Implement Image manipulation using Java
5. Demonstrate the various cryptographic Library in java

**REFERENCES:**

1. Elliotte Rusty Harold, –Java Network Programming], O‘Reilly Publishers, 2000.
2. Jonathan Knudsen, –Java Cryptographyl, O‘Reilly Publishers, 1998.
3. Douglas A. Lyon, —Image Processing in Javal, Prentice Hall PTR, 1999.
4. Nick Efford —Digital Image Processing: A Practical Introduction Using Javal, AddisonWesley,2000.
5. Herbert Schildt, Java – The Complete Reference, 7th Edition. Tata McGraw- Hill Edition.

**CS17E63**

**C# AND .NET PROGRAMMING**

**LT P C**

**3 0 0 3**

**OBJECTIVES:**

**The student should be made to:**

- Understand the foundations of .NET framework.
- Learn the object oriented Concepts in C#.
- Understand SQL Server and ADO.NET.
- Be aware of application development in .NET.
- Learn web based applications and web services on .NET (ASP.NET).

**UNIT I INTRODUCTION TO .NET FRAMEWORK AND C# 9**

Knowledge of .NET framework - .NET features and .NET development platform - Understanding advantages of .NET framework - Introducing C# - Literals, Variables and Data Types – Operators and



Expressions - Branching and Looping – C# Methods - Implicit and Explicit casting - Arrays, Array Class and Array List - Strings, Structure and Enumerations - Boxing and Un-boxing.

**UNIT II OBJECT ORIENTED ASPECTS OF C# 9**

Class and Objects - Constructors and its types - Inheritance – Properties and Indexers, Index overloading – Polymorphism - Abstract and Interface - Operator overloading – Delegates – Errors and Exception - Threading.

**UNIT III SQL SERVER DATABASE AND ADO.NET 9**

Building windows application - Creating our own window forms with events and controls - Menu creation - Inheriting window forms - Dialog Box (Modal and Modeless) - Design and develop Database using SQL Server - Accessing data with ADO.NET - Dataset, Data Adapter - Updating database using stored procedures.

**UNIT IV WEB APPLICATION DEVELOPMENT USING ASP.NET 9**

Recap on HTML – JavaScript - CSS - Basics of ASP.NET - ASP.NET controls - Creation of Master Pages - Gridview control - Understand Data Binding, SQL Server with ASP.NET.

**UNIT V WEB DEPLOYMENT AND WEB SERVICES 9**

Creating virtual directory and Configuring IIS - Create web services - Passing datasets and returning datasets from web services - Handling Transaction and Exceptions - Security in .NET: 3DES, MD5 Hashing.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

1. List the major elements of the .NET framework.
2. Analyze the basic structure of a C# application.
3. Debug, compile, and run a simple application.
4. Develop programs using C# on .NET.
5. Design and develop Web based applications on .NET and deploy web services.

**TEXT BOOKS:**

1. Herbert Schildt, The Complete Reference: C# 4.0, Second Edition, Tata McGraw Hill, 2012.
2. Christian Nagel et al. Professional C# 2012 with .NET 4.5, First Edition, Wiley India, 2012.
3. E. Balagurusamy, Programming in C#, Third Edition, Tata McGraw-Hill, New Delhi, 2004.

**REFERENCES:**

1. Andrew Troelsen, Pro C# 2010 and the .NET 4 Platform, Fifth edition, A Press, 2010.
2. Ian Griffiths, Matthew Adams, Jesse Liberty, Programming C# 4.0, Sixth Edition, O'Reilly, 2010.

**IT17E64**

**MULTIMEDIA SYSTEMS**

**L T P C  
3 0 0 3**

**OBJECTIVES:**

- To understand the basic concepts of multimedia, multimedia architecture and multimedia databases.
- To acquire knowledge about Compression & Decompression techniques.
- To study about File format, Storage and retrieval technologies.
- To understand the I/O Technologies used in multimedia.
- To study about hypermedia, messaging standards & Distributed Multimedia Systems.

**UNIT I MULTIMEDIA SYSTEMS DESIGN 9**  
 Multimedia basics – Multimedia applications – Multimedia system architecture – Evolving technologies for multimedia – Defining objects for multimedia systems – Multimedia data interface standards – Multimedia databases. (Text Book 1, 2: Chapter 1)

**UNIT II COMPRESSION AND DECOMPRESSION 9**  
 Compression and Decompression: Need for Data Compression – Types of Compression – Binary Image Compression Schemes – Image Compression – Video Compression – Audio Compression. (Text Book 1: Chapter7 & Text Book 2: Chapter 2)

**UNIT III DATA AND FILE FORMAT STANDARDS 9**  
 Introduction - Rich Text Format – TIFF File Format – Resource Interface File Format – MIDI File Format - JPEG DIB File Format – AVI Indeo File Format – MPEG Standards TWAIN. (Text Book 1: Chapter 3.2, 9, 11, 14 & Text Book 2: Chapter 2 & 3)

**UNIT IV MULTIMEDIA I/O TECHNOLOGIES 9**  
 Introduction - Image Scanners – Digital Voice and Audio – Digital Camera – Video Images and Animation – Full Motion Video – Storage and Retrieval Technologies: Hard Disk Technology – RAID Technology – Optical Media – Hierarchical Storage Management. (Text Book 1: Chapter 5, 6 & Text Book 2: Chapter 4 & 5)

**UNIT V HYPERMEDIA 9**  
 Hypermedia Messaging: Mobile Messaging – Hypermedia Message Components - Hypermedia Linking and Embedding – Integrated Multimedia Message Standards – Distributed Multimedia Systems: Components – Multimedia Object Servers – Distributed Multimedia Databases. (Text Book 2: Chapter 8-10)

**TOTAL: 45 PERIODS**

**OUTCOMES:**

At the end the student should be able to

1. Gain knowledge about basics of multimedia and its purpose.
2. Understand about various techniques used for compressing and decompressing various forms of data.
3. Solve a wide range of multimedia design problems.
4. Develop various multimedia file handling techniques and animation.
5. Gain knowledge about the various hypermedia and distributed multimedia design techniques.

**TEXT BOOKS:**

1. Fundamentals of Multimedia, Second edition ZeNian Li, Mark S. Drew, Jiangchuan Liu Springer, ISBN978-3-319-05289-2, ISBN 978-3-319-05290-8 (ebook), 2014
2. Prabat K Andleigh and Kiran Thakrar, -Multimedia Systems and Design, Prentice Hall India, 2003, New Delhi.

**REFERENCES:**

1. Ralf Steinmetz, Klara Steinmetz, —Multimedia Computing, Communications & Applications| Pearson education, 2004.
2. Tay Vaughan, -Multimedia Making It Work, McGraw Hill, 2002.
3. Parekh R —Principles of Multimedial Tata McGraw-Hill, 2006.

**SEMESTER VII  
ELECTIVE – II**

CS17E83

**CYBER FORENSICS****L T P C  
3 0 0 3****OBJECTIVES:****The student should be made to:**

- Have an introduction into the process of Cyber Forensics.
- Understand the Environment of forensics.
- Learn process of collecting evidences.
- Gain working knowledge of analyzing evidences using tools.
- Learn other sources of evidences and its future challenges.

**UNIT I DIGITAL FORENSICS PROCESS 9**

Forensic Science, Digital Forensics, Digital Evidence, Digital Forensics Process – Identification, Collection, Examination, Analysis, Presentation Phases.Cyber Crime Law- International Legal Framework of Cybercrime Law, Digital Crime, Investigation Methods for Collecting Digital Evidence.

**UNIT II FORENSICS ENVIRONMENTS 9**

Hardware and Software Environments – Storage Devices, Operating System, File Systems, Metadata, Locating evidence in file systems-Password security, Encryption, and Hidden files. Case study – linking the evidence to the user, Data Analysis using forensics tool ILookIX

**UNIT III COLLECTING EVIDENCES 9**

Use of Digital Evidence, File Metadata and Correlation with Other Evidence, Technical Complexities of Digital Evidence. Data carving, Date and time problems, Physical Acquisition and Safekeeping of Digital Evidence. Forensic Imaging Processes. Case Study – IXImager, Understanding .ASB container

**UNIT IV ANALYZING DIGITAL EVIDENCE 9**

Selecting and Analyzing Digital Evidence - Locating digital evidence, Categorizing files, Eliminating superfluous files, The Event Analysis tool, Cloud Analysis tool, The Lead Analysis tool, Volume Shadow Copy analysis tools,Validating the Evidence. Case study – illustrating the recovery of deleted evidence held in volume shadows.

**UNIT V OTHER SOURCES OF EVIDENCES 9**

Windows and Other Operating Systems as Sources of Evidence, Examining Browsers, E-mails, Messaging Systems, and Mobile Phones, Internet and Cloud.-Challenges in Digital Forensics.

**TOTAL: 45 PERIODS****OUTCOMES:****At the end of the course, student will be able to:**

1. Identify the need for cybercrime investigation.
2. Understand the hardware and software components responsible for seeking evidence.
3. Have knowledge on the techniques used for collecting evidences.
4. Analyse the evidence through suitable tools.
5. Examine other sources of evidences.

**TEXT BOOKS:**

1. Richard Boddington, Practical Digital Forensics, PACKT publishing, First Edition, 2016  
ANDRÉ ÁRNES.

**REFERENCES:**

1. John R.Vacca, Computer Forensics, Second Edition, Cengage Learning, 2005.
2. Richard E.Smith, Internet Cryptography, Third Edition, Pearson Education, 2008.
3. Marjie T.Britz, Computer Forensics and Cyber Crime: An Introduction, Third Edition, Prentice Hall, 2013.

**IT17E71 WIRELESS SENSOR NETWORKS****L T P C  
3 0 0 3****OBJECTIVES:**

- To provide an overview about sensor networks and emerging technologies.
- To study about the node and network architecture of sensor nodes and its execution environment.
- To understand the concepts of communication, MAC, routing protocols and also study about the naming and addressing in WSN.
- To learn about topology control and clustering in networks with timing synchronization for localization services with sensor tasking and control.
- To study about sensor node hardware and software platforms and understand the simulation and programming techniques

**UNIT I OVERVIEW OF WIRELESS SENSOR NETWORKS 9**  
Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks**UNIT II ARCHITECTURES 9**  
Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes , Operating Systems and Execution Environments, Network Architecture -Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.**UNIT III NETWORKING SENSORS 9**  
Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing.**UNIT IV INFRASTRUCTURE ESTABLISHMENT 9**  
Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.**UNIT V SENSOR NETWORK PLATFORMS AND TOOLS 9**  
Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.**OUTCOMES:**

Upon successful completion of this course, Students shall be able to

1. understand the different sensor networks and emerging technologies.
2. Design a different node and network architecture
3. understood the concepts of communication, MAC, routing protocols and also study about the naming and addressing in WSN.
4. Design a system with topology control and clustering in networks along with timing synchronization for localization services, sensor tasking and control.
5. Familiar with sensor node hardware and software platforms and understand the simulation and programming techniques

**TEXT BOOK**

1. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, —Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

**REFERENCES**

1. KazemSohraby, Daniel Minoli, & TaiebZnati, —Wireless Sensor Networks- Technology, Protocols, And Applications, John Wiley, 2007.
2. Anna Hac, —Wireless Sensor Network Designs, John Wiley, 2003.

**IT17E72****VIRTUAL REALITY****L T P C****3 0 0 3****OBJECTIVES:**

The student should be able to

- Gain knowledge on Virtual Reality basics
- Know the different kinds of Input and Output devices
- Understand the modelling techniques and human factors involved
- Learn the VR programming
- Learn the various applications of VR in different domains

**UNIT I INTRODUCTION****9**

The three F's of virtual reality, History of early VR, commercial VR technology, VR becomes an Industry, Five classic components of a VR system. (Ref. Book 1: Chapter 1)

**UNIT II INPUT AND OUTPUT DEVICES****9**

Three-dimensional position trackers, navigation and manipulation, interfaces and gesture interfaces, Graphics displays, sound displays & haptic feedback. (Ref. Book 1: Chapter 2 - 3)

**UNIT III MODELING AND HUMAN FACTORS****9**

Geometric modeling, kinematics modeling, physical modeling, behaviour modeling, model management, Methodology and terminology, user performance studies, VR health and safety issues. (Ref. Book 1: Chapter 5, 7)

**UNIT IV VR PROGRAMMING****9**

Introducing Java 3D, loading and manipulating external models, using a lathe to make shapes, 3D Sprites, animated 3D sprites, particle systems. (Ref. Book 2: Chapter 14, 16, 17, 18, 19 and 21)

**UNIT V APPLICATIONS****9**

Medical, Education, Arts and Entertainment, Military, Manufacturing, Robotics. (Ref. Book 1: Chapter 8 - 9)

**TOTAL: 45 PERIODS****OUTCOMES:**

At the end the student will be able to

1. Acquire knowledge on Virtual Reality basics
2. Categorize different kinds of Input and Output devices
3. Define modeling techniques and human factors involved
4. Implement VR programming concepts and create models
5. Demonstrate the various applications of VR in different domains

**REFERENCES:**

1. Virtual Reality Technology, Second Edition, Gregory C. Burdea & Philippe Coiffet, John Wiley & Sons, Inc.,
2. Killer Game Programming in Java, Andrew Davison, Oreilly-SPD, 2005.
3. Understanding Virtual Reality, interface, Application and Design, William R.Sherman, Alan Craig, Elsevier(Morgan Kaufmann).
4. 3D Modeling and surfacing, Bill Fleming, Elsevier(Morgan Kauffman).
5. 3D Game Engine Design, David H.Eberly, Elsevier.
6. Virtual Reality Systems, John Vince, Pearson Education.

**IT17E73      INFORMATION RETRIEVAL TECHNIQUES****L T P C****3 0 0 3****OBJECTIVES:****The student should be made to:**

- Understand the basics of Information Retrieval with pertinence to modeling, query operations and indexing.
- Get an understanding of machine learning techniques for text classification and clustering.
- Understand the various applications of Information Retrieval giving emphasis to Multimedia IR, Web Search.
- Understand the concepts of digital libraries.

**UNIT I      INTRODUCTION****8**

Motivation – Basic Concepts – Practical Issues - Retrieval Process – Architecture – Boolean Retrieval –Retrieval Evaluation – Open Source IR Systems–History of Web Search – Web Characteristics–The impact of the web on IR —IR Versus Web Search–Components of a Search engine

**UNIT II      MODELING****10**

Taxonomy and Characterization of IR Models – Boolean Model – Vector Model – Term Weighting – Scoring and Ranking –Language Models – Set Theoretic Models – Probabilistic Models – Algebraic Models – Structured Text Retrieval Models – Models for Browsing –**Text Operations**

**UNIT III      INDEXING****9**

Static and Dynamic Inverted Indices – Index Construction and Index Compression. Searching - Sequential Searching and Pattern Matching. Query Operations -Query Languages – Query Processing - Relevance Feedback and Query Expansion - Automatic Local and Global Analysis – Measuring Effectiveness and Efficiency

**UNIT IV      CLASSIFICATION AND CLUSTERING****8**

Text Classification and Naive Bayes – Vector Space Classification – Support vector machines and Machine learning on documents. Flat Clustering – Hierarchical Clustering –Matrix decompositions and latent semantic indexing – Fusion and Meta learning

**UNIT V      SEARCHING AND RANKING****10**

Searching the Web –Structure of the Web –IR and web search – Static and Dynamic Ranking - Web Crawling and Indexing – Link Analysis - XML Retrieval Multimedia IR: Models and Languages – Indexing and Searching Parallel and Distributed IR – Digital Libraries

**TOTAL: 45 PERIODS****OUTCOMES:****At the end of the course, student will be able to:**

1. Build an Information Retrieval system using the available tools.
2. Identify and design the various components of an Information Retrieval system.
3. Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval.
4. Analyze the Web content structure.
5. Design an efficient search engine.

**TEXT BOOKS:**

1. Ricardo Baeza - Yates, Berthier Ribeiro – Neto, –Modern Information Retrieval: The concepts and Technology behind Search (ACM Press Books), Second Edition, 2011
2. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schutze, –Introduction to Information Retrieval, Cambridge University Press, First South Asian Edition 2012

**REFERENCES:**

1. Stefan Butcher, Charles L. A. Clarke, Gordon V. Cormack, –Information Retrieval Implementing and Evaluating Search Engines, The MIT Press, Cambridge, Massachusetts London, England, 2010
2. <http://www.search-engines-book.com/slides/>.

**IT17E76****Comprehension****L T P C****3 3 0 3****Course Objectives:****The student should be made to:**

- To explain the concepts of computer organization and architecture
- To describe the concepts of programming, data structures and algorithms
- To explore the concepts of compiler design
- To emphasize the concepts of operating systems and databases
- To explain the computer network concepts

**UNIT I Computer Organization and Architecture 6**

Machine instructions and addressing modes, ALU, data-path and control unit, Instruction pipelining, pipeline hazards Memory hierarchy: cache, main memory and secondary storage; I/O interface (interrupt and DMA mode).

**UNIT II Programming, Data structures and Algorithms 9**

Programming in C. Recursion, Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs. Searching, sorting, hashing, Asymptotic worst case time and space complexity, Algorithm design techniques: greedy, dynamic programming and divide-and-conquer. Graph traversals, minimum spanning trees, shortest paths

**UNIT III Compiler Design 9**

Lexical analysis, parsing, syntax-directed translation. Runtime environments, Intermediate code generation, Local optimisation, Data flow analyses: constant propagation, liveness analysis, common subexpression elimination.

**UNIT IV Operating System and Databases 9**

System calls, processes, threads, inter-process communication, concurrency and synchronization, Deadlock, CPU and I/O scheduling, Memory management and virtual memory, File systems, ER-model, Relational model: relational algebra, tuple calculus, SQL, Integrity constraints, normal forms, File organization,

indexing (e.g., B and B+ trees), Transactions and concurrency control.

**UNIT V Computer Networks**

**12**

OSI and TCP/IP Protocol Stacks; Basics of packet, circuit and virtual circuit-switching; framing, error detection, Medium Access Control, Ethernet bridging; Routing protocols: shortest path, flooding, distance vector and link state routing; Fragmentation and IP addressing, IPv4, CIDR notation, Basics of IP support protocols (ARP, DHCP, ICMP), Network Address Translation (NAT); Transport layer: flow control and congestion control, UDP, TCP, sockets; Application layer protocols: DNS, SMTP, HTTP, FTP, Email.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

On completion of this course, the students will be able to

- be expert in computer organization and architecture concepts
- implement programming, data structures and algorithms
- explore operating systems and database concepts
- design computer networks concepts

**Text Books**

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, Fifth Edition, Tata McGraw Hill, 2002.
2. Brian W. Kernighan and Dennis M. Ritchie, “The C Programming Language”, 2nd Edition, Pearson Education, 1988
3. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education, 1997
4. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, Ninth Edition, John Wiley and Sons Inc., 2012.
5. Abraham Silberschatz, Henry F. Korth and S. Sudharshan, “Database System Concepts”, Sixth Edition, Tata Mc Graw Hill, 2011.
6. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Fifth Edition, Morgan Kaufmann Publishers Inc., 2011.

**SEMESTER VII  
ELECTIVE – III**

**IT17E74**

**DESIGN THINKING**

**L T P C  
3 0 0 3**

**OBJECTIVES:**

Student will be able to:

1. Understand the background and driving of Innovation and Design Thinking
2. Understand the Design Thinking practices and models
3. Use DT tools to aid design thinking for agile software development.
4. Learn DT in the context of user experience design
5. Learn the implications of DT in various domains

**UNIT I INTRODUCTION**

**7**

Design Thinking- History of Design Thinking - Need for DT – Benefits –Skills for Design Thinking –Design Thinking and Its Relevance to Innovation–Governance Innovation - Principles of Good Design

**UNIT II DESIGN THINKING PROCESSES**

**12**



Design Thinking Models –Stanford’s Design Thinking Model, IBMs Model, MVJ Model and Royal Civil Service Commission’s Model – Google Sprint - Double Diamond Method- Design Thinking Processes: Stages of Thinking – Research –Idea Generation – Refinement – Prototyping – Implementation –Essential Methods and Tools - Case Studies

<b>UNIT III</b>	<b>DESIGN THINKING AND UX DESIGN</b>	<b>PROCESS</b>	<b>9</b>
Design thinking and UX Design – usability — impact of human psychology on design - Conducting user Interviews -7 influencing factors for UX – Research tools for UX –Interaction Design – Mobile Web Design - Current Trends			
<b>UNIT IV</b>	<b>DESIGN THINKING FOR SOFTWARE DEVELOPMENT</b>		<b>10</b>
Roles of DT in SW engineering - Design thinking and agile development - Design thinking and Scrum –Tools for Design Thinking -Case Studies			
<b>UNIT V</b>	<b>APPLIED DESIGN THINKING</b>		<b>9</b>
Applied Design Thinking and Strategy – 10 principles for business management- DT in innovation Business, Education –DT in Society – DT in Engineering - Cases where on DT doesn't work.			

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

1. Explain and Understand key concepts of Design Thinking
2. Understand the Design Thinking Models and practices
3. Understand applications of DT to various domains
4. Investigate and think creatively about design problems and opportunities in SW Engineering
5. Apply design thinking skills to solve real time user experience problems

**TEXT BOOKS:**

1. <http://asimetrica.org/wp-content/uploads/2014/06/design-thinking.pdf> (e-book)
2. <http://www.rcsc.gov.bt/wp-content/uploads/2017/07/dt-guide-book-master-copy.pdf> (e-book)
3. Idris Mootee, –Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School, Wiley, 2017. (e-book)
4. Basics Design - 8: Design Thinking by Gavin Ambrose, Paul Harris, AVA Publishing (UK) Ltd., 2010.
5. The Basics of User Experience Design BY INTERACTION DESIGN FOUNDATION (unit V) [e-book]

**REFERENCES:**

1. Tim Brown, Barry Katz –Change by Design - How Design Thinking Transforms Organizations and Inspires Innovation, First Edition, Happer Collins, 2009
2. Thomas Lockwood, –Design Thinking – Integrating, Innovation, Customer experience and Brand value, First Edition, Allworth Press, 2009

**GE17E51 HUMAN VALUES AND PROFESSIONAL ETHICS L T P C**  
**3 0 0 3**

**OBJECTIVE:**

- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

**UNIT I HUMAN VALUES 10**  
Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

**UNIT II ENGINEERING ETHICS 9**

Senses of ‘Engineering Ethics’ – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg’s theory – Gilligan’s theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

**UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9**

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law-Case studies

**UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination

**UNIT V GLOBAL ISSUES 8**

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Code of Conduct – Corporate Social Responsibility

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of the course, the students:

1. Should be able to apply ethics in society,
2. Discuss the ethical issues related to engineering
3. Realize the responsibilities and
4. Realize the rights in the society
5. Understand the global issues and its impact.

**TEXTBOOKS:**

1. Mike W. Martin and Roland Schinzinger, —Ethics in Engineering, Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, —Engineering Ethics, Prentice Hall of India, New Delhi, 2004.

**REFERENCES:**

1. Charles B. Fleddermann, –Engineering Ethics, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, —Engineering Ethics – Concepts and Cases, Cengage Learning, 2009
3. John R Boatright, —Ethics and the Conduct of Business, Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, —Fundamentals of Ethics for Scientists and Engineers, Oxford University Press, Oxford, 2001

5. Laura P. Hartman and Joe Desjardins, —Business Ethics: Decision Making for Personal Integrity and Social Responsibility| Mc Graw Hill education, India Pvt. Ltd.,New Delhi 2013.
6. World Community Service Centre, " Value Education", Vethathiri publications, Erode, 2011

**IT17E75****SOFTWARE PROJECT MANAGEMENT****L T P C****3 0 0 3****OBJECTIVES:****The Student should be made to:**

- Learn the fundamentals of software project management
- Learn about the stages in the software development lifecycle and associated processes.
- Know about the quality standards for project management, process maturity models
- Explore estimation techniques, schedule, monitor and control the project.
- Discuss and where appropriate apply the principles of project risk management.

**UNIT I PROJECT EVALUATION AND PROJECT PLANNING****9**

Importance of Software Project Management – Activities Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

**UNIT II PROJECT LIFE CYCLE AND EFFORT ESTIMATION****9**

Software process and Process Models – Choice of Process models - mental delivery –Agile methods – Extreme Programming – SCRUM – Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – Staffing Pattern. – Case Studies on Effort Estimation.

**UNIT III ACTIVITY PLANNING AND RISK MANAGEMENT****9**

Objectives of Activity planning - Sequencing and Scheduling Activities - Network Planning Models Forward Pass - Backward Pass & Activity Float - Critical path (CRM) method - Risk identification – Assessment – Monitoring - PERT technique - Resource Allocation - Creation of critical patterns - Cost schedules. – Case Studies on Risk Management.

**UNIT IV MANAGEMENT AND CONTROL****9**

Framework for Management and control –Collection of data Project termination – Visualizing progress –Cost monitoring –Earned Value Analysis-Project tracking –Change control-Software Configuration Management –Managing contracts. Managing people: Organizational behavior –Best methods of staff selection –Motivation –Ethical and Programmed concerns –Working in teams –Case Studies.

**UNIT V STAFFING IN SOFTWARE PROJECTS****9**

Introduction -Managing people -Understanding Behavior - Organizational Behavior: A Background Selecting The Right Person For The Job - Instruction In The Best Methods – Motivation - The Oldman - Hackman Job Characteristics Model - Working In Team - Decision Making -Team Structures & Organizational Structures - Communications Genres, Plans - Case Studies

**TOTAL: 45 PERIODS**

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

1. Know about software projects and to evaluate them.
2. Perform estimation for software projects.
3. Know activity planning techniques.
4. Demonstrate Project scheduling and risk evaluation skills.
5. Handle staffing related problems.

**TEXT BOOKS:**

1. Bob Hughes, Mike Cotterell, - Software Project Managementl, Fifth edition, Tata Mc Graw Hill, 2011.

**REFERENCES:**

1. Walker Royce - Software Project Management A Unified Frameworkl, Pearson Education, 2004
2. Rishabh Anand , "Software Project Management" S.K. Kataria& Sons; 2013.
3. S.A. Kelkar, "Software Project Management: A Concise Study Paperback " , Phi 2013.
4. Ramesh Gopalaswamy, —Managing Global Software Projectsl, Tata McGraw Hill, 2001.
5. Humphrey Watts, —Managing the software processl, Addison Wesley, 1989.
6. Ashfaque Ahmed "Software Project Management Process Driven Approach",Auerbach Pub., 2011.

<b>GE17451</b>	<b>TOTAL QUALITY MANAGEMENT</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**OBJECTIVES:**

- To facilitate the understanding of basic quality management in engineering.
- To facilitate the understanding of various principles of TQM.
- To be acquainted with management tools, six sigma and benchmarking.
- To be acquainted with quality functions, TPM concepts & continuous improvement tools.
- To learn various quality systems and TQM implementation in manufacturing and service sectors.

**UNIT I INTRODUCTION 9**

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Costs of quality.

**UNIT II TQM PRINCIPLES 9**

Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles, Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

**UNIT III TQM TOOLS AND TECHNIQUES I 9**

The seven traditional tools of quality - New management tools - Six sigma, Lean Six Sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

**UNIT IV TQM TOOLS AND TECHNIQUES II 9**

Control Charts - Process Capability - Concepts of Six Sigma - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures. POKA-YOKE.

**UNIT V QUALITY SYSTEMS 9**

Need for ISO 9000 - ISO 9001:2015 Quality System - Elements, Documentation, Quality Auditing - QS 9000 - ISO 14000 - Concepts, Requirements and Benefits – ISO 9000:2005, ISO 9004:2009 - TQM Implementation in manufacturing and service sectors. Quality System for Automotive Supplier TS 16949, Quality System for Telecom Industries - TL 9000

**TOTAL: 45 PERIODS**

**OUTCOMES:**

1. Ability to explain the importance of quality in engineering.
2. Ability to explain various principles in TQM.
3. Explore the knowledge of implementing various TQM tools.
4. Ability to create rapport among workers to form a quality team.
5. Ability to explain the benefits of implementing ISO-9000 & ISO-14000 in manufacturing and service sectors.

**TEXT BOOK:**

1. Dale H. Besterfield, et al., "Total quality Management", Third Edition, Pearson Education Asia, Indian Reprint, 2011.

**REFERENCES:**

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8<sup>th</sup> Edition, First Indian Edition, Cengage Learning, 2012.
2. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
3. Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall(India) Pvt. Ltd., 2006.

**SEMESTER VIII  
ELECTIVE - IV**

IT17E81

SERVICE ORIENTED ARCHITECTURE

**L T P C  
3 0 0 3**

**OBJECTIVES:****The student should be made to:**

- Learn XML fundamentals.
- Be exposed to build applications based on XML.
- Understand the key principles behind SOA.
- Be familiar with the web services technology elements for realizing SOA.
- Learn the various web service standards.

**UNIT I INTRODUCTION TO XML****9**

XML document structure – Well formed and valid documents – Namespaces – DTD – XML Schema – X-Files. (Ref. Book 1: Chapter 2-5)

**UNIT II BUILDING XML- BASED APPLICATIONS****9**

Parsing XML – using DOM, SAX – XML Transformation and XSL – XSL Formatting – Modeling Databases in XML (Ref. Book 1: Chapter 7-9)

**UNIT III SERVICE ORIENTED ARCHITECTURE****9**

Characteristics of SOA, Comparing SOA with Client-Server and Distributed architectures – Benefits of SOA -- Principles of Service orientation – Service layers. (Ref. Book 2: Chapter 3-4,8-9 )

**UNIT IV WEB SERVICES****9**

Service descriptions – WSDL – Messaging with SOAP – Service discovery – UDDI – Message Exchange Patterns – Orchestration – Choreography –WS Transactions (Ref. Book 2: Chapter 4, 6, 13,14 )

**UNIT V BUILDING SOA-BASED APPLICATIONS****9**

Service Oriented Analysis and Design – Service Modeling – Design standards and guidelines -- Composition – WS-BPEL – WS-Coordination – WS-Policy – WS-Security – SOA support in J2EE. (Ref. Book 2: Chapter 11, 13,14-18 )

**TOTAL: 45 PERIODS****OUTCOMES:****Upon successful completion of this course, students will be able to:**

1. Build applications based on XML.
2. Develop web services using technology elements.
3. Build SOA-based applications for intra-enterprise and inter-enterprise applications.
4. Design SOAP based applications
5. Understand WS policies and Security.

**TEXTBOOKS:**

1. Ron Schmelzer et al. — XML and Web Services, Pearson Education, 2002
2. Thomas Erl, —Service Oriented Architecture: Concepts, Technology, and Design, Pearson Education, 2005.

**REFERENCES:**

1. Frank P.Coyle, -XML, Web Services and the Data Revolution, Pearson Education, 2002.

2. Eric Newcomer, Greg Lomow, —Understanding SOA with Web Services, Pearson Education, 2005.
3. Sandeep Chatterjee and James Webber, —Developing Enterprise Web Services: An Architect's Guidel, Prentice Hall, 2004.
4. James McGovern, Sameer Tyagi, Michael E. Stevens, Sunil Mathew, Java Web Services Architecture, Morgan Kaufmann Publishers, 2003

## CS17E75 HUMAN COMPUTER INTERACTION

**L T P C**  
**3 0 0 3**

### OBJECTIVES:

#### The Student should be made to:

- Learn the foundations of Human Computer Interaction.
- Be familiar with the design technologies and software process
- Learn human interaction models and theories
- Be aware of Design thinking concepts.
- Learn the guidelines of design thinking and apply it.

### UNIT I FOUNDATIONS OF HCI

**9**

The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity.

### UNIT II DESIGN & SOFTWARE PROCESS

**9**

Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. HCI Patterns

### UNIT III MODELS AND THEORIES

**9**

Cognitive models – Socio-Organizational issues and stake holder requirements – Communication and collaboration models

### UNIT IV FOUNDATIONS OF DESIGN THINKING

**9**

Why Design Thinking – The Design Process – Design Criteria – Visualization – Journey Mapping – Value Chain Analysis – Mind Mapping – Case Studies

### UNIT V APPLYING DESIGN THINKING

**9**

Brainstorming - Concept Development – Assumption Testing – Rapid Prototyping – Customer Co-creation – Learning launch – Free mind (Mind – Mapping Tool) – Case Studies

**TOTAL 45 PERIODS**

### OUTCOMES:

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

1. Describe the foundations of Human Computer Interaction.
2. Demonstrate with the design technologies and software process.
3. Apply the concepts of human interaction models and theories
4. Describe the foundations of design thinking concepts.
5. Apply the concepts of design thinking in mind mapping tools

### TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, Human Computer Interaction, Third Edition, Pearson Education, 2004



- Jeanne Liedtka, Tim Ogilvie, and Rachel Brozenske, The Designing for Growth Field Book: A Step-by-Step Project Guide, First Edition (New York: Columbia University Press, 2014).

**REFERENCES:**

- Tim Brown, Barry Katz Change by Design - How Design Thinking Transforms Organizations and Inspires Innovation, First Edition, Happer Collins,2009
- Thomas Lockwood, Design Thinking – Integrating, Innovation, Customer experience and Brand value, First Edition, Allworth Press, 2009
- Jenny Preece , Helen Sharp, Yvonne Rogers, Interaction Design - beyond human-computer interaction, Fourth Edition, John Wiley & Sons, Inc, 2015

**IT17E82****INTERNET OF THINGS****L T P C  
3 0 0 3****OBJECTIVES:****The student should be able to:**

- Learn the Fundamentals of IOT.
- Know the Design Methodology.
- Apply the concept of Internet of Things in real world scenario
- Build a small low cost embedded system using present day embedded platforms
- Apply the concept of Internet of Things in real world scenario

**UNIT I FUNDAMENTALS****9**

Introduction to Embedded system- Evolution of IoT- Difference between embedded system and IoT- IIoT and Industry 4.0- IoT Characteristics – IoT Vs M2M- IoT Levels and Domain Specific IoTs

**UNIT II ARCHITECTURE****9**

IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Four important key elements of IoT- Real-World Design Constraints, Technical Design constraints: Data representation and visualization, Interaction and remote control.

**UNIT III IoT DESIGN AND CHALLENGES****9**

Devices and gateways- IoT Edge: Sensors and activators, Communication modules , Zigbee , RFID, Wi-Fi, Power sources-Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management- Challenges in IoT: Design challenges, Development challenges, Security challenges, Other challenges

**UNIT IV BUILDING IOT WITH HARDWARE PLATFORMS****9**

Present day embedded platforms: Arduino /Intel Galileo/Raspberry Pi- Physical device – IoT Software – NOOBS/ENERGIA/MQTT -Interfaces – Communications Programming.

**UNIT V CASE STUDIES****9**

Domain specific applications of IoT Home automation, Industry applications, Surveillance applications, Other IoT applications -Connecting IoT to cloud- - Software & Management Tools for IoT

**TOTAL: 45 PERIODS****OUTCOMES:****At the end of the course, the students should be able to:**

- Understand the Reference architecture and various IoT levels
- Design a portable IoT using present day embedded platforms and relevant protocols
- Develop web services to access/control IoT devices
- Developing Cloud based applications using IoT
- Develop applications in Energia/Noobs/MQTT

**TEXT BOOK:**

1. Arshdeep Bahga, Vijay Madiseti, "Internet of Things-A hands-on approach", Universities Press, 2015.
2. Dr. Ovidiu Vermesan, Dr. Peter Friess, —Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, River Publishers

**REFERENCES:**

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, —From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014.
2. Peter Waher, —Learning Internet of Things, PACKT publishing, BIRMINGHAM – MUMBAI
3. Bernd Scholz-Reiter, Florian Michahelles, —Architecting the Internet of Things, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer
4. Daniel Minoli, —Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications, ISBN: 978-1-11847347-4, Willy Publications

**IT17E83****SOCIAL NETWORK ANALYSIS****L T P C****3 0 0 3****OBJECTIVES:****The student should be made to:**

- Understand the components of the social network.
- Model and visualize the social network.
- Mine the users in the social network.
- Understand the evolution of the social network.
- Mine the interest of the user.

**UNIT I INTRODUCTION****9**

Introduction to Web - Limitations of current Web – Development of Semantic Web – Emergence of the Social Web – Statistical Properties of Social Networks -Network analysis – Development of Social Network Analysis - Key concepts and measures in network analysis – Discussion networks - Blogs and online communities - Web-based networks-Data Mining in Social Networks.

**UNIT II MODELING AND VISUALIZATION****9**

Visualizing Online Social Networks - A Taxonomy of Visualizations - Graph Representation - Centrality- Clustering - Node-Edge Diagrams - Visualizing Social Networks with Matrix-Based Representations- Node-Link Diagrams - Hybrid Representations - Modelling and aggregating social network data – Random Walks and their Applications –Use of Hadoop and Map Reduce - Ontological representation of social individuals and relationships.

**UNIT III MINING COMMUNITIES****9**

Aggregating and reasoning with social network data, Advanced Representations – Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Evaluating Communities – Core Methods for Community Detection & Mining - Applications of Community Mining Algorithms - Node Classification in Social Networks-**Optimization**

**UNIT IV      EVOLUTION****9**

Evolution in Social Networks – Framework - Tracing Smoothly Evolving Communities – Models and Algorithms for Social Influence Analysis - Influence Related Statistics - Social Similarity and Influence - Influence Maximization in Viral Marketing - Algorithms and Systems for Expert Location in Social Networks - Expert Location without Graph Constraints - with Score Propagation – Expert Team Formation - Link Prediction in Social Networks - Feature based Link Prediction - Bayesian Probabilistic Models - Probabilistic Relational Models.

**UNIT V      TEXT AND OPINION MINING****9**

Text Mining in Social Networks -Opinion extraction – Sentiment classification and clustering - Temporal sentiment analysis - Irony detection in opinion mining –**Opinion Spam Detection**- Wish analysis - Product review mining – Review Classification – Tracking sentiments towards topics over time.

**TOTAL: 45 PERIODS****OUTCOMES:****At the end of the course, the student should be able to:**

1. Work on the internal components of the social network.
2. Model and visualize the social network.
3. Mine the behaviour of the users in the social network.
4. Predict the possible next outcome of the social network.
5. Mine the opinion of the user.

**TEXT BOOKS:**

1. Peter Mika, Social Networks and the Semantic Web, Springer, First edition, 2007.
2. Borko Furht, Handbook of Social Network Technologies and Applications, Springer, First edition, 2010.

**REFERENCES:**

1. Charu C. Aggarwal, Social Network Data Analytics, Springer; 2011
2. Guandong Xu , Yanchun Zhang and Lin Li, Web Mining and Social Networking – Techniques and applications, Springer, First edition, 2011.
3. Giles, Mark Smith, John Yen, Advances in Social Network Mining and Analysis, Springer, 2010.
4. Ajith Abraham, Aboul Ella Hassanien, Vaclav Snašel, Computational Social Network Analysis: Trends, Tools and Research Advances, Springer, 2009.
5. Toby Segaran, Programming Collective Intelligence, O'Reilly, 2012
6. Bing Liu. Sentiment Analysis and Opinion Mining, Morgan & Claypool Publishers, May 2012.

**SEMESTER VIII  
ELECTIVE - V**

**MG17E81 LEAN STARTUP MANAGEMENT**

**L T P C  
3 0 0 3**

**OBJECTIVES:**

- The objective of the course is to make a student to create and commercialize the product

**UNIT I**

Creativity and Design Thinking (identify the vertical for business opportunity, understand your customers, and accurately assess market opportunity)

**UNIT II**

Minimum Viable Product (Value Proposition, Customer Segments, Build-measure-learn process)

**UNIT III**

Business Model Development(Channels and Partners, Revenue Model and streams, Key Resources, Activities and Costs, Customer Relationships and Customer Development Processes, Business model canvas –the lean model-templates)

**UNIT IV**

Business Plan and Access to Funding(visioning your venture, taking the product/ service to market, Market plan including Digital & Viral Marketing, start-up finance - Costs/Profits & Losses/cash flow, Angel/VC,/Bank Loans and Key elements of raising money)

**UNIT V**

Legal, Regulatory, CSR, Standards, Taxes

**TOTAL: 45 PERIODS**

**OUTCOMES:**

At the end of the course, the student shall be able to

1. Create design for Business and Market Opportunity
2. Measure the viability of the product.
3. Develop Business Models
4. Understand and develop the business plans
5. Execution of the Business Models

**TEXT BOOKS:**

1. Steve Blank, K & S Ranch ,|The Startup Owner's Manual: The Step-By-Step Guide for Building a Great Company|, 1st edition, 2012
2. Steve Blank ,|The Four Steps to the Epiphany|, K&S Ranch; 2nd edition, 2013
3. Eric Ries ,|The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses|, Crown Business, 2011

**REFERENCE BOOKS:**

1. Steve Blank –Holding a Cat by the Tail, , K&S Ranch Publishing LLC, 2014
2. Karal T Ulrich, –Product Design and Development|, SD Eppinger, McGraw Hill
3. Peter Thiel,|Zero to One: Notes on Startups, or How to Build the Future|, Crown Business , 2014
4. Lean Analytics: Use Data to Build a Better Startup Faster (Lean Series), Alistair Croll & Benjamin Yoskovitz, O'Reilly Media; 1st Edition

5. Marty Cagan, -Inspired: How To Create Products Customers Love, SVPG Press; 1st edition, 2008

## **IT17E84 SOFTWARE TESTING AND QUALITY ASSURANCE**

**LT P C**

**3 0 0 3**

### **OBJECTIVES:**

#### **The student should be able to:**

- Know what is software quality and various defect removal processes.
- Know various testing techniques.
- Aware of various types of testing
- Learn to manage testing and test automation.
- Quality Metrics of various Software

### **UNIT I INTRODUCTION 9**

Introduction to Software Quality - Challenges – Objectives – Quality Factors – Components of SQA – Contract Review – Development and Quality Plans – SQA Components in Project Life Cycle – SQA Defect Removal Policies – Reviews.

### **UNIT II TESTING TECHNIQUES 9**

Using White Box Approach to Test design - Static Testing Vs. Structural Testing – Code Functional Testing – Coverage and Control Flow Graphs –Using Black Box Approaches to Test Case Design – Random Testing – Requirements based testing –Decision tables –State-based testing – Cause-effect graphing – Error guessing.

### **UNIT III TEST LEVELS AND METHODOLOGIES 9**

Levels of Testing - Unit Testing - Integration Testing - Defect Bash Elimination- System Testing– System and Acceptance Testing – Testing Strategies – White Box and Black Box Approach- Compatibility testing-Performance Testing – Regression Testing - Internationalization Testing – Ad-hoc Testing – Website Testing –Usability and Accessibility Testing – Configuration Testing - Compatibility Testing - Case study for White box testing and Black box testing techniques.

### **UNIT IV TEST AUTOMATION AND MANAGEMENT 9**

Test plan – Management – Execution and Reporting – Software Test Automation – Automated Testing tools - Hierarchical Models of Software Quality – Configuration Management – Documentation Control.

### **UNIT V SQA IN PROJECT MANAGEMENT 9**

Project progress control – costs – quality management standards – project process standards – management and its role in SQA – SQA unit.

**TOTAL: 45 PERIODS**

### **OUTCOMES**

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

1. Analyze the product Quality.
2. Apply suitable type of testing methodology.
3. Test the product with white and black box testing strategies.
4. Perform test management with documentation.
5. Understand quality management standards

**TEXTBOOKS:**

1. Daniel Galin, —Software Quality Assurance from Theory to Implementation, Pearson Education, 2009
2. Yogesh Singh, —Software Testing, Cambridge University Press, 2012
3. Srinivasan Desikan, Gopaldaswamy Ramesh, Software Testing – Principles and Practices, Pearson Education, 2006
4. William Perry, —Effective Methods of Software Testing, Third Edition, Wiley Publishing 2007

**REFERENCES:**

1. Aditya Mathur, —Foundations of Software Testing, Pearson Education, 2008
2. Ron Patton, Software Testing, Second Edition, Pearson Education, 2007
3. Robert Furtell, Donald Shafer and Linda Shafer, —Quality Software Project Management, Pearson Education Asia, 2002.

**CS17E72 FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT L T P C  
3 0 0 3**

**OBJECTIVE:**

This program can be offered with all Undergraduate programs/courses for all engineering streams. The FSIPD program aims to improve students' awareness and understanding of the basic concepts involved in integrated product Development (IPD) by providing exposure to the key product development concepts. After completing this program, the student will be able to:

- Understand and analyse various global trends and decide on the scope of the new product design.
- 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
- Understand requirement engineering and know how to collect, analyse and arrive at requirement for new product development and convert them in to design specification
- Understand system modelling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
- Gain knowledge of the Innovation & Product Development process in the Business Context.

**UNIT I FUNDAMENTALS OF PRODUCT DEVELOPMENT 9**

Global Trends Analysis and Product decision - Types of various trends affecting product decision - Social Trends - Technological Trends -Political/Policy Trends - Economic Trends - Environmental Trends - PESTLE Analysis(Requirements, Aim, Process), Various factors of Pestle analysis(Political, Technological, Legal). 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 Requirement - Requirement Engineering (Gathering, Analysis, Design Specification) - Traceability Matrix and Analysis - Requirement Management. System Design & Modelling: Introduction to System Modelling - System Optimization (Problem Formulation), Optimization Techniques (Bracketing method, Fibonacci search method, Cubic interpolation, Random jumping method) - System Specification - Sub-System Design - Interface Design

**UNIT III DESIGN AND TESTING 13**

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 – Software Subsystems - High Level Design/Low Level Design of S/W Program. Prototyping - Types of Prototypes, Introduction to Rapid Prototyping and Rapid Manufacturing, Testing and Certification - Manufacturing/ Purchase and

Assembly of Systems, Integration of Mechanical, Embedded and Software systems, Introduction to Product Verification Processes, Validation Processes and Stages, Product Testing Standards Certification, S/W Testing- Hardware Schematic, Component design, Layout and Hardware Testing – Product Documentation.

**UNIT IV SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT 5**

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 - Product development Trade-offs - Intellectual Property Rights and Confidentiality - Security and configuration management.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

1. Define, formulate and analyse a problem
2. Solve specific problems independently or as part of a team
3. 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
4. Work independently as well as in teams
5. Manage a project from start to finish

**TEXT BOOK [INDIAN ECONOMY EDITIONS]:**

1. Foundation Skills in Integrated Product Development (FSIPD), First Edition, 2013, NASSCOM.

**REFERENCES:**

1. Karl T Ulrich and Stephen D Eppinger, Product Design and Development, Tata McGraw Hill, Fifth Edition, New Delhi, 2011
2. John W Newstorm and Keith Davis, Organizational Behaviour, Tata McGraw Hill, Eleventh Edition, New Delhi, 2005.
3. Mark S Sanders and Ernest J McCormick, Human Factors in Engineering and Design, McGraw Hill Education, Seventh Edition, New Delhi, 2013.

**OGE1702**

**INTELLECTUAL PROPERTY RIGHTS**

**L T P C  
3 0 0 3**

**OBJECTIVE:**

- To give an idea about IPR, registration and its enforcement.

**UNIT I INTRODUCTION**

**9**

Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

**UNIT II REGISTRATION OF IPRs 10**

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad

**UNIT III AGREEMENTS AND LEGISLATIONS 10**

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

**UNIT IV DIGITAL PRODUCTS AND LAW 9**

Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies

**UNIT V ENFORCEMENT OF IPRs 7**

Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies

**TOTAL: 45 PERIODS**

**OUTCOMES:****The students have the:**

1. Ability to understand the basics of Intellectual Property right.
2. Able to understand the registration procedures of IPRs.
3. Able to know the different agreements and legislation related to IPRs.
4. Able to know the digital IP laws.
5. Able to understand the Violation and enforcement measures of IPRs

**TEXT BOOKS**

1. S.V. Satarkar, -Intellectual Property Rights and Copy Rights|, EssEss Publications, New Delhi,2002.
2. V. Scople Vinod, -Managing Intellectual Property|, Prentice Hall of India pvt Ltd, 2012

**REFERENCES**

1. Deborah E. Bouchoux, —Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets|, Cengage Learning, Third Edition, 2012.
2. PrabuddhaGanguli,|Intellectual Property Rights: Unleashing the Knowledge Economy|, McGrawHill Education, 2011.
3. Edited by Derek Bosworth and Elizabeth Webster,| The Management of Intellectual Property|, Edward Elgar Publishing Ltd., 2013.