

**DEPARTMENT OF COMPUTER
SCIENCE AND ENGINEERING**

Periyar Nagar, Vallam Thanjavur - 613 403, Tamil Nadu, India
Phone: +91 - 4362 - 264600 Fax: +91- 4362 - 264660
Email: headcse@pmu.edu Web: www.pmu.edu



**PERIYAR
MANIAMMAI**
INSTITUTE OF SCIENCE & TECHNOLOGY
(Deemed to be University)
Established Under Sec. 3 of UGC Act, 1956 • NAAC Accredited
think • innovate • transform

CURRICULUM & SYLLABUS
FOR
B.TECH COMPUTER SCIENCE AND ENGINEERING
(Based on Outcome Based Education)

Regulation 2018 Revision I
(I - VIII Semester)

TABLE OF CONTENTS

S.No	Contents	Page No.
1	Institute Vision and Mission	3
2	Department Vision and Mission	4
3	Programme Educational Objectives (PEO)	5
4	Programme Outcome (PO)	6
5	Graduate Attributes	7
6	B. Tech. (Computer Science and Engineering) – Curriculum	9
7	B. Tech. (Computer Science and Engineering) – Syllabus	14

PERIYAR MANIAMMAI INSTITUTE OF SCIENCE AND TECHNOLOGY

Our University is committed to the following Vision, Mission and core values, which guide us in carrying out our Civil Engineering Department mission and realizing our vision:

INSTITUTION VISION	
To be a University of global dynamism with excellence in knowledge and innovation ensuring social responsibility for creating an egalitarian society.	
INSTITUTION MISSION	
UM1	Offering well balanced programmes with scholarly faculty and state-of-art facilities to impart high level of knowledge.
UM2	Providing student - centered education and foster their growth in critical thinking, creativity, entrepreneurship, problem solving and collaborative work.
UM3	Involving progressive and meaningful research with concern for sustainable development.
UM4	Enabling the students to acquire the skills for global competencies.
UM5	Inculcating Universal values, Self respect, Gender equality, Dignity and Ethics.
INSTITUTION CORE VALUES	
<ul style="list-style-type: none">• Student – centric vocation• Academic excellence• Social Justice, equity, equality, diversity, empowerment, sustainability• Skills and use of technology for global competency.• Continual improvement• Leadership qualities.• Societal needs• Learning, a life – long process• Team work• Entrepreneurship for men and women• Rural development• Basic, Societal, and applied research on Energy, Environment, and Empowerment.	

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

DEPARTMENT VISION	
To Produce Intellectuals who can relate theory and practice, familiar with common themes and apply concepts of Computer Science and Engineering for Research and Societal development.	
DEPARTMENT MISSION	
DM1	To offer UG, PG, Ph.D. programme with state of art facilities in the field of Computer Science and Engineering
DM2	To prepare the students become globally competent by enhancing their skills to work in IT Industries and R & D organizations
DM3	To prepare the students with good ethical attitude and an ability to relate engineering issues to broader social context
DM4	To promote significant research in cutting edge Information Communication technologies with environmental consciousness

Table: 1 Mapping of University Mission (UM) and Department Mission (DM)

	UM 1	UM 2	UM 3	UM 4	UM 5
DM 1	3	3	1	1	1
DM 2	2	3	2	3	1
DM 3	1	2	1	3	3
DM 4	1	1	3	1	1
	7	9	7	8	6

1-Low 2- Medium 3 – High

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

Based on the mission of the department, the programme educational objectives is formulated as

PEO1	Graduates will attain the expertise of analyzing and specifying the requirements for any computing system as well as capable of modeling, designing, implementing and verifying a computing system to meet specified requirements using contemporary tools
PEO2	Graduates will possess diversified professional skills for successful career.
PEO3	Graduates of the programme will have the competencies for communicating, planning, coordinating, organizing, decision making and leading a team
PEO4	Graduates of the programme will have knowledge of professional, interpersonal and ethical responsibility and will contribute to society through active research.

Mapping of Program Educational Objectives (PEOs) with Department Mission (DM)

	DM 1	DM 2	DM3	DM 4
PEO 1	3	3	2	3
PEO 2	2	3	1	1
PEO 3	2	3	2	3
PEO 4	2	2	3	1
	9	11	8	8

1- Low

2 – Medium

3-High

PROGRAMME OUTCOME (PO)

At the time of graduation, competency of the student is measured through the attainment of programme outcomes. The quantification of programme outcomes attainment is measured through the assessment of established course outcomes for each subject.

PROGRAM OUTCOMES	
PO 1	an ability to apply knowledge of computing and mathematics appropriate to the discipline.
PO 2	an ability to analyze a problem, interpret data, and define the computing system requirements which would be appropriate to the solution.
PO 3	an ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.
PO 4	an ability to apply creativity in the design of systems which would help to investigate the complex problem and provide software solution.
PO 5	an ability to use the computing techniques, skills, and modern system tools necessary for practice as a CSE professional
PO 6	an ability to analyze the local and global impact of computing on individuals, organizations, and society
PO 7	an ability to develop and use the software systems within realistic constraints environmental, health and safety, manufacturability, and sustainability considerations
PO 8	an ability in an understanding of professional, ethical, legal, security and social issues and responsibilities
PO 9	an ability to function effectively on teams and individually to accomplish a common goal
PO 10	an ability to communicate effectively with a range of audiences by written and oral
PO 11	ability to plan, organize and follow best practices and standards so that the project is completed as successfully by meeting performance, quality at CMM level, budget and time
PO 12	an ability to engage in Lifelong learning and continuing professional development
PROGRAM SPECIFIC OUTCOME	
PS01	ability to employ latest computer languages, environments and platforms for solving problems in the areas of emerging communication technologies.
PS02	ability to use knowledge in data analytics and mining for industrial problems

GRADUATE ATTRIBUTES

1. **Knowledge base for Engineering:** Demonstrate competence in mathematics, natural sciences, engineering fundamentals and specialized engineering knowledge appropriate to the programme.
2. **Analytical Skills:** Identify, formulate, analyze and solve diverse engineering problems.
3. **Design:** Solution for complicated open-ended engineering problems and design the components with appropriate standards to meet specified needs with proper attention to public health, safety, environment and society.
4. **Experimental Investigation:** Technical skills to conduct investigation, interpretation of observed data and provide solution for multifaceted problems.
5. **Modern Engineering tools usage:** Acquire, select, manipulate relevant techniques, resources and advanced engineering ICT tools to operate simple to complex engineering activities.
6. **Impact of engineering on society:** Provide a product / project for use by the public towards their health, welfare, safety and legal issues to serve the society effectively.
7. **Environment and Sustainability:** Design eco-friendly and sustainable products in demonstrating the technology development to meet present and future needs.
8. **High Ethical Standards:** Practice ethical codes and standards endorsed by professional engineers.
9. **Leadership and team work:** Perform as an individual and as a leader in diverse teams and in multi-disciplinary scenarios.
10. **Communication Skills:** Professional communication with the society to comprehend and formulate reports, documentation, effective delivery of presentation and responsible to clear instructions.
11. **Project management and Finance:** Appropriate in incorporating finance and business practices including project, risk and change management in the practice of engineering by understanding their limitations.
12. **Life-long learners:** Update the technical needs in a challenging world in equipping themselves to maintain their competence.

Table : 3 Mapping of Program Educational Objectives (PEOs) with Program Outcomes (POs)

PO →	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO 2
PEO 1	3	2	2	1	1	2	1	0	1	0	2	1	3	3
PEO 2	1	3	2	3	2	1	1	2	0	2	1	1	3	2
PEO 3	0	1	3	2	3	2	2	1	1	2	1	2	1	1
PEO 4	0	1	2	2	0	1	3	1	1	1	1	1	1	1
	4	7	9	8	6	6	7	4	3	5	5	5	8	7

1 - Low

2 – Medium

3 - High

Table :4 Mapping of Program Outcomes (POs) with Graduate Attributes (GAs)

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA 12
P01	3	2	2	1	1	2	1	1	1	2	2	1
P02	2	2	3	2	1	2	1	1	2	1	1	2
P03	2	2	2	3	3	1	2	1	1	2	1	2
P04	2	2	3	3	1	2	1	1	2	2	1	2
P05	2	1	3	2	3	3	3	2	2	3	1	2
P06	3	2	2	1	1	2	1	1	1	2	2	1
P07	2	2	1	1	2	3	2	3	2	1	2	2
P08	2	1	1	2	1	3	2	2	2	3	1	2
P0 9	2	1	1	2	3	3	2	2	3	3	1	3
P010	2	2	1	1	2	3	2	3	2	1	2	2
P011	2	1	2	3	2	3	1	3	3	2	1	3
P012	2	2	2	3	3	1	2	1	1	2	1	2
PS01	2	1	2	2	1	3	2	2	2	3	1	2
PS02	2	2	2	2	3	1	2	1	1	2	1	2

1- Slightly

2 – Supportive

3 - Highly related

CURRICULUM

Regulation 2018 Revision 1

SEMESTER I

Sub. Code	Name of the Course	L	T	P	C	H
XMA101	Calculus and Linear Algebra	3	1	0	4	4
XCP102	Programming for Problem Solving	3	0	4	5	7
XGS103	English	2	0	2	3	4
XAP104	Applied Chemistry for Engineers	3	1	3	5	7
XWS105	Workshop Practices	1	0	4	3	5
	Total				20	27

SEMESTER II

Sub. Code	Name of the Course	L	T	P	C	H
XMA201	Calculus, Ordinary Differential Equations And Complex Variable	3	1	0	4	4
XES202	Environmental Science	3	0	0	0	3
XBE203	Electrical And Electronics Engineering Systems	3	1	1	5	6
XAP204	Applied Physics for Engineers	3	1	2	6	7
XEG 205	Engineering Graphics	2	0	1	3	4
	Total				18	24

SEMESTER III

Sub. Code	Name of the Course	L	T	P	C	H
XPS301	Probability and Statistics	3	1	0	4	4
XCS302	Analog & Digital Electronic Circuits	3	0	2	5	7
XCS303	Data Structures & Algorithms	3	0	2	5	7
XCS304	Object oriented Programming	2	0	2	4	6
XES306	Entrepreneurship Development	2	0	0	2	2
XCI307	Constitution of India	3	0	0	0	3
	Total				20	29

SEMESTER IV

Sub. Code	Name of the Course	L	T	P	C	H
XCS401	Discrete Mathematics	3	1	0	4	4
XCS402	Computer Organization & Architecture	3	0	2	5	7
XCS403	Operating Systems	3	0	2	5	7
XCS404	Design & Analysis of Algorithms	3	0	2	5	6
XUM405	Total Quality Management	3	0	0	3	3
	Total				22	28

SEMESTER V

Sub. Code	Name of the Course	L	T	P	C	H
XCS501	Signals & Systems	3	0	0	3	3
XCS502	Formal Language & Automata Theory	3	0	0	3	3
XCS503	Database Management Systems	3	0	2	5	7
XCS504	Software Engineering	3	0	2	5	7
XCS505	IT Workshop	1	0	1	2	3
XCSE**	Elective-I	3	0	0	3	3
X**OE*	Open Elective – I	3	0	0	3	3
XCS508	In-Plant Training – II	-	-	-	0	
XCSM01	Programming with Python	1	0	0	0	1
	Total				24	30

SEMESTER VI

Sub. Code	Name of the Course	L	T	P	C	H
XCS601	Compiler Design	3	0	2	5	7
XCS602	Computer Networks	3	0	2	5	7
XCSE**	Elective- II	3	0	0	3	3
XCSE**	Elective- III	3	0	0	3	3
X**OE*	Open Elective –II	3	0	0	3	3
XUM606	Economics for Engineers	3	0	0	3	3
XCSM02	Web designing	1	0	0	0	1
	Total				22	26

SEMESTER VII

Sub. Code	Name of the Course	L	T	P	C	H
XCSOE3	Open Elective –III	3	0	0	3	3
XCSE**	Elective-IV	3	0	0	3	3
XCSE**	Elective-V	3	0	0	3	3
XUM704	Biology	3	0	0	0	3
XUM705	Disaster Management	3	0	0	0	3
XCS706	Project – I	0	0	12	6	0
XCS707	In plant Training - III	0	0	1	1	0
XCSM03	R Programming	1	0	0	0	1
Total					16	16

SEMESTER VIII

Sub. Code	Name of the Course	L	T	P	C	H
XUM801	Cyber Security	3	0	0	3	3
XCSOE4	Open Elective -IV	3	0	0	3	3
XCSOE5	Open Elective -V	3	0	0	3	3
XCS804	Project – II	0	0	12	6	0
Total					15	9

TOTAL CREDIT: 157

LIST OF PROFESSIONAL ELECTIVES**[PEC-CSE]**

The Professional Elective Courses are offered from the following Specialized Threads:

No.	Threads
I.	Theory and Algorithms
II.	Applications
III.	Data Science and Machine Intelligence
IV.	Systems

PROFESSIONAL ELECTIVES GROUP – I**V SEMESTER**

Sub. Code	Name of the Course	L	T	P	C	H
XCSE51	Artificial Intelligence	3	0	0	3	3
XCSE52	Graph Theory	3	0	0	3	3
XCSE53	Data Communication	3	0	0	3	3
XCSE54	Information Theory and Coding	3	0	0	3	3

PROFESSIONAL ELECTIVES GROUP – II**VI SEMESTER**

Sub. Code	Name of the Course	L	T	P	C	H
XCSE61	Web and Internet Technology	3	0	0	3	3
XCSE62	Queuing Theory and Modelling	3	0	0	3	3
XCSE63	Distributed Systems	3	0	0	3	3
XCSE64	Cryptography and Network Security	3	0	0	3	3

PROFESSIONAL ELECTIVES GROUP – III**VI SEMESTER**

Sub. Code	Name of the Course	L	T	P	C	H
XCSE65	Data Mining	3	0	0	3	3
XCSE66	Optimization Techniques	3	0	0	3	3
XCSE67	Multi Agent Intelligent Systems	3	0	0	3	3
XCSE68	Image processing	3	0	0	3	3
XCSE69	Context Aware Computing	3	0	0	3	3

PROFESSIONAL ELECTIVES GROUP – IV**VII SEMESTER**

Sub. Code	Name of the Course	L	T	P	C	H
XCSE71	Information Retrieval	3	0	0	3	3
XCSE72	Cloud Computing	3	0	0	3	3
XCSE73	Fault Tolerant Computing	3	0	0	3	3
XCSE74	Computer Graphics	3	0	0	3	3
XCSE75	Advanced Operating System	3	0	0	3	3
XCSE76	Storage technologies	3	0	0	3	3
XCSE77	Virtualization	3	0	0	3	3

PROFESSIONAL ELECTIVES GROUP – V**VII SEMESTER**

Sub. Code	Name of the Course	L	T	P	C	H
XCSE78	Machine Learning	3	0	0	3	3
XCSE79	Adhoc and Sensor Networks	3	0	0	3	3
XCSE7A	Embedded Systems	3	0	0	3	3
XCSE7B	Fog Computing	3	0	0	3	3
XCSE7C	Quantum Computing	3	0	0	3	3
XCSE7D	Parallel and Distributed algorithms	3	0	0	3	3
XCSE7E	Electronic Design Automation	3	0	0	3	3

OPEN ELECTIVES

Sub. Code	Name of the Course	L	T	P	C	H
XCSOE1	Web Designing	3	0	0	3	3
XCSOE2	Multimedia Design and Development	3	0	0	3	3
XCSOE3	Digital Marketing	3	0	0	3	3
XCSOE4	Project Management	3	0	0	3	3
XCSOE5	Data Management	3	0	0	3	3

SYLLABUS

COURSE CODE			XMA101	L	T	P	C
COURSE NAME			CALCULUS AND LINEAR ALGEBRA	3	1	0	4
C	P	A		L	T	P	H
3.0	0.5	0.5		3	1	0	4
PREREQUISITE: Differentiation and Integration				DOMAIN		LEVEL	
C01	Apply orthogonal transformation to reduce quadratic form to canonical forms.			Cognitive		Remembering Applying	
C02	Apply power series to tests the convergence of the sequences and series. Half range Fourier sine and cosine series.			Cognitive Psychomotor		Applying Remembering Guided Response	
C03	Find the derivative of composite functions and implicit functions.Euler’s theorem and Jacobian			Cognitive Psychomotor		Remembering Guided Response	
C04	Explain the functions of two variables by Taylors expansion, by finding maxima and minima with and without constraints using Lagrangian Method. Directional derivatives, Gradient, Curl and Divergence.			Cognitive Affective		Remembering Understanding Receiving	
C05	Apply Differential and Integral calculus to notions of Curvature and to improper integrals.			Cognitive		Applying	

Unit 1: Matrices	12
Linear Transformation - Eigen values and Eigen vectors -Properties of Eigen values and Eigen vectors - Cayley-Hamilton Theorem – Diagonalisation of Matrices – Real Matrices: Symmetric - Skew-Symmetric and Orthogonal Quadratic form – canonical form - Nature of Quadratic form and Transformation of Quadratic form to Canonical form (Orthogonal only).	
Unit 2: Sequences and series	12
Sequences: Definition and examples-Series: Types and convergence- Series of positive terms – Tests of convergence: comparison test, Integral test and D'Alembert's ratio test-. Fourier series: Half range sine and cosine series- Parseval's Theorem.	
Unit 3: Multivariable Calculus: Partial Differentiation	12
Limits and continuity –Partial differentiation – Total Derivative – Partial differentiation of Composite Functions: Change of Variables – Differentiation of an Implicit Function - Euler's Theorem- Jacobian.	
Unit 4: Multivariable Calculus: Maxima and Minima and Vector Calculus	12
Taylor's theorem for function of Two variables- Maxima, Minima of functions of two variables: with and without constraints - Lagrange's Method of Undetermined Multipliers – Directional Derivatives - Gradient, Divergence and Curl.	

Unit 5: Differential and Integral Calculus			12
Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.			
	LECTURE	TUTORIAL	TOTAL
	45	15	60
Text Books:			
1. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill New Delhi, 11th Reprint, 2015. (Unit-1, Unit-3 and Unit-4). 2. N.P. Bali and Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, Reprint, 2014. (Unit-2). 3. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 40 th Edition, 2010. (Unit-5).			
Reference Books:			
1. G.B. Thomas and R.L. Finney, "Calculus and Analytic geometry", 9 th Edition, Pearson, Reprint, 2002. 2. Veerarajan T., "Engineering Mathematics for first year", Tata McGraw-Hill, New Delhi, 2008. 3. D. Poole, "Linear Algebra: A Modern Introduction", 2 nd Edition, Brooks/Cole, 2005. 4. Erwin kreyszig, "Advanced Engineering Mathematics", 9 th Edition, John Wiley & Sons, 2006.			

Cos Versus GA mapping

Table 1: Mapping of Cos with GAs:

	GA											
	1	2	3	4	5	6	7	8	9	10	11	12
CO 1	3	2	0	0	2	0	0	0	0	1	0	2
CO 2	3	1	0	0	0	0	0	0	0	1	0	1
CO 3	3	1	0	0	0	0	0	0	0	1	0	1
CO 4	3	2	0	0	0	0	0	0	0	1	0	1
CO 5	3	2	0	0	1	0	0	0	0	1	0	2
Total	15	8	0	0	3	0	0	0	0	5	0	7
Scaled Value	3	2	0	0	1	0	0	0	0	1	0	2

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	1	1	2	1	0	0	0	0	0	1	1	1
CO 2	3	2	1	1	2	1	0	0	0	0	0	1	1	1
CO 3	3	2	1	1	2	1	0	0	0	0	0	1	1	1
CO 4	3	2	1	1	2	1	0	0	0	0	0	1	1	1
CO 5	3	2	1	1	2	1	0	0	0	0	0	1	1	1
Total	15	10	5	5	10	5	0	0	0	0	0	5	5	5
Scaled Value	3	2	1	1	2	1	0	0	0	0	0	1	1	1

1-5 → 1, 6-10 → 2, 11-15 → 3

1-Low relation , 2- Medium relation , 3- High relation

COURSE CODE			XCP102	L	T	P	C
COURSE NAME			PROGRAMMING FOR PROBLEM SOLVING	3	0	2	5
C	P	A		L	T	P	H
3.2	1.8	0.0		3	0	3	6
COURSE OUTCOME				Level		Domain	
C01	<i>Define</i> programming fundamentals and <i>Solve</i> simple programs using I/O statements			Remember	Understand	Apply	Cognitive Psychomotor
C02	<i>Define</i> syntax and <i>write simple programs</i> using control structures and arrays			Remember	Understand	Apply	Cognitive Psychomotor
C03	<i>Explain</i> and <i>write simple programs</i> using functions and pointers			Understand	Apply		Cognitive Psychomotor
C04	<i>Explain</i> and <i>write simple programs</i> using structures and unions			Understand	Apply	Analyze	Cognitive Psychomotor
C05	<i>Explain</i> and <i>write simple programs</i> using files and <i>Build</i> simple projects			Remember	Understand	Create	Cognitive Psychomotor

COURSE CONTENT			Hours
UNIT I	PROGRAMMING FUNDAMENTALS AND INPUT / OUTPUT STATEMENTS		9 + 9
	Theory Introduction to components of a computer system, Program – Flowchart – Pseudo code – Software – Introduction to C language – Character set – Tokens: Identifiers, Keywords, Constants, and Operators – sample program structure -Header files – Data Types-Variables - Output statements – Input statements. Practical <ol style="list-style-type: none"> 1. Program to display a simple picture using dots. 2. Program for addition of two numbers 3. Program to swap two numbers 4. Program to solve any mathematical formula. 		
UNIT II	CONTROL STRUCTURE AND ARRAYS		9 + 9
	Theory Control Structures – Conditional Control statements: Branching, Looping - Unconditional control structures: switch, break, continue, goto statements – Arrays: One Dimensional Array – Declaration – Initialization – Accessing Array Elements – Searching – Sorting – Two Dimensional arrays - Declaration – Initialization – Matrix Operations – Multi Dimensional Arrays - Declaration – Initialization. Storage classes: auto – extern – static. Strings: Basic operations on strings.		

	Practical 1. Program to find greatest of 3 numbers using Branching Statements 2. Program to display divisible numbers between n1 and n2 using looping Statement 3. Program to remove duplicate element in an array. 4. Program to perform string operations. 5. Performing basic sorting algorithms			
UNIT III	FUNCTIONS AND POINTERS	9 + 9		
	Theory Functions: Built in functions – User Defined Functions - Parameter passing methods - Passing arrays to functions – Recursion - Programs using arrays and functions. Pointers - Pointer declaration - Address operator - Pointer expressions & pointer arithmetic - Pointers and function - Call by value - Call by Reference - Pointer to arrays - Use of Pointers in self-referential structures-Notion of linked list(no implementation). Practical 1. Program to find factorial of a given number using four function types. 2. Programs using Recursion such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort 3. Programs using Pointers			
UNIT IV	STRUCTURES AND UNIONS	9 + 9		
	Theory Structures and Unions - Giving values to members - Initializing structure - Functions and structures - Passing structure to elements to functions - Passing entire function to functions - Arrays of structure - Structure within a structure and Union. Practical 1. Program to read and display student mark sheet Structures with variables 2. Program to read and display student marks of a class using Structures with arrays 3. Program to create linked list using Structures with pointers			
UNIT V	FILES	9 + 9		
	Theory File management in C - File operation functions in C - Defining and opening a file - Closing a file - The getw and putw functions - The fprintf & fscanf functions - fseek function – Files and Structures. Practical 1. Program for copying contents of one file to another file. 2. Program using files using structure with pointer			
	LECTURE	PRACTICAL	TOTAL	
	45	45	90	

TEXT BOOKS /REFERENCE BOOKS

1. Byron Gottfried, "Programming with C", III Edition, (Indian Adapted Edition), TMH publications, 2010
2. Yeshwant Kanethker, "Let us C", BPB Publications, 2008
3. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", Pearson Education Inc. 2005
4. Behrouz A. Forouzan and Richard. F. Gilberg, "A Structured Programming Approach Using C", II Edition, Brooks-Cole Thomson Learning Publications, 2001
5. Johnson baugh R. and Kalin M., "Applications Programming in ANSI C", III Edition, Pearson Education India, 2003
6. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill, 7th edition 2017.

Table 1: COs Versus POs Mapping

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	0	0	3	0	0	0	0	0	2	3	2	0
CO2	3	2	0	0	2	0	0	0	0	0	2	3	2	0
CO3	2	2	1	2	2	0	0	0	0	0	2	2	2	0
CO4	2	2	1	2	2	0	0	0	0	0	2	2	2	0
CO5	2	2	1	0	2	0	0	1	0	2	2	2	2	0
Total	12	10	3	4	11	0	0	1	0	2	10	12	10	0
Scaled Value	3	2	1	1	3	0	0	1	0	1	2	3	2	0

1 – 5 → 1, 6 – 10 → 2, 11 – 15 → 3

1 - Low Relation, 2- Medium Relation, 3- High Relation

COURSE CODE				XGS103				L	T	P	SS	C
COURSE NAME				ENGLISH				2	0	1	0	3
PRE-REQUISITES (IF ANY)								L	T	P	SS	H
C	P	A						2	0	2	0	4
2.0	6.0	4.0										
Course Outcomes:								Domain		Level		
CO1	Ability to recall the meaning for proper usage							Cognitive		Remember		
CO2	Apply the techniques in sentence patterns							Cognitive		Apply		
CO3	Identify the common errors in sentences							Cognitive		Remember		
CO4	Construct the Nature and Style of sensible Writing							Cognitive		Create		
CO5	Practicing the writing skills							Psychomotor		Guided Response		
CO6	Grasping the techniques in learning sounds and etiquettes							Psychomotor		Adapting		
UNIT I - Vocabulary Building											9	
1.1 The concept of Word Formation												
1.2 Root words from foreign languages and their use in English												
1.3 Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.												
1.4 Synonyms, antonyms, and standard abbreviations.												
UNIT II - Basic Writing Skills											9	
2.1 Sentence Structures												
2.2 Use of phrases and clauses in sentences												
2.3 Importance of proper punctuation												
2.4 Creating coherence												
2.5 Organizing principles of paragraphs in documents												
2.6 Techniques for writing precisely												
UNIT III - Identifying Common Errors in Writing											9	
3.1 Subject-verb agreement												
3.2 Noun-pronoun agreement												
3.3 Misplaced modifiers												
3.4 Articles												
3.5 Prepositions												
3.6 Redundancies												
3.7 Clichés												
UNIT IV - Nature and Style of sensible Writing											9	
4.1 Describing												
4.2 Defining												
4.3 Classifying												
4.4 Providing examples or evidence												
4.5 Writing introduction and conclusion												

UNIT V - Writing Practices	9
5.1 Comprehension 5.2 Précis Writing 5.3 Essay Writing	
Unit VI - Oral Communication (This unit involves interactive practice sessions in Language Lab) ☐ Listening Comprehension ☐ Pronunciation, Intonation, Stress and Rhythm ☐ Common Everyday Situations: Conversations and Dialogues ☐ Communication at Workplace ☐ Interviews ☐ Formal Presentations	
Suggested Readings: (i) Practical English Usage. Michael Swan. OUP. 1995 (ii) Remedial English Grammar. F.T. Wood. Macmillan.2007 (iii) On Writing Well. William Zinsser. Harper Resource Book. 2001 (iv) Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006 (v) Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011 (vi) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press.	

Table 1: Mapping of Cos with POs:

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
C01	2	0	0	0	0	0	2	0	1	0	0	0	0	0
C02	2	0	0	0	0	0	2	0	1	0	0	0	0	0
C03	1	0	0	0	0	0	1	0	1	0	0	0	0	0
C04	2	0	0	0	0	0	1	0	1	0	0	0	0	0
C05	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	7	0	0	0	0	0	6	0	4	0	0	0	0	0
Scaled Value	2	0	0	0	0	0	2	0	1	0	0	0	0	0
	1	0	0	0	0	0	1	0	1	0	0	0	0	0

1-5= 1, 6-10 = 2, 11-15= 3

1- Low Relation, 2 – Medium Relation, 3- High Relation

COURSE CODE			XAC104		L	T	P	C
COURSE NAME			APPLIED CHEMISTRY FOR ENGINEERS		3	1	1	5
C	P	A			L	T	P	H
3.5	1.0	0.5			3	1	2	6
PREREQUISITES			Nil					
COURSE OUTCOMES					Domain	Level		
C01	<i>Identify</i> the periodic properties such as ionization energy, electron affinity, oxidation states and electro negativity. <i>Describe</i> the various water quality parameters like hardness and alkalinity.				Cognitive Psychomotor	Remember Perception		
C02	<i>Interpret</i> bulk properties and processes using thermodynamic and kinetic considerations				Cognitive Psychomotor	Understand Set		
C03	<i>Explain and Measure</i> microscopic chemistry in terms of atomic, molecular orbitals and intermolecular forces.				Cognitive Psychomotor Affective	Apply Mechanism Receive		
C04	<i>Apply, Measure</i> and <i>Distinguish</i> the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques				Cognitive Psychomotor Affective	Remember Analyze Perception Respond		
C05	<i>Describe, Illustrate and Discuss</i> the stereochemistry and chemical reactions that are used in the synthesis of molecules.				Cognitive Psychomotor	Remember Apply Mechanism		
UNIT – I		PERIODIC PROPERTIES AND WATER CHEMISTRY					8+3+6	
Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity, electronegativity, polarizability and oxidation states. Water Chemistry -Water quality parameters-Definition and explanation of hardness, determination of hardness by EDTA method-Introduction to alkalinity.								
UNIT-II		USE OF FREE ENERGY IN CHEMICAL EQUILIBRIA					12+3+6	
Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Corrosion-Types, factors affecting corrosion rate and Control methods. Use of free energy considerations in metallurgy through Ellingham diagrams. Advantages of electroless plating, electroless plating of nickel and copper on Printed Circuit Board (PCB).								
UNIT-III		ATOMIC AND MOLECULAR STRUCTURE					10+3+6	

<p>Schrodinger equation. Particle in a box solution and their applications for conjugated molecules and nanoparticles.. Molecular orbitals of diatomic molecules and plots of the multicenter orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic molecules. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.</p> <p>Intermolecular forces and potential energy surfaces</p> <p>Ionic, dipolar and Vander waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H₃, H₂F and HCN and trajectories on these surfaces.</p>				
UNIT-IV	SPECTROSCOPIC TECHNIQUES AND APPLICATIONS			7+3+6
<p>Principles of spectroscopy and selection rules. Electronic spectroscopy-chromophore, auxochromes, types of electronic transition and application. Fluorescence and its applications in medicine. Vibrational spectroscopy-types of vibrations, Instrumentation and applications. Rotational spectroscopy of diatomic molecules. Nuclear magnetic resonance spectroscopy-concept of chemical shift and applications-magnetic resonance imaging. Diffraction and scattering.</p>				
UNIT-V	STEREOCHEMISTRY AND ORGANIC REACTIONS			8+3+6
<p>Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds</p> <p>Organic reactions and synthesis of a drug molecule</p> <p>Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization reactions and ring opening reactions. Synthesis of a commonly used drug molecule- Aspirin and paracetamol.</p>				
	LECTURE	TUTORIAL	PRACTICAL	TOTAL HOURS
Hours	45	15	30	90
TEXT BOOKS				
<p>1. Puri B.R. Sharma, L.R., Kalia K.K. Principles of Inorganic Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co., 1993</p> <p>2. Lee. J.D. Concise Inorganic Chemistry, UK, Black well science, 2006.</p> <p>3. Trapp. C, Cady, M. Giunta. C, Atkins's Physical Chemistry, 10th Edition, Oxford publishers, 2014.</p> <p>4. Glasstone S., Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co. Ltd, 1983.</p> <p>5. Morrison R.T. and Boyd R.N. Organic Chemistry (6th edition), New York, Allyn & Bacon Ltd., 1976.</p> <p>6. Banwell. C.N, Fundamentals of Molecular Spectroscopy, (3th Edition), McGraw-Hill Book Company, Europe 1983.</p> <p>7. Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, (4th edition), S./ Chand & Company Ltd. New Delhi, 1977.</p> <p>8. P. S. Kalsi, Stereochemistry: Conformation and mechanism, (9th Edition), New Age International Publishers, 2017.</p>				

REFERENCE BOOKS				
1. Puri B R Sharma L R and Madan S Pathania, “ Principles of Physical Chemistry”, Vishal publishing Co., Edition 2004				
2. Kuriocose, J C and Rajaram, J, “Engineering Chemistry”, Volume I/II, Tata McGraw-Hill Publishing Co. Ltd. New Delhi, 2000				
E Resources - MOOCs:				
1. http://www.mooc-list.com/course/chemistry-minor-saylororg				
2. https://www.canvas.net/courses/exploring-chemistry				
3. http://freevidelectures.com/Course/2263/Engineering-Chemistry-I				
4. http://freevidelectures.com/Course/3001/Chemistry-I				
5. http://freevidelectures.com/Course/3167/Chemistry-II				
6. http://ocw.mit.edu/courses/chemistry/				
Laboratory Part			30 hrs	
Experiments :				
1. Determination of chloride ion present in the water sample by Argentometric method.			C01	
2. Determination of total, temporary and permanent hardness of water sample by EDTA method.			C01	
3. Determination of cell constant and conductance of solutions.			C02	
4. Potentiometry - determination of redox potentials and emfs.			C02	
5. Determination of surface tension and viscosity.			C03	
6. Adsorption of acetic acid by charcoal.			C03	
7. Determination of the rate constant of a reaction.			C04	
8. Estimation of iron by colorimetric method.			C04	
9. Synthesis of a polymer/drug.			C05	
10. Saponification/acid value of an oil.			C05	
REFERENCE BOOKS				
1. Mendham, Denney R.C., Barnes J.D and Thomas N.J.K., “Vogel’s Textbook of Quantitative Chemical Analysis”, 6th Edition, Pearson Education, 2004.				
2. Garland, C. W.; Nibler, J. W.; Shoemaker, D. P. “Experiments in Physical Chemistry”, 8th Ed.; McGraw-Hill: New York, 2003.				
E Resources - MOOCs:				
1. http://freevidelectures.com/Course/2380/Chemistry-Laboratory-Techniques				
2. http://freevidelectures.com/Course/2941/Chemistry-1A-General-Chemistry-Fall-2011				
3. http://ocw.mit.edu/courses/chemistry/5-301-chemistry-laboratory-techniques				
	LECTURE	TUTORIAL	PRACTICAL	TOTAL HOURS
HOURS	45	15	30	90

Table 1 : Mapping of CO's with PO's:

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
C01	3	0	0	0	0	0	2	3	3	0	0	0	0	0
C02	2	0	0	0	0	0	1	2	2	0	0	0	0	0
C03	3	0	0	0	0	0	2	3	3	0	0	0	0	0
C04	3	0	0	0	0	0	3	3	3	0	0	0	0	0
C05	3	0	0	0	0	0	2	2	3	0	0	0	0	0

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

1- Low Relation, 2-Medium Relation, 3-High Relation

COURSE CODE			XWP105	L	T	P	C
COURSE NAME			WORKSHOP PRACTICES	1	0	2	3
C	P	A		L	T	P	H
1.0	3.0	0.0		2	0	4	6
PREREQUISITE:							
COURSE OUTCOMES:				Domain	Level		
C01	Summarize the machining methods and Practice machining operation.			Cognitive Psychomotor	Understanding Guided response		
C02	Defining metal casting process, moulding methodsand relates Casting and Smithy applications.			Cognitive Psychomotor	Remembering Perception		
C03	Plan basic carpentry and fitting operation and Practice carpentry and fitting operations.			Cognitive Psychomotor	Applying Guided response		
C04	Summarize metal joining operation and Practice welding operation.			Cognitive Psychomotor	Understanding Guided response		
C05	Illustrate the, electrical and electronics basics and Makes appropriate connections.			Cognitive Psychomotor	Understanding Origination		
COURSE CONTENT							
EXP. NO	TITLE				CO RELATION		
1	INTRODUCTION TO MACHINING PROCESS				C01		
2	PLAIN TURINING USING LATHE OPERATION				C01		
3	INTRODUCTION TO CNC				C01		
4	DEMONSTRATION OF PLAIN TURNING USING CNC				C01		
5	STUDY OF METAL CASTING OPERATION				C02		
6	DEMONSTRATION OF MOULDING PROCESS				C02		
7	STUDY OF SMITHY OPERATION				C02		
8	STUDY OF CARPENTRY TOOLS				C03		
9	HALF LAP JOINT – CARPENTRY				C03		
10	MORTISE AND TENON JOINT – CARPENTRY				C03		
11	STUDY OF FITTING TOOLS				C03		
12	SQUARE FITTING				C03		
13	TRIANGULAR FITTING				C03		

14	STUDY OF WELDING TOOLS	C04
15	SQUARE BUTT JOINT - WELDING	C04
16	TEE JOINT – WELDING	C04
17	INTRODUCTION TO HOUSE WIRING	C05
18	ONE LAMP CONTROLLED BY ONE SWITCH	C05
19	TWO LAMPS CONTROLLED BY SINGLE SWITCH	C05
20	STAIRCASE WIRING	C05
TEXT BOOKS		
1. Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Chaoudhary. Media Promoters and Publishers Pvt. Ltd., Bombay 2. Workshop Technology by Manchanda Vol. I,II,III India Publishing House, Jalandhar.		
REFERENCES		
1. Manual on Workshop Practice by K Venkata Reddy, KL Narayana et al; MacMillan India Ltd. 2. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi 3. Workshop Technology by B.S. Raghuwanshi, Dhanpat Rai and Co., New Delhi. 4. Workshop Technology by HS Bawa, Tata McGraw Hill Publishers, New Delhi.		
E RESOURCES		
1. http://nptel.ac.in/courses/112107145/		

Mapping of CO's with PO'S:

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
C01	2	1	2	2	1	0	0	1	1	0	1	2	0	0
C02	2	1	2	2	1	0	0	1	1	0	1	2	0	0
C03	2	1	2	2	1	0	0	1	1	0	1	2	0	0
C04	2	1	2	2	1	0	0	1	1	0	1	2	0	0
C05	2	1	2	2	1	0	0	1	1	0	1	2	0	0

1 – 5 → 1, 6 – 10 → 2, 11 – 15 → 3

1 - Low Relation, 2- Medium Relation, 3- High Relation

SEMESTER II

COURSE CODE			XMA201	L	T	P	C
COURSE NAME			CALCULUS, ORDINARY DIFFERENTIAL EQUATIONS AND COMPLEX VARIABLE	3	1	0	4
C	P	A		L	T	P	H
3.0	0.5	0.5		3	1	0	4
PREREQUISITE: Mathematics I (Calculus and Linear Algebra)							
COURSE OUTCOMES:				Domain		Level	
CO1	Find double and triple integrals and to find line, surface and volume of an integral by Applying Greens, Gauss divergence and Stokes theorem.			Cognitive		Applying Remembering	
CO2	Solve first order differential equations of different types which are solvable for p, y, x and Clairaut's type.			Cognitive		Applying	
CO3	Solve Second order ordinary differential equations with variable coefficients using various methods.			Cognitive		Applying	
CO4	Use CR equations to verify analytic functions and to find harmonic functions and harmonic conjugate. Conformal mapping of translation and rotation. Mobius transformation.			Cognitive Psychomotor		Remembering Applying Guided Response	
CO5	Apply Cauchy residue theorem to evaluate contour integrals involving sine and cosine function and to state Cauchy integral formula, Liouville's theorem. Taylor's series, zeros of analytic functions, singularities, Laurent's series.			Cognitive Affective		Applying Receiving	

Unit -I MULTIVARIABLE CALCULUS (INTEGRATION)	12
Multiple Integration: Double integrals (Cartesian) - change of order of integration in double integrals - Change of variables (Cartesian to polar) - Triple integrals (Cartesian), Scalar line integrals - vector line integrals - scalar surface integrals - vector surface integrals - Theorems of Green, Gauss and Stokes.	
Unit -II FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS	12
Exact - linear and Bernoulli's equations - Euler's equations - Equations not of first degree: equations solvable for p - equations solvable for y- equations solvable for x and Clairaut's type.	
Unit - III ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDERS	12
Second order linear differential equations with variable coefficients- method of variation of parameters - Cauchy-Euler equation- Power series solutions- Legendre polynomials- Bessel functions of the first kind and their properties.	

Unit -IV COMPLEX VARIABLE – DIFFERENTIATION			12
Differentiation-Cauchy-Riemann equations- analytic functions-harmonic functions-finding harmonic conjugate- elementary analytic functions (exponential, trigonometric, logarithm) and their properties- Conformal mappings- Mobius transformations and their properties.			
Unit - V COMPLEX VARIABLE – INTEGRATION			12
Contour integrals - Cauchy-Goursat theorem (without proof) - Cauchy Integral formula (without proof)-Liouville's theorem (without proof)- Taylor's series- zeros of analytic functions- singularities- Laurent's series – Residues- Cauchy Residue theorem (without proof)- Evaluation of definite integral involving sine and cosine- Evaluation of certain improper integrals using the Bromwich contour.			
	LECTURE	TUTORIAL	TOTAL
	45	15	60
Text Book:			
1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 40th th Edition, 2008.			
Reference Books:			
1. G.B. Thomas and R.L. Finney, "Calculus and Analytic geometry", 9 th Edition, Pearson, Reprint, 2002.			
2. Erwin kreyszig, "Advanced Engineering Mathematics", 9 th Edition, John Wiley & Sons, 2006.			
3. W. E. Boyce and R. C. DiPrima, "Elementary Differential Equations and Boundary Value Problems", 9 th Edn. Wiley India, 2009.			
4. S. L. Ross, "Differential Equations", 3 rd Ed., Wiley India, 1984.			
5.E. A. Coddington, "An Introduction to Ordinary Differential Equations", Prentice Hall India, 1995.			
6. E. L. Ince, "Ordinary Differential Equations", Dover Publications, 1958.			
7. J. W. Brown and R. V. Churchill, "Complex Variables and Applications", 7 th Ed., McGraw Hill, 2004.			
8. N.P. Bali and Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, Reprint, 2008.			

Cos Versus GA mapping

Table 1: Mapping of Cos with GAs:

	GA											
	1	2	3	4	5	6	7	8	9	10	11	12
CO 1	3	2	0	0	2	0	0	0	0	1	0	2
CO 2	3	1	0	0	0	0	0	0	0	1	0	1
CO 3	3	1	0	0	0	0	0	0	0	1	0	1
CO 4	3	2	0	0	0	0	0	0	0	1	0	1
CO 5	3	2	0	0	1	0	0	0	0	1	0	2
Total	15	8	0	0	3	0	0	0	0	5	0	7
Scaled Value	3	2	0	0	1	0	0	0	0	1	0	3

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	1	1	2	1	0	0	0	0	0	1	1	1
CO 2	3	2	1	1	2	1	0	0	0	0	0	1	1	1
CO 3	3	2	1	1	2	1	0	0	0	0	0	1	1	1
CO 4	3	2	1	1	2	1	0	0	0	0	0	1	1	1
CO 5	3	2	1	1	2	1	0	0	0	0	0	1	1	1
Total	15	10	5	5	10	5	0	0	0	0	0	5	5	5
Scaled Value	3	2	1	1	2	1	0	0	0	0	0	1	1	1

1-6 → 1, 6-10 → 2, 11-15 → 3

1-Low relation , 2- Medium relation , 3- High relation

COURSE CODE			XUM202			L	T	P	C
COURSE NAME			ENVIRONMENTAL SCIENCE			3	0	0	0
C	P	A				L	T	P	H
2.5	0.0	0.5				3	0	0	3
COURSE OUTCOMES					DOMAIN	LEVEL			
C01	Describe the significance of natural resources and explain anthropogenic impacts.				Cognitive	Remembering Understanding			
C02	Illustrate the significance of ecosystem, biodiversity and natural geo bio chemical cycles for maintaining ecological balance.				Cognitive	Understanding			
C03	Identify the facts, consequences, preventive measures of major pollutions and recognize the disaster phenomenon.				Cognitive Affective	Remembering Receiving			
C04	Explain the socio-economic, policy dynamics and practice the control measures of global issues for sustainable development.				Cognitive	Understanding Analyzing			
C05	Recognize the impact of population and the concept of various welfare programs, and apply the modern technology towards environmental protection.				Cognitive	Understanding Applying			
UNIT - I INTRODUCTION TO ENVIRONMENTAL STUDIES AND ENERGY								12	
Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, flood, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – Role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.									
UNIT – II ECOSYSTEMS AND BIODIVERSITY								7	
Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to Biodiversity – Definition: genetic, species and ecosystem diversity - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.									

UNIT – III ENVIRONMENTAL POLLUTION			10
Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – Solid waste management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: flood, earthquake, cyclone and landslide.			
UNIT –IV SOCIAL ISSUES AND THE ENVIRONMENT			10
Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Wasteland reclamation – Consumerism and waste products – Environment Protection Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.			
UNIT –V HUMAN POPULATION AND THE ENVIRONMENT			6
Population growth, variation among nations – Population explosion – Family welfare programme – Environment and human health – Human rights – Value education - HIV / AIDS – Women and Child welfare programme– Role of Information Technology in Environment and human health – Case studies.			
	LECTURE	TUTORIAL	TOTAL
	45	0	45
TEXT BOOKS			
<ol style="list-style-type: none"> 1. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co, USA, 2000. 2. Townsend C., Harper J and Michael Begon, Essentials of Ecology, Blackwell Science, UK, 2003 3. Trivedi R.K and P.K.Goel, Introduction to Air pollution, Techno Science Publications, India, 2003. 4. Disaster mitigation, Preparedness, Recovery and Response, SBS Publishers & Distributors Pvt. Ltd, New Delhi, 2006. 5. Introduction to International disaster management, Butterworth Heinemann, 2006. 6. Gilbert M.Masters, Introduction to Environmental Engineering and Science, Pearson Education Pvt., Ltd., Second Edition, New Delhi, 2004. 			
REFERENCE BOOKS			
<ol style="list-style-type: none"> 1. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media, India, 2009. 2. Cunningham, W.P.Cooper, T.H.Gorhani, Environmental Encyclopedia, Jaico Publ., House, Mumbai, 2001. 3. S.K.Dhameja, Environmental Engineering and Management, S.K.Kataria and Sons, New Delhi, 2012. 4. Sahni, Disaster Risk Reduction in South Asia, PHI Learning, New Delhi, 2003. 5. Sundar, Disaster Management, Sarup & Sons, New Delhi, 2007. 6. G.K.Ghosh, Disaster Management, A.P.H.Publishers, New Delhi, 2006. 			

E RESOURCES

1. <http://www.e-booksdirectory.com/details.php?ebook=10526>
2. <https://www.free-ebooks.net/ebook/Introduction-to-Environmental-Science>
3. <https://www.free-ebooks.net/ebook/What-is-Biodiversity>
4. https://www.learner.org/courses/envsci/unit/unit_vis.php?unit=4
5. <http://bookboon.com/en/pollution-prevention-and-control-ebook>
6. <http://www.e-booksdirectory.com/details.php?ebook=8557>
7. <http://www.e-booksdirectory.com/details.php?ebook=6804>
8. <http://bookboon.com/en/atmospheric-pollution-ebook>
9. <http://www.e-booksdirectory.com/details.php?ebook=3749>
10. <http://www.e-booksdirectory.com/details.php?ebook=2604>
11. <http://www.e-booksdirectory.com/details.php?ebook=2116>
12. <http://www.e-booksdirectory.com/details.php?ebook=1026>
13. <http://www.faadooengineers.com/threads/7894-Environmental-Science>

Table:1 Mapping of CO's with B.Tech GA's:

	GA											
	1	2	3	4	5	6	7	8	9	10	11	12
C01	3	0	0	0	0	0	0	0	0	0	0	1
C02	2	0	0	0	0	2	1	0	0	1	0	1
C03	2	1	3	0	0	3	1	0	2	1	0	1
C04	1	1	2	0	0	3	2	3	0	0	0	1
C05	2	1	1	0	0	3	0	0	0	0	0	1
Total	10	3	6	0	0	11	4	3	2	2	0	5
Scaled value	2	1	2	0	0	3	1	1	1	1	0	1

Table 2 : Mapping of CO's with PO's:

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
C01	3	0	0	0	0	0	2	3	3	0	0	0	0	0
C02	2	0	0	0	0	0	1	2	2	0	0	0	0	0
C03	3	0	0	0	0	0	2	3	3	0	0	0	0	0
C04	3	0	0	0	0	0	3	3	3	0	0	0	0	0
C05	3	0	0	0	0	0	2	2	3	0	0	0	0	0

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

0-No Relation, 1- Low Relation, 2-Medium Relation, 3-High Relation

COURSE CODE			XBE203			L	T	P	C
COURSE NAME			ELECTRICAL AND ELECTRONICS ENGINEERING SYSTEMS			3	1	1	5
C	P	A				L	T	P	H
3.0	1.0	0.0				3	1	2	6
PREREQUISITES : PHYSICS									
COURSE OUTCOMES					Domain	Level			
C01	Define and Relate the fundamentals of electrical parameters and build and explain AC, DC circuits by Using measuring devices				Cognitive Psychomotor	Remember Understand Mechanism set			
C02	Define and Explain the operation of DC and AC machines.				Cognitive	Remember Understand			
C03	Recall and Illustrate various semiconductor devices and their applications and displays the input output characteristics of basic semiconductor devices.				Cognitive Psychomotor	Remember Understand Mechanism			
C04	Relate and Explain the number systems and logic gates. Construct the different digital circuit.				Cognitive Psychomotor	Remember Understand Origination			
C05	Label and Outline the different types of microprocessors and their applications.				Cognitive	Remember Understand			
UNIT I- FUNDAMENTALS OF DC AND AC CIRCUITS,MEASUREMENTS							9+6+12		
Fundamentals of DC– Ohm’s Law – Kirchoff’s Laws - Sources - Voltage and Current relations – Star/Delta Transformation - Fundamentals of AC – Average Value, RMS Value, Form Factor - AC power and Power Factor, Phasor Representation of sinusoidal quantities - Simple Series, Parallel, Series Parallel Circuit - Operating Principles of Moving coil and Moving Iron Instruments (Ammeter, Voltmeter) and Dynamometer type meters (Watt meter and Energy meter).									
UNIT II – ELECTRICAL MACHINES							9 + 3+0		
Construction, Principle of Operation, Basic Equations, Types and Application of DC Generators, DC motors - Basics of Single Phase Induction Motor and Three Phase Induction Motor- Construction, Principle of Operation of Single Phase Transformer, Three phase transformers, Auto transformer.									
UNIT III – SEMICONDUCTOR DEVICES							9 + 0+8		
Classification of Semiconductors, Construction, Operation and Characteristics: PN Junction Diode – Zener Diode, PNP, NPN Transistors, Field Effect Transistors and Silicon Controlled Rectifier – Applications.									
UNIT IV – DIGITAL ELECTRONICS							9 + 3+10		
Basic of Concepts of Number Systems, Logic Gates, Boolean Algebra, Adders, Subtractors, multiplexer, demultiplexer, encoder, decoder, Flip-flops, Up/Down counters, Shift Registers.									
UNIT V – MICROPROCESSORS					34	9+ 3+0			

Architecture, 8085, 8086 - Interfacing Basics: Data transfer concepts – Simple Programming concepts

LIST OF EXPERIMENTS :					
1.	Study of Electrical Symbols, Tools and Safety Precautions, Power Supplies.				
2.	Study of Active and Passive elements – Resistors, Inductors and Capacitors, Bread Board.				
3.	Verification of AC Voltage, Current and Power in Series and Parallel connection.				
4.	Testing of DC Voltage and Current in series and parallel resistors which are connected in breadboard by using Voltmeter, Ammeter and Multimeter.				
5.	Fluorescent lamp connection with choke.				
6.	Staircase Wiring.				
7.	Forward and Reverse bias characteristics of PN junction diode.				
8.	Forward and Reverse bias characteristics of zener diode.				
9.	Input and Output Characteristics of NPN transistor.				
10.	Construction and verification of simple Logic Gates.				
11.	Construction and verification of adders.				
12.	Construction and verification of subtractor.				
		LECTURE	TUTORIAL	PRACTICAL	TOTAL
		45	15	30	90
TEXT BOOKS					
1. Metha V.K., 2008. Principles of Electronics. Chand and Company.					
2. Malvino, A. P., 2006. Electronics Principles. 7 th ed. New Delhi: Tata McGraw-Hill.					
3. Rajakamal, 2007. Digital System-Principle & Design. 2 nd ed. Pearson education.					
4. Morris Mano, 1999. Digital Design. Prentice Hall of India.					
5. Ramesh, S. Gaonkar, 2000. Microprocessor Architecture, Programming and its Applications with the 8085. 4 th ed. India: Penram International Publications.					
REFERENCE BOOKS:					
1. Corton,H.,2004. Electrical Technology. CBS Publishers & Distributors.					
2. Syed, A. Nasar, 1998, Electrical Circuits. Schaum Series.					
3. Jacob Millman and Christos, C. Halkias, 1967. Electronics Devices.New Delhi: McGraw-Hill.					
4. Millman, J. andHalkias, C. C., 1972. Integrated Electronics: Analog and Digital Circuits and Systems. Tokyo: McGraw-Hill, Kogakusha Ltd.					
5. Mohammed Rafiquzzaman, 1999. Microprocessors - Theory and Applications: Intel and Motorola. Prentice Hall International.					
E-REFERENCES:					
1. NTPEL, Basic Electrical Technology (Web Course), Prof. N. K. De, Prof. T. K. Bhattacharya and Prof. G.D. Roy, IIT Kharagpur.					
2. Prof.L.Umanand, http://freevideolectures.com/Course/2335/Basic-Electrical-Technology# , IISc Bangalore.					
3. http://nptel.ac.in/Onlinecourses/Nagendra/ , Dr. Nagendra Krishnapura , IIT Madras.					
4. Dr.LUmanand , http://www.nptelvideos.in/2012/11/basic-electrical-technology.html , IISC Bangalore.					

Table: 1 Mapping of COs with POs:

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	3	1	1	1	1	0	0	1	1	1	0	0	0
CO 2	3	3	1	1	1	1	0	0	1	1	1	0	0	0
CO 3	2	2	2	1	2	2	1	1	1	1	1	0	0	0
CO 4	2	2	1	1	1	1	1	1	1	1	1	0	0	0
CO 5	2	2	1	1	1	1	1	1	1	1	1	0	0	0
Total	12	12	6	5	6	6	3	3	5	5	5	0	0	0
Scaled value	3	3	2	1	2	2	1	1	1	1	1	0	0	0

1-5 → 1, 6-10 → 2, 11-15 → 3

0 – No relation, 1 – Low relation, 2 – Medium relation, 3 – High relation

COURSE CODE			XAP204	L	T	P	C
COURSE NAME			APPLIED PHYSICS FOR ENGINEERS	3	1	2	6
C	P	A		L	T	P	H
2.8	0.8	0.4		3	1	3	7
PREREQUISITE: Basic Physics in HSC level							
Course Outcomes				Domain	Level		
C01	Identify the basics of mechanics, explain the principles of elasticity and determine its significance in engineering systems and technological advances.			Cognitive Psychomotor	Remember Understand Mechanism		
C02	Illustrate the laws of electrostatics, magneto-statics and electromagnetic induction; use and locate basic applications of electromagnetic induction to technology.			Cognitive Psychomotor Affective	Remember Analyze Mechanism Respond		
C03	Understand the fundamental phenomena in optics by measurement and describe the working principle and application of various lasers and fibre optics.			Cognitive Psychomotor Affective	Understand Apply Mechanism Receive		
C04	Analyse energy bands in solids, discuss and use physics principles of latest technology using semiconductor devices.			Cognitive Psychomotor Affective	Understand Analyze Mechanism Receive		
C05	Develop Knowledge on particle duality and solve Schrodinger equation for simple potential.			Cognitive:	Understand Apply		
UNIT - I MECHANICS OF SOLIDS					9+3+9		
Mechanics: Force - Newton's laws of motion - work and energy - impulse and momentum - torque - law of conservation of energy and momentum - Friction. Elasticity: Stress - Strain - Hooke's law - Stress strain diagram - Classification of elastic modulus - Moment, couple and torque - Torsion pendulum - Applications of torsion pendulum - Bending of beams - Experimental determination of Young's modulus: Uniform bending and non-uniform bending.							
UNIT -II ELECTROMAGNETIC THEORY					9+3+3		
Laws of electrostatics - Electrostatic field and potential of a dipole; Dielectric Polarisation, Dielectric constant, internal field - Clausius Mossotti Equation - Laws of magnetism - Ampere's Faraday's law; Lenz's law - Maxwell's equation - Plane electromagnetic waves; their transverse nature - expression for plane, circularly and elliptically polarized light - quarter and half wave plates - production and detection of plane, circularly and elliptically polarized light.							
UNIT -III OPTICS, LASERS AND FIBRE OPTICS					9+3+12		
Optics: Dispersion- Optical instrument: Spectrometer - Determination of refractive index and dispersive power of a prism- Interference of light in thin films: air wedge - Diffraction: grating. LASER: Introduction - Population inversion -Pumping - Laser action - Nd-YAG laser - CO ₂ laser - Applications							

Fibre Optics: Principle and propagation of light in optical fibre - Numerical aperture and acceptance angle - Types of optical fibre - Fibre optic communication system (Block diagram).	
UNIT –IV SEMICONDUCTOR PHYSICS	9+3+6
<p>Semiconductors: Energy bands in solids - Energy band diagram of good conductors, insulators and semiconductors - Concept of Fermi level - Intrinsic semiconductors - Concept of holes - doping - Extrinsic semiconductors - P type and N type semiconductors - Hall effect.</p> <p>Diodes and Transistors: P-N junction diode - Forward bias and reverse bias - Rectification action of diode - Working of full wave rectifier using P N junction diodes - PNP and NPN transistors - Three different configurations - Advantages of common emitter configuration - working of NPN transistor as an amplifier in common emitter configuration.</p>	
UNIT –V QUANTUM PHYSICS	9+3+0
Introduction to quantum physics, black body radiation, Compton effect, de Broglie hypothesis, wave – particle duality, uncertainty principle, Schrodinger wave equation (Time dependent and Time independent), particle in a box, Extension to three dimension - Degeneracy.	
TEXT BOOKS	
<ol style="list-style-type: none"> 1. Gaur R. K. and Gupta S. L., "Engineering Physics", Dhanpat Rai Publications, 2009. 2. Avadhanulu M. N. "Engineering Physics" (Volume I and II), S. Chand & Company Ltd., New Delhi, 2010. 	
REFERENCE BOOKS	
<ol style="list-style-type: none"> 1. Palanisamy P. K., "Engineering Physics", Scitech Publications (India) Pvt. Ltd, Chennai. 2. Arumugam M., "Engineering Physics" (Volume I and II), Anuradha Publishers, 2010. 3. Senthil Kumar G., " Engineering Physics", 2nd Enlarged Revised Edition, VRB Publishers, Chennai, 2011. 4. Mani P., "Engineering Physics", Dhanam Publications, Chennai, 2007. 	
E RESOURCES	
NPTEL , Engineering Physics, Prof. M. K. Srivastava, Department of Physics, IIT, Roorkee.	
<u>LABORATORY</u>	
1.	Torsional Pendulum - determination of moment of inertia and rigidity modulus of the given material of the wire.
2.	Uniform Bending - Determination of the Young's Modulus of the material of the beam.
3.	Non-Uniform Bending - Determination of the Young's Modulus of the material of the beam.
4.	Meter Bridge - Determination of specific resistance of the material of the wire.
5.	Spectrometer - Determination of dispersive power of the give prism.
6.	Spectrometer - Determination of wavelength of various colours in Hg source using grating.
7.	Air wedge - Determination of thickness of a given thin wire.
8.	Laser - Determination of wavelength of given laser source and size of the given micro particle using Laser grating.

9.	Post office Box - Determination of band gap of a given semiconductor.			
10	PN Junction Diode - Determination of V-I characteristics of the given diode.			
.				
REFERENCE BOOKS				
1. Samir Kumar Ghosh, "A text book of Advanced Practical Physics", New Central Agency (P) Ltd, 2008.				
2. Arora C.L., "Practical Physics", S. Chand & Company Ltd., New Delhi, 2013.				
3. Umayal Sundari AR., "Applied Physics Laboratory Manual", PMU Press, Thanjavur, 2012.				
	LECTURE	TUTORIAL	PRACTICAL	TOTAL HOURS
Hours	45	15	30	90

Table 1: Mapping of CO's with PO:

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2	2	1	0	0	0	1	0	0	1	0	0
CO2	3	0	1	0	1	0	0	0	0	0	0	1	0	0
CO3	3	2	2	2	1	0	0	0	1	0	0	1	0	0
CO4	3	2	2	2	1	0	0	0	1	0	0	1	0	0
CO5	3	0	2	0	0	0	0	0	0	0	0	1	0	0
Total	15	6	9	6	4	0	0	0	3	0	0	5	0	0
Scaled Value	3	2	2	2	1	0	0	0	1	0	0	1	0	0

1 - 5 → 1, 6 - 10 → 2, 11 - 15 → 3

1- Low Relation, 2-Medium Relation, 3-High Relation

COURSE CODE			XEG 205	L	T	P	C
COURSE NAME			ENGINEERING GRAPHICS	2	0	1	3
C	P	A		L	T	P	H
1.75	1.0	0.25		2	0	2	4
PREREQUISITE: NIL							
COURSE OUTCOMES:			Domain	Level			
C01	Apply the national and international standards, construct and practice various curves		Cognitive Psychomotor Affective	Applying Guided response Responds to Phenomena			
C02	Interpret, construct and practice orthographic projections of points, straight lines and planes.		Cognitive Psychomotor Affective	Understanding Mechanism Responds to Phenomena			
C03	Construct Sketch and Practice projection of solids in various positions and true shape of sectioned solids.		Cognitive Psychomotor Affective	Applying Complex Overt Response Responds to Phenomena			
C04	Interpret, Sketch and Practice the development of lateral surfaces of simple and truncated solids, intersection of solids.		Cognitive Psychomotor Affective	Understanding Complex Overt Response Responds to Phenomena			
C05	Construct sketch and practice isometric and perspective views of simple and truncated solids.		Cognitive Psychomotor Affective	Applying Complex Overt Response Responds to Phenomena			
UNIT-I INTRODUCTION, FREE HAND SKETCHING OF ENGG OBJECTS AND CONSTRUCTION OF PLANE CURVE							6+6
Importance of graphics in engineering applications – use of drafting instruments – BIS specifications and conventions as per SP 46-2003. Pictorial representation of engineering objects – representation of three dimensional objects in two dimensional media – need for multiple views – developing visualization skills through free hand sketching of three dimensional objects. Polygons & curves used in engineering practice – methods of construction – construction of ellipse, parabola and hyperbola by eccentricity method – cycloidal and involute curves – construction – drawing of tangents to the above curves.							
UNIT -II PROJECTION OF POINTS, LINES AND PLANE SURFACES							6+6
General principles of orthographic projection – first angle projection – layout of views – projections of points, straight lines located in the first quadrant – determination of true lengths of lines and their inclinations to the planes of projection – traces – projection of polygonal surfaces and circular lamina inclined to both the planes of projection.							
UNIT-III PROJECTION OF SOLIDS AND SECTIONS OF SOLIDS							6+6
Projection of simple solids like prism, pyramid, cylinder and cone when the axis is inclined to one plane of projection – change of position & auxiliary projection methods – sectioning of above solids in simple vertical positions by cutting plane inclined to one reference plane and perpendicular to the other and above solids in inclined position with cutting planes parallel to one reference plane – true shapes of sections.							

UNIT - IV DEVELOPMENT OF SURFACES AND INTERSECTION OF SOLIDS			6+6
Need for development of surfaces – development of lateral surfaces of simple and truncated solids – prisms, pyramids, cylinders and cones – development of lateral surfaces of the above solids with square and circular cutouts perpendicular to their axes – intersection of solids and curves of intersection –prism with cylinder, cylinder & cylinder, cone & cylinder with normal intersection of axes and with no offset.			
UNIT - V ISOMETRIC AND PERSPECTIVE PROJECTIONS			6+6
Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones – principles of perspective projections – projection of prisms, pyramids and cylinders by visual ray and vanishing point methods.			
THEORY 30 PRACTICAL 30 TOTAL HRS 60			
TEXT BOOKS			
1. Bhatt,N.D, “Engineering Drawing”, Charotar Publishing House, 46 th Edition-2003. 2. Natarajan,K.V, “ A Textbook of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2006 . 3. Dr. P.K. Srividhya, P. Pandiyaraj, “Engineering Graphics”, PMU Publications, Vallam, 2013			

REFERENCES
1. Luzadder and Duff, “Fundamentals of Engineering Drawing” Prentice Hall of India PvtLtd, XI Edition - 2001. 2. Venugopal,K. and Prabhu Raja, V., “Engineering Graphics”, New Age International(P) Ltd., 2008. 3. Gopalakrishnan.K.R,. “Engineering Drawing I & II”, Subhas Publications, 1998. 4. Shah,M.B and Rana,B.C.,”Engineering Drawing”, Pearson Education,2005.
E RESOURCES
1. http://periyarnet/Econtent 2. http://nptel.ac.in/courses/112103019/

Table 1: Mapping of CO's with PO'S:

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
C01	3	3	3	2	3	2	3	1	1	2	3	3	3	-
C02	3	3	3	1	3	1	3	1	1	1	2	3	3	-
C03	3	3	3	1	3	1	3	1	1	1	2	3	3	-
C04	3	3	3	1	3	1	3	1	1	1	2	3	3	-
C05	3	3	3	1	3	1	3	1	1	1	2	3	3	-
Total	15	15	15	6	15	6	15	5	5	6	11	3	3	-
Scaled	3	3	3	2	3	2	3	1	1	2	3	3	3	-

1 - 5 → 1, 6 - 10 → 2, 11 - 15 → 3

1- Low Relation, 2-Medium Relation, 3-High Relation

SEMESTER III

COURSE CODE			XMA301	L	T	P	C
COURSE NAME			PROBABILITY AND STATISTICS	3	1	0	4
C	P	A		L	T	P	H
4.0	0.0	0.0		3	1	0	4
PREREQUISITE: CALCULUS AND LINEAR ALGEBRA							
COURSE OUTCOMES:							
Course outcomes:				Domain	Level		
CO1	Explain conditional probability, independent events, find expected values and Moments of Discrete random variables with properties.			Cognitive	Understanding Remembering		
CO2	Find distribution function, Marginal density function, conditional density function, define density function of conditional distribution functions normal, exponential and gamma distributions.			Cognitive	Remembering		
CO3	Find measures of central tendency and to determine statistical parameters of Binomial, Poisson and Normal and to find correlation, regression and Rank Correlation coefficient of two variables.			Cognitive	Remembering		
CO4	Explain large sample test for single proportion, difference of proportion, single mean, difference of means and difference of standard deviations with simple problems.			Cognitive	Understanding		
CO5	Explain small sample test for single mean, difference of mean and correlation coefficients, variance test, chisquare test with simple Problems.			Cognitive	Understanding		

UNIT I: BASIC PROBABILITY	10
Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Chebyshev's Inequality.	
UNIT II: CONTINUOUS PROBABILITY DISTRIBUTIONS	10
Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.	
UNIT III: BIVARIATE DISTRIBUTIONS	10
Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.	
UNIT IV: BASIC STATISTICS	10

Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, normal and Poisson - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.			
UNIT V: APPLIED STATISTICS			10
Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.			
UNIT VI: SMALL SAMPLES			10
Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.			
	LECTURE	TUTORIAL	TOTAL
	45	15	60
Textbooks/References			
1. Erwin Kreyszig, Advanced Engineering Mathematics, 9 th Edition, John Wiley & Sons, 2006. 2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint). 3. S. Ross, A First Course in Probability, 6 th Ed., Pearson Education India, 2002. 4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3 rd Ed., Wiley, 1968. 5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010. 6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35 th Edition, 2000. 7. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.			

Cos Versus GA mapping

Table 1: Mapping of Cos with GAs:

	GA											
	1	2	3	4	5	6	7	8	9	10	11	12
CO 1	3	2	0	0	2	0	0	0	0	1	0	2
CO 2	3	1	0	0	0	0	0	0	0	1	0	1
CO 3	3	1	0	0	0	0	0	0	0	1	0	1
CO 4	3	2	0	0	0	0	0	0	0	1	0	1
CO 5	3	2	0	0	1	0	0	0	0	1	0	2
Total	15	8	0	0	3	0	0	0	0	5	0	7
Scaled Value	3	2	0	0	1	0	0	0	0	1	0	3

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2

CO 1	3	2	1	1	2	1	0	0	0	0	0	1	1	1
CO 2	3	2	1	1	2	1	0	0	0	0	0	1	1	1
CO 3	3	2	1	1	2	1	0	0	0	0	0	1	1	1
CO 4	3	2	1	1	2	1	0	0	0	0	0	1	1	1
CO 5	3	2	1	1	2	1	0	0	0	0	0	1	1	1
Total	15	10	5	5	10	5	0	0	0	0	0	5	5	5
Scaled Value	3	2	1	1	2	1	0	0	0	0	0	1	1	1

1 – 5 → 1, 6 – 10 → 2, 11 – 15 → 3

1 - Low Relation, 2- Medium Relation, 3- High Relation

COURSE CODE			XCS302	L	T	P	C
COURSE NAME			ANALOG AND DIGITAL ELECTRONIC CIRCUITS	3	0	2	5
C	P	A		L	T	P	H
3.0	1.0	1.0		3	0	4	7
Course outcome				DOMAIN		LEVEL	
CO1	<i>Classify</i> and <i>describe</i> the basics of devices and discuss the applications			Cognitive Psychomotor		Understanding Set	
CO2	<i>Apply</i> op-amp concept to <i>analyze</i> and <i>design</i> the applications circuits			Cognitive Psychomotor		Understanding Remembering Set	
CO3	<i>Apply</i> the Boolean algebra to <i>design</i> the digital logic families			Cognitive Psychomotor		Understanding Mechanism	
CO4	<i>Describe</i> and <i>design</i> the Combinational digital circuits			Cognitive Psychomotor Affective		Understanding Remembering Set Respond	
CO5	<i>Discuss</i> and <i>design</i> the Sequential digital circuits			Cognitive Psychomotor Affective		Understanding Remembering Set Respond	

COURSE CONTENT		Hours
UNIT I	SEMICONDUCTOR DEVICES AND CIRCUITS	9 + 12
	Basics and characteristics – p-n junction diode, Zener diode, BJT and MOSFET –applications, rectifier, clipper, clamper and amplifier circuits. Differential amplifier and Direct coupled Multistage amplifier. List of Experiments: 1. Design and implementation of rectifiers, clipper and Clamper Circuits 2. Design and implementation of amplifier circuits.	
UNIT II	LINEAR AND NON LINEAR APPLICATIONS OF OP-AMP	9 + 12
	Introduction to op-amp-Linear applications; Inverting and non-inverting amplifier, differential amplifier, Integrator, active filter, voltage regulator, We in bridge and Phase shift oscillators Nonlinear applications; Comparator, Zero crossing Detector, wave and triangular wave generators. List of Experiments 3. Design and implementation of Op-amp linear applications. 4. Design and implementation of Op-amp non-linear applications	
UNIT III	FUNDAMENTALS OF DIGITAL SYSTEMS AND LOGIC FAMILIES	9 + 12
	Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive –OR operations, Boolean algebra, examples of IC gates. Number Systems – binary, signed binary, octal and hexadecimal number-arithmetic calculation-digital logic families; TTL, Schottky TTL and CMOS logic. A/D and D/A converter. List of Experiments: 5. Verification of Boolean theorems using digital logic gates.	

UNIT IV	COMBINATIONAL DIGITAL CIRCUITS	9 + 12
	Standard representation for logic function, K-map representation, Multiplexer, Demultiplexer, Adders, Subtractors, Digital comparator and code converters. List of Experiments: 6. Design and implementation of combinational circuits using basic gates for code converters. 7. Design and implementation of binary adder / subtractor using basic gates. 8. Design and implementation of Multiplexers/Demultiplexers.	
UNIT V	SEQUENTIAL DIGITAL CIRCUITS, MEMORIES AND PLD	9 + 12
	Sequential digital circuits; Flipflops-SR, J-K, T and D flip flops-Shift Register types and applications-Counters types and applications. Memory organization and operation, expanding memory size, classification and characteristics of memories, read only memory, random access memory, addressable memory, PLD (Programmable Logic Device). Memory and List of Experiments: 9. Design and implementation of Shift registers. 10. Design and implementation of counters.	
	LECTURE	PRACTICAL
	45	60
		TOTAL
		105
TEXT BOOKS / REFERENCE BOOKS		
1. R.L.Boylestad, L. Nashelsky, Electronic devices, and circuit theory, Prentice Hall, 2002		
2. A.S.Sedra and K.C.Smith, "Microelectronic Circuits", New York, Oxford University Press, 7 th edition		
3. R.P.Jain, "Modern Digital Electronics", McGraw Hill Education, 2009		
4. M.M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.		
5. A.Kumar 'Fundamentals of Digital circuits', Prentice hall India, 2016.		

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
C01	1	1	1	1	1	1	1	1	0	0	0	0	2	0
C02	1	1	1	1	1	1	1	1	0	0	0	0	2	0
C03	3	3	3	2	3	3	3	1	0	0	0	0	3	1
C04	3	3	3	2	3	3	3	1	0	0	0	0	3	1
C05	3	3	3	2	3	3	3	1	0	0	0	0	3	1

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

1- Low Relation, 2-Medium Relation, 3-High Relation

COURSE CODE			XCS303	L	T	P	C
COURSE NAME			DATA STRUCTURE AND ALGORITHMS	3	0	2	5
C	P	A		L	T	P	H
4.0	1.0	0.0		3	0	4	7
Course outcome				Domain		Level	
C01	<i>Understand and apply</i> linear data structures			Cognitive Psychomotor		Understand Apply Guided Response	
C02	<i>Understand and apply</i> nonlinear data structures			Cognitive Psychomotor		Understand Apply Guided Response	
C03	<i>Understand and apply</i> sorting techniques			Cognitive Psychomotor		Understand Apply Guided Response	
C04	<i>Understand and apply</i> graph algorithms			Cognitive Psychomotor		Understand Apply Guided Response	
C05	<i>Design</i> different algorithm techniques.			Cognitive		Understand Apply	

COURSE CONTENT			Hours
UNIT I	LINEAR DATA STRUCTURE		9 + 18
	Theory ADT – List ADT – Stack ADT – Queue ADT. Practical <ol style="list-style-type: none"> 1. Singly Linked List 2. Doubly linked List 3. Circular Linked List 4. Stack Using Array implementation 5. Queue Using Array Implementation 6. Program for Balancing symbol 7. Program for Postfix expression evaluation 		
UNIT II	NON LINEAR DATA STRUCTURE		9 + 14
	Theory Trees – Binary Trees – Binary Search Trees – AVL Trees – Splay Trees – Tree Traversal – B Trees- B+ Tree Practical <ol style="list-style-type: none"> 8. Binary Search Tree 		

UNIT III	SORTING	12 + 14
	Theory Insertion sort – Shell sort – Heap sort – Merge sort – Quick sort – Bucket sort – External Sorting Practical 9. Insertion Sort 10. Heap Sort 11. Merge Sort 12. Quick Sort	
UNIT IV	GRAPH ALGORITHMS	12 + 14
	Theory Topological sort – Shortest path algorithms – Network Flow problems – Minimum Spanning Tree – Applications of Depth First search – NP completeness. Practical 13. Dijkstra's Algorithm	
UNIT V	ALGORITHM DESIGN TECHNIQUES	12
	Theory Greedy Algorithms – Divide and Conquer – Dynamic Programming – Randomized Algorithms – Backtracking algorithms	
	LECTURE	TUTORIAL
	45	0
	PRACTICAL	TOTAL
	60	105

TEXT BOOKS /REFERENCE BOOKS

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, Reprint 2011.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Second Edition, McGraw Hill, 2002
3. Reema Thareja, "Data Structures Using C", Oxford University Press, 2011
4. Algorithms, Data Structures, and Problem Solving with C++, Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
5. "How to Solve it by Computer", 2nd Impression by R. G. Dromey, Pearson Education

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
C01	3	1	1	1	1	0	0	0	1	0	1	1	3	2
C02	3	2	1	1	1	0	0	0	1	0	1	1	3	2
C03	3	1	1	1	1	0	0	0	1	0	1	1	3	2
C04	3	2	1	2	1	0	0	0	1	0	1	1	3	2
C05	3	1	1	2	0	0	0	0	0	0	1	2	3	2

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

1- Low Relation, 2-Medium Relation, 3-High Relation

COURSE CODE			XCS304	L	T	P	C
COURSE NAME			OBJECT ORIENTED PROGRAMMING	2	0	2	4
C	P	A		L	T	P	H
3.0	0.5	0.5		2	0	4	6
COURSE OUTCOME				Domain		Level	
C01	To understand the basic concepts of OOP and classes and objects in C++.			Cognitive Psychomotor Affective		Understand Guided Response Set	
C02	To develop a solution to problems and demonstrating the usage of file handling in C++.			Cognitive, Psychomotor Affective		Apply Create Guided Response Set	
C03	To understand the basic concepts of OOP in Java and design patterns.			Cognitive Psychomotor Affective		Understand Guided Response Set	
C04	To apply the ability to program with Multithreading and Exception handling in java.			Cognitive Psychomotor Affective		Understand Apply Guided Response Set	
C05	To demonstrate the ability to develop a solution to various I/O manipulation operations and connectivity to database.			Cognitive Psychomotor Affective		Understand Apply Guided Response Set	
COURSE CONTENT						Hours	
UNIT- I PROGRAMMING IN C++						6 + 12	
C++ fundamentals, Classes and objects, Abstract data types, ADT implementation- Concrete state space- concrete invariant- abstraction function. Implementing operations Constructors and destructors, operator overloading – inheritance, functions and polymorphism. List of Experiments: 1. Design C++ classes with static members, methods with default arguments, friend functions. 2.Implement complex number class with necessary operator overloading and type conversions such as integer to complex, double to complex, complex to double etc.							
UNIT - II FILE HANDLING IN C++						6 + 12	
C++ streams – console streams – console stream classes-formatted and unformatted console I/O operations, manipulators - File streams - classes file modes file pointers and manipulations file I/O – Exception handling. List of Experiments:							

3. Implement Matrix class with dynamic memory allocation and necessary methods. Give proper constructor, destructor, copy constructor, and overloading of assignment operator. 4. Overload the new and delete operators to provide custom dynamic allocation of memory.					
UNIT - III JAVA INTRODUCTION & DESIGN PATTERNS					6 + 12
Design patterns. Introduction and classification. The iterator pattern. - Model-view-controller pattern. Introduction to java, data types, variables and arrays, operators, control statements, classes, objects, methods, Memory management. List of Experiments: 5. Simple Java applications <ul style="list-style-type: none"> - For understanding reference to an instance of a class (object), methods - Handling Strings in Java - Constructor in Java 					
UNIT- IV JAVA INTRODUCTION & PROGRAMMING					6 + 12
Inheritance Packages and Interfaces, Exception handling Strings, Input /Output, Multithreading – interrupting threads – thread states – thread priorities – thread synchronization – Executors. List of Experiments: 6. Simple Package creation. <ul style="list-style-type: none"> - Developing user defined packages in Java 7. Interfaces <ul style="list-style-type: none"> - Developing user-defined interfaces and implementation - Use of predefined interfaces 8. Exception Handling Mechanism in Java <ul style="list-style-type: none"> - Handling pre-defined exceptions 					
UNIT V FILE HANDLING IN JAVA					
	Files - streams - byte streams, character streams, text input/output, binary input/output, random access file operations, File management using File class. Connecting to a database using JDBC List of Experiments: 9. Program to implement streaming models 10. Program to implement JDBC Connectivity 11. Create a GUI interface program using scala.				6 + 12
		LECTURE	PRACTICAL	TOTAL	
		30	60	90	

TEXT BOOKS /REFERENCE BOOKS

1. K.R.Venugopal, Rajkumar Buyya, T.Ravishankar, "Mastering C++", TMH, 2003
2. Bjarne Stroustrup, "The C++ programming language", Addison Wesley, 2000
3. Herbert Schidt and Dale Srien, "Java Fundamentals - A comprehensive Introduction", TMH.
4. Herbert Schildt, "The Complete Reference (Fully updated for jdk7)", Oracle press 8th Edition, 2012
5. Barbara Liskov, Program Development in Java, Addison-Wesley, 2001
6. Java for Programmers, P.J. Deitel and H.M. Deitel, Pearson education
7. Java: How to Program P.J. Deitel and H.M. Deitel, PHI.
8. Object Oriented Programming through Java, P. Radha Krishna, Universities Press.
9. Thinking in Java, Bruce Eckel, Pearson Education
10. Ira Pohl, "Object oriented programming using C++", Pearson Education Asia, 2003
11. John R.Hubbard, "Programming with C++", Schaums outline series, TMH, 2003
12. E.Balagurusamy " Object Oriented Programming with C++", TMH 2/e
13. Cay S.Horstmann and Gary Cornel, "Core Java Programming Volume - I", 9th Edition, 2012.
14. Programming in Java, Bruce Eckel, Pearson Education
15. Programming in Java, S. Malhotra and S. Choudhary, Oxford Univ. Press.
16. Deitel & Deitel, "Java How to Program", Prentice Hall, 9th Edition, 2012

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
C01	3	3	3	3	3	2	2	2	1	0	0	2	1	1
C02	3	3	3	3	3	2	2	2	1	0	0	2	1	1
C03	2	2	2	3	3	3	2	2	1	0	0	1	2	1
C04	2	2	2	2	0	0	0	0	0	0	0	0	2	1
C05	3	2	3	3	3	0	2	2	2	0	0	0	1	1

1 – 5 → 1, 6 – 10 → 2, 11 – 15 → 3

1 - Low Relation, 2- Medium Relation, 3- High Relation

COURSE CODE			XES306	L	T	P	C
COURSE NAME			ENTREPRENEURSHIP DEVELOPMENT	2	0	0	2
C	P	A		L	T	P	H
1.2	0.0	0.8		2	0	0	2
COURSE OUTCOME				Domain		Level	
C01	Recognise and describe the personal traits of an entrepreneur.			Cognitive Affective		Understand Receiving	
C02	Determine the new venture ideas and analyze the feasibility report.			Cognitive		Understand Analyze	
C03	Develop the business plan and analyze the plan as an individual or in team.			Cognitive Affective		Receiving Analyze	
C04	Describe various parameters to be taken into consideration for launching and managing small business.			Cognitive		Understand	
C05	Describe Technological management and Intellectual Property Rights			Cognitive		Understand	
UNIT I ENTREPRENEURIAL TRAITS AND FUNCTIONS						6	
Definition of Entrepreneurship; competencies and traits of an entrepreneur; factors affecting Entrepreneurship Development; Role of Family and Society ; Achievement Motivation; Entrepreneurship as a career and national development.							
UNIT -II NEW PRODUCT DEVELOPMENT AND VENTURE CREATION						6	
Ideation to Concept development; Sources and Criteria for Selection of Product; market assessment ; Feasibility Report ;Project Profile; processes involved in starting a new venture; legal formalities; Ownership; Case Study.							
UNIT –III ENTREPRENEURIAL FINANCE						6	
Financial forecasting for a new venture; Finance mobilization; Business plan preparation: Sources of Financing, Angel Investors and Venture Capital; Government support in startup promotion.							
UNIT –IV LAUNCHING OF SMALL BUSINESS AND ITS MANGEMENT						6	
Operations Planning - Market and Channel Selection - Growth Strategies - Product Launching – Incubation, Monitoring and Evaluation of Business - Preventing Sickness and Rehabilitation of Business Units.							
UNIT–V TECHNOLOGY MANAGEMENT, IPR PORTFOLIO FOR NEW PRODUCT VENTURE						6	
Technology management; Impact of technology on society and business; Role of Government in supporting Technology Development and IPR protection; Entrepreneurship Development Training and Other Support Services.							
				LECTURE		TUTORIAL	
				30		0	
						TOTAL	
						30	

TEXT BOOKS

- Hisrich, 2016, *Entrepreneurship*, Tata McGraw Hill, New Delhi.
- S.S.Khanka, 2013, *Entrepreneurial Development*, S.Chand and Company Limited, New Delhi.

REFERENCE BOOKS

- Mathew Manimala, 2005, *Entrepreneurship Theory at the Crossroads, Paradigms & Praxis*, Biztrantra, 2nd Edition.
- Prasanna Chandra, 2009, *Projects – Planning, Analysis, Selection, Implementation and Reviews*, Tata McGraw-Hill.
- P.Saravanel, 1997, *Entrepreneurial Development*, Ess Pee kay Publishing House, Chennai.
- Arya Kumar, 2012, *Entrepreneurship: Creating and Leading an Entrepreneurial Organisation*, Pearson Education India.
- Donald F Kuratko, T.V Rao, 2012, *Entrepreneurship: A South Asian perspective*, Cengage Learning India.
- Dinesh Awasthi, Raman Jaggi, V.Padmanand, *Suggested Reading / Reference Material for Entrepreneurship Development Programmes (EDP/WEDP/TEDP)*, EDI Publication, Entrepreneurship Development Institute of India, Ahmedabad. Available from: <http://www.ediindia.org/doc/EDP-TEDP.pdf>

WEB SITES AND WEB RESOURCES:

- Jeff Hawkins, “ Characteristics of a successful entrepreneur”, ALISON Online entrepreneurship courses, <https://alison.com/learn/entrepreneurial-skills>
- Jeff Cornwall, “Entrepreneurship -- From Idea to Launch”, UdeMy online Education, <https://www.udemy.com/entrepreneurship-from-idea-to-launch/>

TABLE :1 MAPPING COURSE OUTCOME WITH GRADUATE ATTRIBUTES:

Course Outcomes	GA											
	1	2	3	4	5	6	7	8	9	10	11	12
C01	0	0	0	0	0	0	0	0	3	3	3	1
C02	0	0	1	2	3	2	1	1	1	2	3	0
C03	0	0	0	0	0	1	0	2	3	3	0	2
C04	0	0	0	0	0	1	1	2	3	0	3	3
C05	0	0	0	0	0	1	1	3	0	0	0	3
Total	0	0	1	2	3	5	3	8	10	8	9	9
Scaled Value			1	1	1	2	1	2	3	2	2	2

1 – 5 → 1, 6 – 10 → 2, 11 – 15 → 3

1- Low Relation, 2-Medium Relation, 3-High Relation

COURSE CODE			XCI307			L	T	P	C
COURSE NAME			CONSTITUTION OF INDIA			3	0	0	3
C	P	A				L	T	P	H
2.0	0.0	1.0				3	0	0	3
COURSE OUTCOME					Domain	Level			
CO1	Understand the Constitutional History				Cognitive	Understanding			
CO2	Understand the Powers and Functions				Cognitive	Understanding			
CO3	Understand the Legislature				Affective	Remembering			
CO4	Understand the Judiciary				Affective	Remembering			
CO5	Understand the Centre State relations				Cognitive	Understanding			
UNIT I									8
Constitutional History- The Constitutional Rights- Preamble- Fundamental Rights- Fundamental Duties- Directive principles of State Policy.									
UNIT II									9
The Union Executive- The President of India (powers and functions)- Vice-President of India- The Council of Ministers-Prime Minister- Powers and Functions.									
UNIT III									10
Union Legislature- Structure and Functions of Lok Sabha- Structure and Functions of Rajya Sabha- Legislative Procedure in India- Important Committes of Lok Sabha- Speaker of the Lok Sabha.									
UNIT IV									9
The Union Judiciary- Powers of the Supreme Court- Original Jurisdiction- Appelete jurisdictions- Advisory Jurisdiction- Judicial review.									
UNIT V									9
Centre State relations- Political Parties- Role of governor, powers and functions of Chief Minister-Legislative Assembly- State Judiciary- Powers and Functions of the High Courts.									
LECTURE					TUTORIAL		PRACTICAL		TOTAL
45					0		0		45
REFERENCES									
1. W.H.Morris Shores- Government and politics of India, NewDelhi,B.1.Publishers,1974.									
2. M.V.Pylee- Constitutional Government in India, Bombay, Asia Publishing House, 1977.									
3. R.Thanker- The Government and politics of India, London:Macmillon, 1995.									
4. A.C.Kapur- Select Constitutions S,Chand & Co.,NewDelhi, 1995									
5. V.D.Mahajan- Select Modern Governments,S,Chand &Co, NewDelhi,1995.									
6. B.C.Rout- Democractic Constitution of India.									
7. Gopal K.Puri- Constitution of India, India 2005.									

Table 1: Mapping of COs with POs

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	2	0	0	1	0	0	0	0	0	0	0	0	0	0
CO 2	2	0	0	1	0	0	0	0	0	0	0	0	0	0
CO 3	2	0	0	1	0	0	0	0	1	0	0	0	0	0
CO 4	2	0	0	1	0	0	0	1	1	0	0	0	0	0
CO 5	2	2	0	1	0	0	0	1	1	0	0	0	0	0
Total	10	2	0	5	0	0	0	2	3	0	0	0	0	0
Scaled Value	2	1	0	1	0	0	0	1	1	0	0	0	0	0

1-5 →1, 6-10 →2, 11-15 →3

1- Low Relation, 2- Medium Relation, 3- High Relation

COURSE CODE			XPS401	L	T	P	C
COURSE NAME			DISCRETE MATHEMATICS	3	1	0	4
C	P	A		L	T	P	H
4	0	0		3	1	0	4

PREREQUISITE: CALCULUS AND LINEAR ALGEBRA

COURSE OUTCOMES			DOMAIN	LEVEL
CO1	Define and Explain Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets.		Cognitive	Remembering Understanding
CO2	Define and Explain Basic counting techniques- inclusion and exclusion, pigeon-hole principle, permutation and combination.		Cognitive	Remembering Understanding
CO3	Define and Explain The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers.		Cognitive	Remembering Understanding
CO4	Define and Explain Algebraic Structures with one Binary Operation and two Binary Operations.		Cognitive	Remembering Understanding
CO5	Define and Explain Graphs and their properties.		Cognitive	Remembering Understanding

UNIT I: SETS, RELATION AND FUNCTION

12

Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem.

Principles of Mathematical Induction:

The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.

UNIT II:

12

Basic counting techniques- inclusion and exclusion, pigeon-hole principle, permutation and combination.

UNIT III: PROPOSITIONAL LOGIC

12

Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. Proof Techniques: Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.

UNIT IV: ALGEBRAIC STRUCTURES AND MORPHISM				12	
Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form.					
UNIT V: Graphs and Trees				12	
Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring, Colouring maps and Planar Graphs, Colouring Vertices, Colouring Edges, List Colouring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distances.					
			LECTURE	TUTORIAL	TOTAL
			45	15	60
SUGGESTED BOOKS:					
1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill					
2. Susanna S. Epp, Discrete Mathematics with Applications,4 th edition, Wadsworth Publishing Co. Inc.					
3. C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3 rd Edition by, Tata McGraw – Hill.					
SUGGESTED REFERENCE BOOKS:					
1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and It’s Application to Computer Science”, TMG Edition, Tata Mcgraw-Hill					
2. Norman L. Biggs, Discrete Mathematics, 2 nd Edition, Oxford University Press. Schaum’s Outlines Series, Seymour Lipschutz, Marc Lipson,					
3. Discrete Mathematics, Tata McGraw - Hill					

Cos Versus GA mapping

Table 1: Mapping of Cos with GAs:

	GA											
	1	2	3	4	5	6	7	8	9	10	11	12
CO 1	3	2	0	0	2	0	0	0	0	1	0	2
CO 2	3	1	0	0	2	0	0	0	0	1	0	2
CO 3	3	1	0	0	1	0	0	0	0	1	0	2
CO 4	3	2	0	0	1	0	0	0	0	1	0	2
CO 5	3	2	0	0	1	0	0	0	0	1	0	2
Total	15	8	0	0	7	0	0	0	0	5	0	10
Scaled Value	3	2	0	0	2	0	0	0	0	1	0	2

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2

CO 1	3	2	1	1	2	1	0	0	0	0	0	1	1	1
CO 2	3	2	1	1	2	1	0	0	0	0	0	1	1	1
CO 3	3	2	1	1	2	1	0	0	0	0	0	1	1	1
CO 4	3	2	1	1	2	1	0	0	0	0	0	1	1	1
CO 5	3	2	1	1	2	1	0	0	0	0	0	1	1	1
Total	15	10	5	5	10	5	0	0	0	0	0	5	5	5
Scaled Value	3	2	1	1	2	1	0	0	0	0	0	1	1	1

1 – 5 → 1, 6 – 10 → 2, 11 – 15 → 3

0 - No Relation, 1 - Low Relation, 2- Medium Relation, 3- High Relation

COURSE CODE			XCS402	L	T	P	C
COURSE NAME			COMPUTER ARCHITECTURE AND ORGANIZATION	3	0	2	5
C	P	A		L	T	P	H
4.0	1.0	0.0		3	0	4	5
COURSE OUTCOME				DOMAIN		LEVEL	
CO1	<i>Describe</i> functional unit of computer and <i>Recognize</i> various Addressing modes.			Cognitive Psychomotor		Remember, Understand Guided Response	
CO2	<i>Describe and Analyze</i> of arithmetic unit.			Cognitive Psychomotor		Remember, Analyze Guided Response	
CO3	<i>Describe</i> and <i>Recognize</i> the basic processing unit.			Cognitive Psychomotor		Remember, Understand Guided Response	
CO4	<i>Explain</i> and <i>Illustrate</i> the memory System.			Cognitive Psychomotor		Remember, Analyze Guided Response	
CO5	<i>Explain and Analyze</i> the I/O Organization.			Cognitive Psychomotor		Remember, Analyze Guided Response	

COURSE CONTENT		Hours
UNIT I BASIC STRUCTURE OF COMPUTERS		9+9
	Functional units - Basic operational concepts - Bus structures - Software performance – Memory locations and addresses – Memory operations – Instruction and instruction sequencing – Addressing modes – Assembly language – Basic I/O operations – Stacks and queues- Measuring, Reporting and Summarizing Performance – Quantitative principles of computer design Practical: 1. String Manipulations, Sorting And Searching- Ascending & Descending Largest & Smallest.	
UNIT II ARITHMETIC UNIT		9+6
	Addition and subtraction of signed numbers – Design of fast adders – Multiplication of positive numbers - Signed operand multiplication and fast multiplication – Integer division – Floating point numbers and operations. Practical: 3.16 Bit Arithmetic Operation a. Addition b. Subtraction c. Multiplication d. Division 4. Logical Operations.	

UNIT III BASIC PROCESSING UNIT				9
Fundamental concepts – Execution of a complete instruction – Multiple bus organization – Hardwired control – Micro programmed control. Pipelining – Basic concepts – Data hazards – Instruction hazards – Influence on Instruction sets – Data path and control consideration – Superscalar operation.				
UNIT IV MEMORY SYSTEM				9+9
Basic concepts – Semiconductor RAMs - ROMs – Speed - size and cost – Cache memories - Performance consideration – Virtual memory- Memory Management requirements – Secondary storage. Practical: Simulate the mapping techniques of Cache memory 5. Direct Mapped cache 6. Associative Mapped cache 7. Set Associative Mapped cache.				
UNIT V I/O ORGANIZATION				9+6
Accessing I/O devices – Interrupts – Direct Memory Access – Buses – Interface circuits – Standard I/O Interfaces (PCI, SCSI, USB). Practical: 8. Traffic light control 9. Stepper motor control 10.Key board and Display				

TEXT BOOKS /REFERENCE BOOKS

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, 6th Edition "Computer Organization", McGraw- Hill, 2012.
2. John L. Hennessey and David A. Patterson, "Computer Architecture: A Quantitative Approach", 5th Edition, Morgan Kaufmann, 2011
3. William Stallings, "Computer Organization and Architecture – Designing for Performance", 9th Edition, Pearson Education, 2010
4. John P. Hayes, "Computer Architecture and Organization", 3rd Edition, McGraw Hill, 1998

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	3	2	2	1	1	0	0	0	2	2	3	1
CO2	3	2	3	1	2	1	2	0	0	0	1	1	3	1
CO3	3	2	2	2	2	1	1	0	0	0	3	1	3	1
CO4	3	2	2	1	2	1	1	0	0	0	1	1	3	1
CO5	3	2	3	2	1	1	1	0	0	0	2	1	3	1
Total	15	10	13	8	9	5	6	0	0	0	9	6	15	5

1 – 5 → 1, 6 – 10 → 2, 11 – 15 → 3

0 - No Relation, 1 - Low Relation, 2- Medium Relation, 3- High Relation

COURSE CODE			XCS403	L	T	P	C
COURSE NAME			OPERATING SYSTEMS	3	0	2	5
C	P	A		L	T	P	H
4.0	1.0	0.0		3	0	4	5
COURSE OUTCOME				Domain		Level	
CO1	Understand the fundamental concepts of Operating system			Cognitive Psychomotor		Remembering Understand	
CO2	Understand and implement the process management, CPU scheduling algorithms, threads and Real time scheduling.			Cognitive Psychomotor		Understand Apply	
CO3	Understand and implement recognize the inter-process communication, synchronization and deadlocks.			Cognitive Psychomotor		Understand Apply	
CO4	Understand and implement the memory management techniques.			Cognitive Psychomotor		Understand Apply	
CO5	Understand the concepts of storage management, Disk Management and file management.			Cognitive Psychomotor		Understand	

COURSE CONTENT		Hours
UNIT I OPERATING SYSTEMS OVERVIEW		9 + 6
	<p>Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case study on UNIX and WINDOWS Operating System.</p> <p>Practical</p> <ol style="list-style-type: none"> 1. Basic Commands in Linux 2. Write programs using the process related system calls of UNIX operating system like fork, exec, exit, wait, getuid, geteuid, close, kill etc... 3. Write C programs to simulate UNIX commands like ls, grep, etc... 	
UNIT II PROCESS MANAGEMENT		9+6
	<p>Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching</p> <p>Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads</p> <p>Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput,</p>	

	<p>Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor Scheduling: Real Time scheduling: RM and EDF.</p> <p>Practical</p> <p>4. Write programs using the I/O system calls of UNIX operating system (open, read, write, etc)</p> <p>5. Implement the various scheduling algorithms like FCFS and SJF scheduling, Priority and Round robin scheduling.</p>	
UNIT III INTER-PROCESS COMMUNICATION		9+6
	<p>Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer\Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dining Philosopher Problem etc.</p> <p>Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, and Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.</p> <p>Practical</p> <p>6. Simulate Inter Process Communication</p> <p>7. Implement the semaphores like Producer – Consumer problem</p> <p>8. Implementation of Banker's Algorithm</p>	
UNIT IV MEMORY MANAGEMENT		9+6
	<p>Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction; Paging: Principle of Operation – Page allocation– Hardware support for paging, Protection and sharing, Disadvantages of paging.</p> <p>Virtual Memory: Basics of Virtual Memory– Hardware and control structures – Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not Recently used (NRU) and Least Recently used (LRU).</p> <p>Practical</p> <p>9. Implementation of Memory Management Scheme- Paging</p> <ol style="list-style-type: none"> Implementation of Best Fit algorithm Implementation of First Fit Algorithm Implement the contiguous file allocation technique Implementation of FIFO Page Replacement Algorithm Implementation of LRU Page Replacement Algorithm 	
UNIT V I/O SYSTEMS		9+6
	<p>I/O Hardware: I/O devices, Device controllers, Direct memory access</p> <p>Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms.</p> <p>Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-</p>	

	SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks. File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance. Practical 11. Simulate Storage Features using virtual box component	
	LECTURE	PRACTICAL
	45	30
		TOTAL
		75

a

TEXT BOOKS /REFERENCE BOOKS
1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9 th Edition, John Wiley and Sons Inc., 2012.
2. William Stallings, "Operating Systems – Internals and Design Principles", 7 th Edition, Prentice Hall, 2011
3. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education, 1996.
4. Gary J. Nutt, "Operating Systems: A Modern Perspective", 2 nd Edition, Addison-Wesley, 2000
5. Maurice Bach, "Design of the Unix Operating Systems", 8 th Edition, Prentice-Hall of India, 2012
6. Daniel P. Bovet, Marco Cesati, "Understanding the Linux Kernel", 3rd Edition, O'Reilly and Associates, 2005

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PROGRAM OUTCOMES												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
C01	3	1	3	0	0	0	0	0	1	0	0	1	3	1
C02	3	3	3	1	0	0	0	0	0	0	1	2	3	1
C03	2	3	3	1	1	0	0	0	1	0	1	2	3	1
C04	3	2	0	1	1	1	1	0	1	0	0	2	3	1
C05	3	2	0	1	1	1	1	0	1	0	0	2	3	1

1 – 5 → 1,

6 – 10 → 2,

11 – 15 → 3

1 - Low Relation, 2- Medium Relation, 3- High Relation

COURSE CODE			XCS404	L	T	P	C
COURSE NAME			DESIGN AND ANALYSIS OF ALGORITHMS	3	0	2	5
C	P	A		L	T	P	H
4.0	1.0	0.0		3	0	4	5
Course Outcome							
			Domain	Level			
C01	Explain and classify the characteristics and analysis of algorithm and propose the correct algorithmic strategy to solve any problem.			Cognitive	Understanding		
C02	Design algorithms for any problem based on the strategy and sorting and searching problems.			Cognitive Psychomotor	Apply Guided Response		
C03	Analyze any given algorithm and express its complexity in asymptotic notation			Cognitive Psychomotor	Analyze Guided Response		
C04	Explain the limitations of algorithm and Identify any problem as belonging to the class of P, NP-Complete or NP-Hard			Cognitive Psychomotor	Understand Guided Response		
C05	Propose approximation algorithm for any NP problem			Cognitive Psychomotor	Analyze Guided Response		
COURSE CONTENT						Hours	
UNIT I	ANALYSING ALGORITHMS					9	
	Introduction: Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior - Performance measurements of Algorithm, Time and space trade-offs - Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters’ theorem. The Role of Algorithms in Computing - Growth of Functions – Recurrences - The Substitution Method - The Recurrence Tree Method - The Master Method - Probabilistic Analysis and Randomized Algorithms – Amortized Analysis – Aggregate Analysis – Accounting Method.						
UNIT II	DIVIDE AND CONQUER & GREEDY DESIGN STRATEGIES					9 + 9	
	Fundamental Algorithmic Strategies: Brute-Force, Greedy,Dynamic Programming, Branch and-Bound and Backtracking methodologies for the design of algorithms - Topological sorting - Analysis of Sorting Algorithm – Quick Sort, Merge Sort – Quick Sort Randomized Version – Sorting in Linear Time - Lower Bounds for Sorting - Selection in Expected Linear Time - Selection in Worst case Linear Time – Greedy Algorithms - Elements of Greedy Strategy - Huffman Code, Dijkstra’s Shortest Path Algorithm – Heuristics - characteristics and their application domains.						

	<p>List of Experiments:</p> <ol style="list-style-type: none"> 1. Sort a given set of elements using the Quicksort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator. 2. Using OpenMP, implement a parallelized Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator. 3. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm. 	
UNIT III	DYNAMIC PROGRAMMING AND OTHER DESIGN STRATEGIES	9 + 9
	<p>Dynamic Programming – Matrix Chain Multiplication - Elements of Dynamic programming –Longest Common Sequences – Warshall's and Floyds Algorithm – Transitive Closure – Minimum Spanning Tree - All Pairs Shortest Path Algorithm – Analysis – Backtracking – Graph Coloring Problem – Branch and Bound Strategy - Knapsack Problem - Kruskal's algorithm – Prims algorithm.</p> <p>List of Experiments:</p> <ol style="list-style-type: none"> 4. Compute the transitive closure of a given directed graph using Warshall's algorithm. 5. Obtain the Topological ordering of vertices in a given digraph. 6. Implement 0/1 Knapsack problem using Dynamic Programming. 7. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm. 8. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm. Parallelize this algorithm, implement it using OpenMP and determine the speed-up achieved. 9. Implement N Queen's problem using Back Tracking. 10. Implement the spanning tree algorithm using Prims Algorithm 	
UNIT IV	FLOW NETWORKS AND STRING MATCHING	8 + 6
	<p>Flow Networks – Network Flow Algorithm - Ford Fulkerson Method - String Matching - Naive String Matching Algorithm – Knuth Morris Pratt Algorithm - Analysis.</p> <p>List of Experiments:</p> <ol style="list-style-type: none"> 11. Implement the Ford-Fulkerson Algorithm for Maximum Flow Problem. 12. Implement the Knuth Morris Pratt Algorithm 	
UNIT V	NP PROBLEMS	9 + 6
	<p>NP-Completeness – Polynomial Time Verification – Theory of Reducibility – Circuit Satisfiability – NP - Completeness Proofs – NP Complete Problems: Vertex Cover, Hamiltonian Cycle and Traveling Salesman Problems - Cook's theorem– Approximation Algorithms – Approximation Algorithms to Vertex - Cover and Traveling Salesman Problems - Randomized algorithms - Class of problems beyond NP – P</p>	

	SPACE. List of Experiments: 13.Implement travelling salesman problem using the dynamic programming approach. 14.Implement the Hamiltonian Cycle using the dynamic programming approach.					
		LECTURE	TUTORIAL	PRACTICAL	TOTAL	
		45	-	30	75	

TEXT BOOKS /REFERENCE BOOKS

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Introduction to Algorithms, Third Edition, Prentice Hall, 2010.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms Second Edition, Universities Press, 2008.
3. Kenneth A. Berman and Jerome L. Paul, Algorithms, Cengage Learning India, 2010.
4. Alfred V Aho, John E Hopcroft and Jeffrey D Ullman, The Design and Analysis of Computer Algorithms, First Edition, Pearson Education, 2006
5. Ding-Zhu Du, Ker-I Ko, Xiaodong Hu, Design and Analysis of Approximation Algorithms, Springer Optimization and Its Applications, First Edition, 2011.
6. I.Zámecníková, J.Hromkovic, Design and Analysis of Randomized Algorithms: Introduction to Design Paradigms (Texts in Theoretical Computer Science. An EATCS Series), 2005.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PROGRAM OUTCOMES												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
C01	2	1	2	1	0	0	0	0	1	0	0	1	1	1
C02	2	3	2	1	1	0	0	0	0	0	1	1	2	2
C03	2	3	2	1	1	0	0	0	1	0	1	1	2	3
C04	3	2	2	1	1	1	1	0	1	0	0	0	2	3
C05	2	2	2	1	1	1	1	0	1	0	0	1	1	2

1 – 5 → 1, 6 – 10 → 2, 11 – 15 → 3

1- Low Relation, 2-Medium Relation, 3-High Relation

COURSE CODE			XUM405	L	T	P	C
COURSE NAME			TOTAL QUALITY MANAGEMENT	3	0	0	3
C	P	A		L	T	P	H
3.0	0.0	0.0		3	0	0	3
Course outcome							
				Domain	Level		
C01	List and Explain the basic concepts of total quality concepts and its limitations.			Cognitive	Remembering, Understanding		
C02	Analyze and Explain the Customer satisfaction, Employee involvement, supplier selection and appraise the performance by TQM principle.			Cognitive	Analyzing Evaluating		
C03	Explain and Apply the Statistical Process Control Tools.			Cognitive	Understanding, Applying		
C04	Select and Explain the different TQM tools and their significance.			Cognitive	Remembering, Understanding		
C05	Explain the importance aspects of different quality systems			Cognitive	Understanding		

COURSE CONTENT		Hours
UNIT I INTRODUCTION		9
	Definition of quality – Dimensions of quality – Quality planning – Quality costs – Analysis techniques for quality costs – Basic concepts of Total Quality Management – Historical review –Principles of TQM – Leadership – Concepts – Role of senior management – Quality Council –Quality statements – Strategic planning – Deming philosophy – Barriers to TQM implementation	
UNIT II TQM PRINCIPLES		9
	Customer satisfaction – Customer perception of quality – Customer complaints – Service quality –Customer retention – Employee involvement – Motivation, empowerment, teams, recognition and reward – Performance appraisal – Benefits – Continuous process improvement – Juran trilogy – PDSA cycle – 5S – Kaizen – Supplier partnership – Partnering – Sourcing – Supplier selection – Supplier rating – Relationship development – Performance measures – Basic concepts – Strategy – Performance measure.	
UNIT III STATISTICAL PROCESS CONTROL (SPC)		9
	The seven tools of quality – Statistical fundamentals – Measures of central tendency and dispersion – Population and sample – Normal curve – Control charts for variables and attributes – Process capability – Concept of six sigma – New seven management tools.	

UNIT IV TQM TOOLS				9
Benchmarking – Reasons to benchmark – Benchmarking process – Quality Function Deployment (QFD) – House of quality – QFD process – Benefits – Taguchi quality loss function – Total Productive Maintenance (TPM) – Concept – Improvement needs – FMEA – Stages of FMEA.				
UNIT V QUALITY SYSTEMS				9
Need for ISO 9000 and other quality systems – ISO 9000:2000 quality system – Elements –Implementation of quality system – Documentation – Quality auditing – TS 16949 – ISO 14000 –Concept, requirements and benefits.				
		LECTURE	TUTORIAL	TOTAL
		45	0	45

TEXT BOOKS

- 1.Dale H. Besterfield, et. Al. "Total Quality Management", New Delhi, Pearson Education, Inc.. 2007.
- 2.James R. Evans and William M. Lidsay, "The Management and Control of Quality", 5th Edition, South- Western, 2002.

REFERENCES

1. Feigenbaum, A.V., "Total Quality Management", McGraw Hill, 1991.
2. Oakland, J.S., "Total Quality Management", Butterworth Heineman, 1989.
3. Narayana V. and Sreenivasan, N.S., "Quality Management – Concepts and Tasks", New Age International, 1996.
4. Zeiri, "Total Quality Management for Engineers", Wood Head Publishers, 1991.

E- REFERENCES

<http://nptel.ac.in/faq/110101010/Prof.IndrajitMukherjee,IIT,Bombay> and Prof.Tapan P.Bagchi, IIT, Kharagpur.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
C01	0	0	0	0	0	2	1	3	2	1	2	1	1	0
C02	0	0	0	0	0	2	1	3	2	1	2	1	1	0
C03	0	0	0	0	0	2	1	3	2	1	2	1	1	0
C04	0	0	0	0	0	2	1	3	2	1	2	1	1	0
C05	0	0	0	0	0	2	1	3	2	1	2	1	1	0
Total	0	0	0	0	0	10	5	15	10	5	10	5	5	0
Scaled	0	0	0	0	0	2	1	3	2	1	3	1	1	0

1 – 5 → 1, 6 – 10 → 2, 11 – 15 → 3
1 - Low Relation, 2- Medium Relation, 3- High Relation

COURSE CODE	XCS501	L	T	P	C
COURSE NAME	SIGNALS AND SYSTEMS	3	0	0	3
C:P:A	3:0:0	L	T	P	H
		3	0	0	3
PREREQUISITES					
COURSE OUTCOMES		Domain		Level	
C01	Describe and classify the signals & systems	Cognitive		Remembering Understanding	
C02	Find and analyze the properties of continuous time signal using Fourier and Laplace Transform,	Cognitive		Remembering , Analyzing	
C03	Find and solve the continuous time LTI system performance of Fourier and Laplace Transform.	Cognitive		Remembering , Applying	
C04	Find ,apply and analyze the properties of discrete time signal using Fourier and Z Transform.	Cognitive		Remembering , Applying Analyzing,	
C05	Explain,Solve and determinethe performance of Discrete Time LTI system in Fourier and Z Transform.	Cognitive		Understanding g Applying, Evaluating	
UNIT I - CLASSIFICATION OF SIGNALS AND SYSTEMS				9	
Continuous time signals (CT signals) - Discrete time signals (DT signals) - Step, Ramp, Pulse,Impulse, Sinusoidal, Exponential, Classification of CT and DT signals - Periodic & Aperiodic signals, Deterministic& Random signals, Energy & Power signals - CT systems and DT systems Classification of systems – Static & Dynamic, Linear & Nonlinear, Time-variant & Time-invariant,Causal&Noncausal, Stable & Unstable.					
UNIT II - ANALYSIS OF CONTINUOUS TIME SIGNAL				9	
Fourier series analysis-spectrum of Continuous Time (CT) signals- Fourier and Laplace Transforms in CT Signal Analysis - Properties.					
UNIT III - LINEAR TIME INVARIANT- CONTINUOUS TIME SYSTEMS				9	
Differential Equation-Block diagram representation-impulse response, convolution integrals- Fourier and Laplace transforms in Analysis of CT systems.					
UNIT IV - ANALYSIS OF DISCRETE TIME SIGNALS				9	
Baseband Sampling of CT signals- Aliasing, Reconstruction of CT signal from DT signals DTFT and properties, Z-transform & properties.					
UNIT V - LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS				9	

Difference Equations-Block diagram representation-Impulse response - Convolution sum-Discrete Fourier and Z Transform Analysis of Recursive & Non-Recursive systems.

	LECTURE	TUTORIAL	PRACTICAL	TOTAL
HOURS	45	0	0	45

TEXT BOOKS

1. P.Ramakrishna Rao, "Signals and Systems", Tata McGraw Hill Publications, 2008.
2. B.P.Lathi, "Principles of Linear Systems and Signals", 2nd Edition, Oxford University Press, 2009.

REFERENCES

1. R.EZeimer, W.H.Tranter. and .R.D.Fannin, "Signals & Systems - Continuous and Discrete", Pearson Education, 2009.
1. John Alan Stuller, "An Introduction to Signals and Systems", Thomson Learning , 2007.
2. M.J .Roberts, "Signals & Systems Analysis using Transform Methods & MATLAB", Tata McGraw Hill, 2007.
3. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, "Signals and Systems", Pearson Education, Indian Reprint, 2007.

E-REFERENCES

1. <http://nptel.ac.in/courses/117104074> (Prof.K.S.Venktesh, "NPTEL, Signals and Systems", IIT-Kanpur)
2. http://tutorialspoint.com/signals_and_systems/index.htm
3. <http://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/lecture-notes/>

COURSE CODE			XCS502		L	T	P	C
COURSE NAME			FORMAL LANGUAGE & AUTOMATA THOERY		2	1	0	3
C:P:A = 3:0:0								
C	P	A			L	T	P	H
3.0	0.0	0.0			2	2	0	4
COURSE OUTCOMES					DOMAIN		LEVEL	
CO1	Explain and Fundamental of the basic kinds of finite automata and their capabilities				Cognitive		Knowledge	
CO2	Describe regular and context-free languages				Cognitive		Knowledge	
CO3	Describe transform regular expressions to grammars				Cognitive and Affective		Knowledge, Create	
CO4	Explain Constructions of Turing Machines				Cognitive		Knowledge,	
CO5	Describe the key results in algorithmic complexity, computability.				Cognitive and Affective		Knowledge, Create	
UNIT I FINITE AUTOMATA								9
Introduction- Basic Mathematical Notation and techniques- Finite State systems – Basic Definitions – Finite Automaton – DFA & NDFA – Finite Automaton with ϵ -moves – Regular Languages- Regular Expression – Equivalence of NFA and DFA – Equivalence of NDFA's with and without ϵ -moves – Equivalence of finite Automaton and regular expressions – Minimization of DFA- - Pumping Lemma for Regular sets – Problems based on Pumping Lemma.								
UNIT II GRAMMARS								9
Grammar Introduction– Types of Grammar - Context Free Grammars and Languages– Derivations and Languages – Ambiguity- Relationship between derivation and derivation trees – Simplification of CFG – Elimination of Useless symbols - Unit productions - Null productions – Greiback Normal form – Chomsky normal form – Problems related to CNF and GNF.								
UNIT III PUSHDOWN AUTOMATA								9
Pushdown Automata- Definitions – Moves – Instantaneous descriptions –Deterministic pushdown automata – Equivalence of Pushdown automata and CFL - pumping lemma for CFL – problems based on pumping Lemma.								
UNIT IV TURING MACHINE								9
Turing Machines- Introduction – Formal definition of Turing machines –Instantaneous descriptions- Turing Machine as Acceptors – Turing Machine as Transducers Computable Languages and functions – Turing Machine constructions – Modifications of Turing Machines.								
UNIT V COMPUTATIONAL COMPLEXITY								9

Undecidability- Basic definitions- Decidable and undecidable problems - Properties of Recursive and Recursively enumerable languages – Introduction to Computational Complexity: Definitions-Time and Space complexity of TMs –complexity classes – introduction to NP-Hardness and NP-Completeness.			
	LECTURE	TUTORIAL	TOTAL
	45	0	45
TEXT BOOKS			
1. Hopcroft J.E., Motwani R. and Ullman J.D, “Introduction to Automata Theory, Languages and Computations”, Second Edition, Pearson Education, 2008.			
REFERENCES			
1. John.C.Martin, “Introduction to Languages and the Theory of Computation” McGraw-Hill Education, 01-May-2010.			
2. Michael Sipser, “Introduction to the Theory of Computation” Cengage Learning, 2012.			
E-REFERENCES			
Theory of Computation by Prof. Somenath Biswas, Computer Science and Engineering, IIT Kanpur			

Mapping of COs with POs:

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	2	2	3	0	0	0	1	1	1	0	0	0	0
CO2	2	3	2	3	0	0	0	0	0	1	0	2	2	1
CO3	2	2	3	1	1	2	1	2	2	0	0	0	0	2
CO4	3	2	2	2	0	0	0	0	0	1	0	1	0	2
CO5	1	1	3	3	1	2	1	1	1	0	0	2	2	2
Total	10	10	12	12	2	4	2	4	4	3	0	5	4	11

Courses	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO1 2	PSO 1	PSO 2
Original	10	10	12	12	2	4	2	4	4	3	0	5	4	11
Scaled to 0,1,2,3 Scale	2	2	3	3	1	1	1	1	1	1	0	1	1	3

COURSE CODE			XCS503			L	T	P	C
COURSE NAME			DATABASE MANAGEMENT SYSTEMS			3	0	2	5
C	P	A				L	T	P	H
2.8	0.8	0.0				3	0	3	5
Learning Objectives: This course aims at <ul style="list-style-type: none">• facilitating the student to understand the various concepts and functionalities of Database Management Systems, the method and model to store data.• How to manipulate through query languages, the effective designing of relational database .• How the system manages the concurrent usage of data in multi user environment.									
COURSE OUTCOMES						DOMAIN		LEVEL	
C01	Construct queries with relational database system with the basics of SQL					Cognitive Psychomotor		Remember, Create Guided Response	
C02	Relate and Apply the design principles for logical design of databases, including ER model and normalization approach					Cognitive Psychomotor		Understand, Apply Guided Response	
C03	Define and Explain the basic database storage structures and access techniques: file and page organizations, indexing methods including B-tree, B+ tree and hashing.					Cognitive		Remember, Understand	
C04	Define and Explain the basic issues of transaction processing and concurrency control.					Cognitive		Remember , Understand	
C05	Work successfully in a team by design and development of database application systems.					Cognitive Psychomotor		Understand, Apply Guided Response	
UNIT I INTRODUCTION								9+3	
Introduction to File and Database systems- Database system structure – Data Models – Types of Data models – ER model – Relational Model – Keys – Relational Algebra and Calculus.									
List of Experiments: 1. Database design using E-R model and Normalization									
UNIT II RELATIONAL MODEL								9+21	
SQL – Data definition- Queries in SQL- Updates- Views – Integrity and Security – Relational Database design – Functional dependencies and Normalization for Relational Databases – Decomposition - Desirable Properties of Decomposition - Boyce-Codd Normal Form.									
List of Experiments: 2. Data Definition Language (DDL) commands in RDBMS 3. Data Manipulation Language (DML) and Data Control Language (DCL) 4. High level language extensions with cursors 5. High level language extension with Triggers 6. Views 7. Procedures and Functions 8. Embedded SQL									
UNIT III DATA STORAGE AND QUERY PROCESSING								9	

Overview of Physical Storage Media – Magnetic Disks – RAID – Tertiary storage – File Organization – Organization of Records in Files – Indexing and Hashing – Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing– Query Processing.

UNIT IV TRANSACTION MANAGEMENT

9

Transaction Processing – Introduction- Need for Concurrency control- Desirable properties of Transaction- Schedule and Recoverability- Serializability and Schedules – Concurrency Control – Types of Locks- Two Phases locking- Deadlock- Time stamp based concurrency control – Recovery Techniques – Immediate Update- Deferred Update - Shadow Paging.

UNIT V ADVANCED DATABASES

9+6

Distributed databases - Homogenous and Heterogeneous - Distributed data Storage Object Oriented Databases - Need for Complex Data types - OO data Model- Nested relations - Complex Types - Inheritance Reference Types - XML - Structure of XML Data - XML Document Schema - Querying and Transformation - Data Mining and Data Warehousing -Web database- Spatial database -Temporal database - Multimedia database.

List of Experiments:

9. Develop the following applications

- Design and implementation of payroll processing system
- Design and implementation of Banking system
- Design and implementation of Library Information System
- Design and implementation of Student Information System

	LECTURE	PRACTICAL	TOTAL
	45	30	75

TEXT BOOKS

- Abraham Silberschatz, Henry F. Korth and S. Sudharshan, "Database System Concepts", Sixth Edition, Tata Mc Graw Hill, 2011.

REFERENCES

- Ramez Elmasri and Shamkant B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education, 2008.

E-RESOURCES

- <http://spoken-tutorial.org>
- <http://vlab.co.in/>

Mapping of COs with POs:

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
C01	3	0	2	1	0	0	0	0	0	0	0	0	3	1
C02	3	2	1	1	0	0	0	0	0	0	0	0	3	1
C03	3	0	0	0	0	0	0	0	0	0	0	0	3	1
C04	3	0	0	0	0	0	0	0	0	0	0	0	3	1
C05	0	3	3	3	2	0	0	0	2	1	0	0	3	3

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
Original	12	5	6	5	2	0	0	0	2	1	0	0	15	7
Scaled to 0,1,2,3 scale	3	1	2	1	1	0	0	0	1	1	0	0	3	2

COURSE CODE			XCS504	L	T	P	C
COURSE NAME			SOFTWARE ENGINEERING	3	0	4	5
C	P	A		L	T	P	H
Objective: Objective of software engineering course are understand the software life cycle models and software development process and elicit, analyze and specify software requirements, design, develop correct and robust software products, testing and adaptation of software maintenance and emerging trends in software engineering.							
COURSE OUTCOMES				DOMAIN		LEVEL	
C01	Describe, understand and compare various methods of software development activities and software development process models.			Cognitive Psychomotor		Describe, Understand, Apply	
C02	Describe, Ability to develop, classify and analyze the knowledge of human-computer interaction and design software architecture for various application.			Cognitive Psychomotor Affect		Describe Create, Analyze	
C03	Describe, apply, Analyze, evaluate and test the basics of software testing and metrics.			Cognitive Psychomotor Affect		Describe Create, Apply	
C04	Describe, apply, Analyze, evaluate and test the basics of software maintenance and software project management concepts			Cognitive Psychomotor Affect		Describe Create, evaluate Apply	
C05	Understand and , Explain, develop and utilize the advanced software engineering concepts and software engineering development tools			Cognitive Psychomotor Affect		Describe Create, Apply	
UNIT-I		SOFTWARE PROCESS AND REQUIREMENTS				9+ 12	
Introduction – Hardware Vs. Software - A Generic view of Process – SDLC - Process life cycle models (Water Fall, Incremental, Evolutionary, Specialized, Agile) – Agile development - System Engineering. Requirements Engineering - Requirement gathering techniques - Requirements Engineering tasks – Process - Requirement Analysis - Eliciting Requirements - Building the analysis Model - Data Modeling Concepts - Object Oriented Analysis.							
List of Experiments: 1. Feasibility study for any two application 2. Project Planning for the above application 3. Software requirement analysis for any two application 4. Write SRS for any two application 5. Create traceability matrix for any two applications							
UNIT –II		DESIGN CONCEPTS AND PRINCIPLES				9 + 6	
Design Engineering – Design Process and Design Concepts and Model-Architectural design - software architecture – data design – architectural design – transform and transaction mapping- Modeling the Component Level Design –Introduction-Designing Class-based Components- User interface analysis and design - Coupling and Cohesion- Design elements of interface, component level and deployment level.							
List of Experiments: 6. Draw use-case, class for any two applications. 7. Draw sequence and collaboration diagram for any two applications.							

8. Draw activity and state chart for any two applications.				
9. Component, package and deployment diagram for any two applications.				
UNIT-III	TESTING	9 + 12		
Testing Strategies - A strategic approach to software testing - Strategic Issues - Test strategy for Conventional software, Object oriented software – SQA - Validation Testing - System testing and debugging - Testing fundamentals - Black Box testing - White Box testing - Basis Path testing - control structure testing - Test case - Performance testing - Object oriented testing.				
List of Experiments:				
10. Generate and Implementation of skeleton code for any two application				
11. Writing test cases for any two application				
12. Testing process for any two application				
13. Check verification & Validation for any two applications.				
UNIT -IV	SOFTWARE PROJECT MANAGEMENT	9		
Project Management life cycle – Need of application maintenance – Management spectrum - Testing Rationale Management – Configuration Management – Project Management – project process product measures and metrics – Estimation of software projects – Decomposition techniques and empirical estimation models - Risk analysis and mitigation plans - Procurement management.				
UNIT V	ADVANCED TOPICS IN SOFTWARE ENGINEERING	9		
Formal Methods – Basic Concepts – Mathematical preliminaries-Appling Mathematical notations for formal specification – Formal specification languages-Clean room software Engineering-Clean room Approach-Functional specification-Component-Based Development-Reengineering-Software Reengineering-Reverse Engineering- Forward Engineering-Introduction to CASE tools and testing tools – Software process improvement –Automation testing tools.				
		LECTURE	PRACTICAL	TOTAL
		45	30	75
TEXT BOOKS				
1. Roger S.Pressman, Software engineering- A practitioner’s Approach, McGraw- Hill International Edition, 8 th edition, 2015.				
REFERENCES				
1. Ian Sommerville, Software engineering, Pearson education Asia, 10 th edition, 2016.				
2. Pankaj Jalote- An Integrated Approach to Software Engineering, 3 rd edition 2011.				
3. C.Ravindranath Pandian, “Software metrics – A guide to planning, analysis and application”, AUERBACH publication, Newyork 2011.				
4. Ali Behforooz, Frederick J Hudson, “Software Engineering Fundamentals”, second edition, Oxford University Press, Noida, 2009.				
E REFERENCES				
1. NPTEL Course Prof. N. L. Sarda, IIT Bombay				
2. http://vlab.co.in/				
3. http://staruml.io/				
4. http://argouml.tigris.org/				
5. http://www.seleniumhq.org				
6. IBM Rational Rose Enterprise Edition 8.1				

Mapping of COs with POs:

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	1	2	1	0	0	1	0	0	0	0	0	2	2	1
CO 2	2	3	3	2	2	1	3	0	0	0	0	1	3	2
CO 3	3	3	3	1	1	3	0	1	2	0	3	3	3	3
CO 4	3	3	3	1	1	3	0	1	2	0	3	3	3	3
CO 5	1	3	0	0	3	0	1	0	0	1	0	1	3	1
	10	14	10	4	7	8	4	2	4	1	6	10	14	10

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
Original value	10	14	10	4	7	8	4	2	4	1	6	10	14	10
Scaled to 0,1,2,3 scale	2	3	2	1	2	2	1	1	1	1	2	2	3	2

COURSE CODE	XCS505	L	T	P	C
COURSE NAME	IT WORKSHOP(SCILAB/MATLAB)	1	0	4	3
PREREQUISITES	Working knowledge of some basic application software (Excel). Basic knowledge of computer programming and an understanding of matrix and linear algebra are highly beneficial.	L	T	P	H
C:P:A	0.25:2.0:0.75	1	0	4	5
Learning Objectives					
<ul style="list-style-type: none">Understanding the MATLAB environmentBeing able to do simple calculations using MATLABBeing able to carry out simple numerical computations and analyses using MATLAB					
COURSE OUTCOMES		DOMAIN		LEVEL	
C01	Understand the main features of the MATLAB development environment	Cognitive, Psychomotor Affective		Understand Guided Response Responding	
C02	Use the MATLAB GUI effectively	Cognitive Psychomotor		Understand Guided Response Responding	
C03	Design simple algorithms to solve problems	Cognitive Psychomotor Affective		Apply Guided Response Responding	
C04	Write simple programs in MATLAB to solve scientific and mathematical problems	Cognitive Psychomotor Affective		Apply Guided Response Responding	
C05	graphical representations and tips for designing and implementing MATLAB code	Cognitive Psychomotor Affective		Apply Guided Response Responding	
THEORY					
MATLAB basics, The MATLAB environment, Basic computer programming Variables and constants, operators and simple calculations ,Formulas and functions, MATLAB toolboxes Matrix and linear algebra review ,Vectors and matrices in MATLAB,Matrix operations and functions in MATLAB Reading and writing data, file handling ,Personalized functions ,Toolbox structure ,MATLAB graphic functions					15
EXPERIMENTS					30
1. Study of Introduction to MATLAB 2. Study of basic matrix operations 3. To solve linear equation 4. Solution of Linear equations for Underdetermined and over determined cases. 5. Determination of Eigen values and Eigen vectors of a Square matrix. 6. Solution of Difference Equations. 7. Solution of Difference Equations using Euler Method. 8. Solution of differential equation using 4th order Runge- Kutta method. 9. Determination of roots of a polynomial. 10. Determination of polynomial using method of Least Square Curve Fitting. 11. Determination of polynomial fit, analyzing residuals, exponential fit and error bounds from the given data.					

	LECTURE	TUTORIAL	TOTAL
HOURS	45	0	45
REFERENCES			
1. Amos Gilat 'MATLAB, An Introduction With Applications', 3 rd edition, Wiley publishers, 2008			
2. Stephen J. Chapman 'MATLAB Programming for Engineers' 5 th edition, Cengage learninb, 2016			
3. Holly Moore 'MATLAB for Engineers', 5 th edition, Pearson, 2012			

Table 1: Mapping of COs with POs:

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
C01				1	3							1		
C02	2	2		1	3							1		
C03		2	1	2	2							1		
C04					2									
C05				2	2									
Total	2	4	1	6	12							3		
Scale d value	1	1	1	2	3							1		

1-5→1, 6-10→2, 11-15→3

0 - No Relation, 1 - Low Relation, 2 - Medium Relation, 3 - High Relation

SUBCODE		XCSM01	L	T	P	C
SUB NAME		Programming with Python	0.5	0	0.5	1
PREREQUISITES		-	L	T	P	H
C:P:A			1	0	1	2
COURSE OUTCOMES			Domain		Level	
CO1	<i>Describe</i> the evolution of python program and the handle installation process with different OS.		Cognitive		Remember	
CO2	<i>Understand</i> the data types and operators with dictionaries.		Cognitive		Remember ,Understand	
UNIT I INSTALLATION			6			
Downloading and installation: overview of python – installing python on windows –installing python on Linux – feature – History and philosophy of python – interactive mode – structure with identification.						
UNIT II DATA TYPE AND STATEMENT			6			
Identification- Data Types and Variables - Operators -input and raw input via the keyboard - Conditional Statements -While Loops -For Loops -Formatted output -Output with Print -Sequential Data Types - Dictionaries -Sets and Frozen Sets -Shallow and Deep Copy.						
UNIT III FUNCTION AND REGULAR EXPRESSION			6			
Functions - Recursion and Recursive Functions - Tests, DocTests, UnitTests - Memoization and Decorators - Passing Arguments- Namespaces - Global vs. Local Variables- File Management - Modular Programming and Modules - Introduction in Regular Expressions - Regular Expressions, Advanced -Lambda Operator, Filter, Reduce and Map -List Comprehension- Generators						
UNIT IV OBJECT ORIENTED PROGRAMMING			6			
Exception Handling - Object Oriented Programming - Inheritance Example - Slots - Classes and Class Creation -Road to Metaclasses -Metaclasses – files input and output - inheritance, polymorphism, operator overloading – Multithreading.						
UNIT V APPLICATION OF PYTHON PROGRAMMING			6			
Graphical user interfaces; event-driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames-, Networks, and Client/Server Programming; introduction to HTML, interacting with remote HTML server, running html-based queries, downloading pages; CGI programming, programming a simple CGI form						
		LECTURE	TUTORIAL	PRACTICAL	TOTAL	
		15	0	15	30	
TEXT BOOKS						
1. Fundamentals of Python: First Programs Author: Kenneth Lambert Publisher: Course Technology, Cengage Learning, 2012 ISBN-13: 978-1-111-82270-5						
E-REFERENCES						
1. https://wiki.python.org/moin/BeginnersGuide/Overview						
2. https://docs.python.org/2/license.html						
3. http://www.python-course.eu/blocks.php						
4. http://www.tutorialspoint.com/python						

COURSE CODE		XCS601	L	T	P	C
COURSE NAME		COMPILER DESIGN	3	0	1	4
C:P:A		2.8:0.8:0.4				
			L	T	P	H
			3	0	2	5
COURSE OUTCOMES			DOMAIN		LEVEL	
C01	<i>Describe</i> the compilers and its construction tools and specification of tokens.		Cognitive		Remember	
C02	<i>Describe</i> and <i>apply</i> various parsing techniques for parsing the string.		Cognitive, Psychomotor		Understand Guided Response	
C03	<i>Illustrate</i> and <i>construct</i> intermediate language.		Cognitive, Psychomotor		Understand Guided Response	
C04	<i>Describe</i> the code generation and <i>make use of</i> code generator to generate target code.		Cognitive, Psychomotor		Understand Guided Response	
C05	<i>Explain</i> code optimization and <i>apply</i> the optimization technique		Cognitive, Psychomotor		Understand Guided Response	
UNIT I INTRODUCTION TO COMPILING						9 + 12
Compilers – analysis of the source program – phases of a compiler – cousins of the compiler – grouping of phases – compiler construction tools – lexical analysis – role of lexical analyzer – input buffering – specification of tokens- Lex- Simple Program using Lex.						
List of Programs						
1. Construction of NFA						
2. Construction of Minimized DFA						
3. Implementation of Lexical Analyzer Using LexTool.						
4. Generation of Tokens for Given Lexeme.						
5. Conversion of Infix to Postfix Expression						
6. Implementation of Symbol Table						
UNIT II SYNTAX ANALYSIS						9 + 8
Role of the parser –Writing Grammars –Context-Free Grammars – Top Down parsing – Recursive Descent Parsing – Predictive Parsing – Bottom-up parsing – Shift Reduce Parsing – Operator Precedent Parsing – LR Parsers – SLR Parser – Canonical LR Parser – LALR Parser- YACC –Simple Program using YACC.						
List of Programs						
7. Syntax Analysis using YACC.						
8. Implementation of Shift Reduce Parsing Algorithm.						
9. Construction of LR Parsing Table.						
10. Construction of Operator Precedence Parse Table.						
UNIT III INTERMEDIATE CODE GENERATION						9 + 5
Intermediate languages – Declarations – Assignment Statements – Boolean Expressions – Case Statements – Back patching – Procedure calls.						
List of Programs						
11.Implementation of Quadruples						
12. Implementation of Triples.						
13. Implementation of Intermediate Code Generation.						

UNIT IV CODE GENERATION			9 + 2
Issues in the design of code generator – The target machine – Runtime Storage management – Basic Blocks and Flow Graphs – Next-use Information – A simple Code generator – DAG representation of Basic Blocks – Peephole Optimization.			
List of Programs			
14. Implementation of Code Generation			
UNIT V CODE OPTIMIZATION AND RUN TIME ENVIRONMENTS			9 + 3
Introduction– Principal Sources of Optimization – Optimization of basic Blocks – Introduction to Global Data Flow Analysis – Runtime Environments – Source Language issues – Storage Organization – Storage Allocation strategies – Access to non-local names – Parameter Passing.			
List of Programs			
15.Implementation of Code Optimization Techniques			
	LECTURE	PRACTICAL	TOTAL
	45	30	75
TEXT BOOKS			
1. Alfred V.Aho, Jeffrey D.Ullman, Ravi Sethi, "Compilers- Principles, Techniques, and Tools(Second Edition)", Pearson Education India, 2008.			
REFERENCES			
1. Allen I. Holub “Compiler Design in C”, Prentice Hall of India, 2003.			
2. C. N. Fischer and R. J. LeBlanc, “Crafting a compiler with C”, Benjamin Cummings, 2003.			
3. J.P. Bennet, “Introduction to Compiler Techniques”, Second Edition, Tata McGraw-Hill, 2003.			
4. Henk Alblas and Albert Nymeyer, “Practice and Principles of Compiler Building with C”, PHI, 2001.			
5. Kenneth C. Loudon, “Compiler Construction: Principles and Practice”, Thompson Learning, 2003.			
E REFERENCES			
1. http://nptel.ac.in/downloads/106108113/			
2. http://www.svecw.edu.in/Docs%5CCSECDLNotes2013.pdf			
3. https://www.wiziq.com/tests/compiler-design			
4. http://spoken-tutorial.org/			
5. http://vlab.co.in/			

Mapping of COs with POs:

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	2	3	2	3	2	1	0	0	2	1	0	2	3	2
CO 2	2	3	2	3	2	1	0	0	2	1	0	1	3	2
CO 3	1	3	3	2	1	1	0	0	1	1	0	2	3	2
CO 4	2	2	2	2	2	1	0	0	1	1	0	1	3	2
CO 5	2	3	3	1	1	1	0	0	1	1	0	1	3	2
Total	9	14	12	11	8	5	0	0	7	5	0	7	15	10

COURSE CODE			XCS602	L	T	P	C
COURSE NAME			COMPUTER NETWORKS	3	0	1	4
C	P	A					
2.8	0.8	0.4		L	T	P	H
				3	0	2	5
COURSE OUTCOMES				DOMAIN		LEVEL	
CO1	Understanding the networks components and Analyzing the various network components.			Cognitive		Understand,	
CO2	Describe and Recognize the network error detection and correction methods.			Cognitive		Remember, Apply,	
CO3	Identify and interpret the network switching and addressing methods and develop the various routing simulations.			Cognitive Psychomotor		Remember, Understand, Guided response	
CO4	Analyse a transport layer functions and setup connection oriented protocol.			Cognitive Psychomotor		Analyze, Create Perception	
CO5	Describe the Application layer functions and network security and Build simple NS2 simulations			Cognitive Psychomotor Affective		Understand Guided Response Receive	
UNIT I DATA COMMUNICATIONS							9
Components- Direction of Data flow-networks- Components and Categories – types of connections- Topologies- Protocols and Standards – ISO/OSI model – Transmission Media – Coaxial Cable – Fiber Optics – Line Coding – Modems.							
UNIT II DATA LINK LAYER							9 +15
Error – Detection and Correction – Parity – LRC - CRC – Hamming code – low Control and Error control – stop and wait – go back –N ARQ – selective repeat ARQ – Sliding window – HDLC – LAN – Ethernet IEEE 802.3 - IEEE 802.5 - IEEE 802.11 – FDDI – SONET – Bridges.							
List of Programs							
1. (a) Implement Single Bit Parity generator and checker using ‘C’ program.							
(b) Implement two dimensional parity generator and checker using ‘C’ program.							
2. (a) Implement Cyclic Redundancy checks sender and receiver using c program.							
(b) Implement checksum sender and receiver using ‘C’ program.							
3. Simulate Stop & Wait protocol.							
4. Implement error detection in data transmission using Hamming code.							
5. Implement bit stuffing sender and receiver using c program.							

UNIT III NETWORK LAYER			9 + 6
Internetworks – Packet switching and Datagram approach – IP addressing methods – subnetting – Routing – Distance Vector Routing – Link State Routing – Routers.			
List of Programs			
7. Simulate the distance vector routing algorithm.			
8. Simulate the link state routing algorithm.			
.			
UNIT IV TRANSPORT LAYER			9 + 6
Duties of Transport Layer – Multiplexing – De multiplexing – Sockets – User Datagram Protocol(UDP) – Transmission Control Protocol (TCP) – Congestion Control – Quality of Service (QOS) – Integrated Services.			
List of Programs			
9. Implement echo Server sender and receiver using TCP.			
10. Implement the Time Server sender and receiver using TCP.			
UNIT V APPLICATION LAYER			9 + 3
Domain Name Space (DNS) – SMTP – POP 3 – FTP – HTTP – WWW- Security - Cryptography Case study on TCP/IP Architecture.			
List of Experiments:			
11. Simulate the file transfer protocol using TCP.			
12. Implement byte stuffing sender and receiver using c program.			
13. To study NS2-Simple programs.			
	LECTURE	PRACTICAL	TOTAL
	45	30	75
TEXT BOOKS			
1. Behrouz A Forouzan “Data Communications Networking” 4th Edition Tata McGraw Hill, 2008.			
2. Andrew S. Tanenbaum, David J. Wetherall, “Computer Networks”, 5th Edition, 2010, ISBN-10: 0132126958, ISBN-13: 978-0132126953			
E REFERENCES			
1. http://nptel.ac.in/courses/106105081/			
2. Nptel videos Computer Networks by Prof. Sujoy Ghosh Department of Computer Science & Engineering Indian Institute of Technology, Kharagpur.			
3. E-Tools: https://www.wireshark.org/			
1.W. STALLINGS, "Data and Computer Communication", 8th edition, Pearson Education, 2006,			
2. Larry L. Peterson and Peter S.Davie , “Computer Networks”, Harcourt Asia Pvt Ltd., Second Edition			

E REFERENCES

1. <http://nptel.ac.in/downloads/106108113/>
2. <http://www.svecw.edu.in/Docs%5CCSECDLNotes2013.pdf>
3. <https://www.wiziq.com/tests/compiler-design>
4. <http://spoken-tutorial.org/>
5. <http://vlab.co.in/>

COURSE CODE	XUM606	L	T	P	C
COURSE NAME	ECONOMICS FOR ENGINEERS	3	0	0	3
PREREQUISITES		L	T	P	H
C:P:A	2.64:0.24:0.12	3	0	0	3
Learning Objectives					
<div><div>➤</div>To provide comprehensive coverage of economical concepts for precise decision makings in engineering domains.</div> <div><div>➤</div>To develop the ability of engineers to analysis the cost and revenue by using economical tools.</div>					
COURSE OUTCOMES		DOMAIN		LEVEL	
C01	<i>Explain</i> the concepts of economics in engineering and <i>identify</i> element of cost to prepare cost sheet	Cognitive Psychomotor		Understand Perception	
C02	<i>Calculate and Explain</i> the Break-even point and marginal costing	Cognitive Psychomotor		Understand &Apply Perception	
C03	<i>Summarize</i> and <i>Use</i> value engineering procedure for cost analysis	Cognitive Affective		Understand Receive	
C04	<i>Estimate</i> replacement problem	Cognitive		Understand	
C05	<i>Compute, Explain</i> and <i>make Use of</i> different methods of depreciation	Cognitive		Understand &Apply	
UNIT I: INTRODUCTION TO ECONOMICS				08	
Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics- types of costing, element of costs, preparation of cost sheet and estimation, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost					
UNIT II: BREAK-EVEN ANALYSIS&SOCIAL COST BENEFIT ANALYSIS				12	
Margin of Safety, Profit, Cost & Quantity analysis-Product Mix decisions and CVP analysis, Profit/Volume Ratio (P/V Ratio), Application of Marginal costing, Limitations Social Cost Benefit Analysis: compare different project alternatives, Calculate direct, indirect and external effects; Monetizing effects; Result of a social cost benefit analysis.					
UNIT III:DEPRECIATION				10	
Depreciation- Introduction, Straight line method of depreciation, declining balance method of depreciation-Sum of the years digits method of depreciation, sinking fund method of depreciation/ Annuity method of depreciation, service output method of depreciation.					

UNIT IV: REPLACEMENT AND MAINTENANCE ANALYSIS			07
Replacement and Maintenance analysis – Types of maintenance, types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset – capital recovery with return and concept of challenger and defender, Simple probabilistic model for items which fail completely.			
UNIT V:INFLATION AND PRICE CHANGE			08
Definition, Effects, Causes, Price Change with Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes in Engineering Economic Analysis, Cash Flows that inflate at different Rates.			
	LECTURE	TUTORIAL	TOTAL
HOURS	45	0	45
TEXT BOOKS			
1. G. Rajendra et.al, “Engineering Economy 1st Edition”, New Age International, 2006 2. S.P.Jain & Narang, “Cost accounting – Principles and Practice”, Kalyani Publishers, Calcutta, 2012.			
REFERENCES			
1. James L.Riggs, David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e , Tata McGraw-Hill 2. Donald Newnan, Ted Eschembach, Jerome Lavelle : Engineering Economics Analysis, OUP 3. John A. White, Kenneth E. Case, David B. Pratt : Principle of Engineering Economic Analysis, John Wiley 4. Sullivan and Wicks: Engineering Economy, Pearson			

Table 1 : Mapping of CO's with POs

	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈	PO ₉	PO ₁₀	PO ₁₁	PO ₁₂
C01	1	2	0	1	0	0	1	1	1	2	2	3
C02	2	2	1	2	0	0	2	1	1	2	3	3
C03	2	2	1	3	0	0	2	2	1	2	2	3
C04	1	2	1	2	0	0	0	1	1	1	2	3
C05	1	2	0	1	0	0	1	1	0	1	2	3
Scaled	1	2	1	2	0	0	1	1	1	2	2	3

0 – No relation

1- Low relation

2- Medium relation

3 – High relation

SUBCODE		XCSM02	L	T	P	C
SUB NAME		WEB DESIGN	0.5	0	0.5	1
PREREQUISITES		HTML and Designing Tools	L	T	P	H
C:P:A 0.5:0.5:0			1	0	1	2
COURSE OUTCOMES			Domain		Level	
CO1	Understand and perform the learning principles and techniques of client-side programming with HTML5.		Cognitive Psychomotor		Understanding Guided Response	
CO2	Understand, demonstrate and use the Joomla Tool.		Cognitive Psychomotor		Understanding Apply Guided Response	
UNIT I HTML5				6		
HTML5 – Overview – Syntax – Attributes – Events – Web Forms 2.0 – SVG – Math ML - Web Store – Web SQL Database – Server Sent Events - Web Sockets – Canvas – Audio and Video – Geolocation – microdata – Drag and Drop – Web Workers – IndexDDB – Web Messaging – CORS – Web RTC.						
UNIT II JOOMLA BASICS				6		
Introduction – Installation – Architecture – Control Panel – Toolbar – Menus – Content Menu – Components Menu – Extensions Menu – Help Menu.						
UNIT III JOOMLA MENUS				6		
Create Menus – Adding Menu Items – Modifying Menu Items – Creating Submenus						
UNIT IV JOOMLA MODULES				6		
Create Modules – Breadcrumb Module – Feed Display Module – Footer Module – Latest News module - Search Module – Random Image Module – Who’s Online Module – Syndicate module – Donation Module						
UNIT V JOOMLA ADVANCED				6		
Template Manager – Customize Template – Adding Template – Creating Template – Customize Logo – Category Management – Adding Content – Formatting Content – Article Metadata – Adding Banners – Adding Contacts – Adding News Feed – Adding Forum – Adding Web links – Plugin Manager – Extension Manager – Website Backup – Website SEO.						
			LECTURE	TUTORIAL	PRACTICAL	TOTAL
			15	0	15	30
TEXT						
1. Eric Meyer on CSS: Mastering the Language of Web Design. 2003. Eric Meyer. New Riders Publishing.						
2. A. Thomas Powell, “The complete reference – HTML and CEE (Covers HTML5)” McGraw Hill, Fifth Edition, 2010.						
3. Kogent Learning Solutions Inc. “HTML5 Black Book: Covers CSS3, Javascript, XML,						

XHTML, Ajax, PHP and JQuery – Black Book”, Dreamtech Press, 2011.

4. Kogent Learning Solutions Inc “Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black Book”, Dreamtech Press, 2009.
5. Jennifer Marriott, Elin Waring, “The Official Joomla! Book – 2nd Edition”, Addison-Wesley Professional, 2012.

REFERENCES

1. Build Your Own Web Site the Right Way Using HTML & CSS, 2nd Edition by Ian Lloyd.
2. The Essential Guide to CSS and HTML Web Design (Essentials) by Craig Grannel.

COURSE CODE			XUM801	L	T	P	C
COURSE NAME			CYBER SECURITY	3	0	0	3
C	P	A		L	T	P	H
3	0	0		3	0	0	3
COURSE OUTCOMES				DOMAIN		LEVEL	
C01	To <i>identify, learn, practice, and understand</i> the basic concepts of networks and cyber-attacks.			Cognitive		Remember, Analyse, Apply.	
C02	To <i>define</i> the concepts of system vulnerability scanning and the scanning tools			Cognitive		Remember	
C03	To <i>demonstrate, describe, and differentiate</i> the network defense mechanisms and <i>identify and apply</i> the tools used to detect and quarantine network attacks.			Cognitive		Understand, Analyze, Apply.	
C04	To <i>describe, differentiate, apply</i> the different tools for scanning.			Cognitive		Understand, Analyze, Apply.	
C05	To <i>identify</i> and <i>list</i> the types of cybercrimes, cyber laws and cyber-crime investigations.			Cognitive		Remember	
UNIT I – INTRODUCTION							9
History of Information Systems and its Importance, Basics, Changing Nature of Information Systems, Need for Distributed Information Systems: Role of Internet and Web Services. Information System Treats and attacks, Classification of Threats and assessing Damages Security in mobile and Wireless Computing-Security Challenges in Mobile Devices, authentication service Security, Security Implication for Organizations, Laptops security Concepts in Internet and World Wide Web: Brief review of Internet Protocols TCP/IP, IPV4, and IPV6. Functions of various networking components-routers, bridges, switches, hub, gateway and Modulation Techniques.							
UNIT II - SYSTEMS VULNERABILITY SCANNING							9
Overview of vulnerability scanning, Open Port / Service Identification, Banner / Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit. Networks Vulnerability Scanning - Netcat, Socat, understanding Port and Services tools - Datapipe, Fpipe, WinRelay, Network Reconnaissance – Nmap, THC-Amap and System tools. Network Sniffers and Injection tools – Tcpdump and Windump, Wireshark, Ettercap, Hping Kismet.							
UNIT III - NETWORK DEFENCE TOOLS							9
Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless VsStateful Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Introduction Detection System, Cryptool.							

UNIT IV – TOOLS FOR SCANNING				9
Scanning for web vulnerabilities tools: Metasploit tool, Nikto, W3af, HTTP utilities - Curl, OpenSSL and Stunnel, Application Inspection tools – Zed Attack Proxy, Sqlmap. DVWA, Webgoat, Password Cracking and Brute-Force Tools – John the Ripper, L0htcrack, Pwdump, THC-Hydra.				
UNIT V - INTRODUCTION TO CYBER CRIME AND LAW				9
Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Clarification of Terms, Traditional Problems Associated with Computer Crime, Introduction to Incident Response, Digital Forensics, Computer Language, Network Language, Realms of the Cyber world, A Brief History of the Internet, Recognizing and Defining Computer Crime, Contemporary Crimes, Computers as Targets, Contaminants and Destruction of Data, Indian IT ACT 2000.				
Introduction to Cyber Crime Investigation: Password Cracking, Key loggers and Spyware, Virus and Worms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks.				
		LECTURE	TUTORIAL	TOTAL
		45	0	45
TEXT BOOKS				
<ol style="list-style-type: none"> 1. Nina Godbole, "Information Systems Security: Security Management, Metrics, Frameworks and Best Practices, w/cd", Wiley Publications, 2008, ISBN 10: 8126516925, ISBN 13 : 9788126516926 2. Thomas J. Mowbray, "Cybersecurity: Managing Systems, Conducting Testing and Investigating Intrusions", Wiley Publications, 2013, Kindle Edition, ISBN 10: 812654919X, ISBN 13 : 9788126549191 3. D.S. Yadav, "Foundations of Information Technology", New Age International publishers, 3rd Edition, 2006, ISBN-10: 8122417620, ISBN-13: 978-8122417623. 				
REFERENCES				
<ol style="list-style-type: none"> 1. Mike Shema, "Anti-Hacker Tool Kit", McGraw Hill Education, 4th edition, 2014, 2. Nina Godbole, SunitBelapure, "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley publications, 2013, ISBN 10 : 8126521791, ISBN 13 : 9788126521791. 3. Corey Schou, Daniel Shoemaker, "Information Assurance for the Enterprise: A Roadmap to Information Security (McGraw-Hill Information Assurance & Security)", Tata McGraw Hill, 2013, ISBN-10: 0072255242, ISBN-13: 978-0072255249. 4. VivekSood, "Cyber Laws Simplified", McGraw Hill Education (INDIA) Private Limited in 2001, ISBN-10: 0070435065, ISBN-13: 978-0070435063. 5. Steven M.Furnell, "Computer Insecurity", Springer Publisher, 2005 Edition. 				
E – REFERENCES				
<ol style="list-style-type: none"> 1. https://www.cryptool.org/en/ 2. https://www.metasploit.com/ 3. http://sectools.org/tool/hydra/ 4. http://www.hping.org/ 5. http://www.winpcap.org/windump/install/ 6. http://www.tcpdump.org/ 				

7. <https://www.wireshark.org/>
8. <https://ettercap.github.io/ettercap/>
9. <https://www.concise-courses.com/hacking-tools/top-ten/>
10. <https://www.cirt.net/Nikto2>
11. <http://sqlmap.org/>

Table 1: Mapping of COs with POs

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
C01	3	3	3	3	3	0	2	2	2	0	0	0	3	2
C02	3	3	3	3	2	1	1	1	2	0	0	0	3	2
C03	0	3	2	2	0	1	2	2	0	0	0	0	0	0
C04	2	2	2	2	0	0	0	0	0	0	0	0	0	0
C05	3	2	3	3	3	0	2	2	2	0	0	0	3	2
Total	11	13	13	13	8	2	7	7	6	0	0	0	9	6

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
Original	11	13	13	13	8	2	7	7	6	0	0	0	9	6
Scaled to 0,1,2,3 scale	3	3	3	3	2	1	2	2	2	0	0	0	2	2

COURSE CODE			XCSE51			L	T	P	C
COURSE NAME			ARTIFICIAL INTELLIGENCE			3	0	0	3
						L	T	P	H
C	P	A				3	0	0	3
3	0	0							
COURSE OUTCOMES					DOMAIN		LEVEL		
C01	Represent knowledge using propositional calculus and predicate calculus.				Cognitive		Understand		
C02	Solve search problems by applying a suitable search strategy				Cognitive		Apply		
C03	Use inference rules to produce predicate calculus expression.				Cognitive		Apply		
C04	Apply and design a fuzzy logic system using fuzzy rules				Cognitive		Apply		
C05	Understand various optimization methods and know about genetic algorithm				Cognitive		Understand		
UNIT I INTRODUCTION					9				
History of AI; Characteristics of AI applications, Problem Solving by Search and Control Strategies, General Problem Solving, Production Systems, Control Strategies; Forward and Backward Chaining, Exhaustive Searches: Depth First and Breadth First Search.									
UNIT II SEARCH STRATEGIES					9				
Hill climbing - Backtracking - Graph search - Properties of A* algorithm - Monotone restriction - Specialized production systems - AO* algorithm. Constraint Satisfaction problems Game Playing Min Max Search procedure.									
UNIT III KNOWLEDGE REPRESENTATION					9				
Game playing - Knowledge Representation, Knowledge Representation using Predicate Logic, Introduction to Predicate Calculus, Reasoning, Use of Predicate Calculus, Knowledge Representation using other Logic-Structured Representation of Knowledge, STRIPS									
UNIT IV FUZZY SET THEORY					9				
Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set-theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If-Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.									
UNIT V OPTIMIZATION					9				
Derivative-based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton’s Method – Step Size Determination – Derivative-free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.									
					LECTURE	TUTORIAL		TOTAL	
					45	0		45	

TEXT BOOKS

1. Elaine Rich and Kevin Knight: Artificial Intelligence – Tata McGraw Hill, 2008
2. Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007.
3. G.Luger, W.A. Stubblefield, "Artificial Intelligence", 3rd Edition, Addison-Wesley Longman, 1998

REFERENCES

1. Nils J. Nilsson: Principles of Artificial Intelligence – Narosa Publication house.
2. Artificial Intelligence: A Modern Approach, Stuart Russell, Peter Norving, Pearson Education 2nd Edition.
3. Artificial Intelligence, Winston, Patrick, Henry, Pearson Education.
4. Artificial Intelligence by Gopal Krishna, Janakiraman.
5. N.J. NILSSON, "Principles of Artificial Intelligence", Narosa Publishing House, 1980

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1	3	0	0	0	0	0	0	0	0	0	0	1	0
CO2	1	3	0	0	0	0	0	0	0	0	0	0	2	0
CO3	1	3	0	1	1	0	0	0	0	0	0	0	3	0
CO4	1	3	0	2	0	0	0	0	0	0	0	0	1	0
CO5	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Total	5	13	0	3	1	0	0	0	0	0	0	0	6	0

COURSE CODE			XCSE52			L	T	P	C
COURSE NAME			GRAPH THEORY			3	0	0	3
						L	T	P	H
C	P	A							
3.0	0.0	0.0							
LEARNING OBJECTIVES:									
<ul style="list-style-type: none">Be familiar with the most fundamental Graph Theory topics and results.Be exposed to the techniques of proofs and analysis.									
COURSE OUTCOMES						DOMAIN		LEVEL	
C01	Write precise and accurate mathematical definitions of objects in graph theory.					Cognitive		Remembering Understanding	
C02	Use mathematical definitions to identify and construct examples and to distinguish examples from non-examples.					Cognitive		Remembering Understanding	
C03	Validate and critically assess a mathematical proof.					Cognitive		Remembering Understanding	
C04	Use a combination of theoretical knowledge and independent mathematical thinking in creative investigation of questions.					Cognitive		Remembering Understanding	
C05	Reason from definitions to construct mathematical proofs.					Cognitive		Remembering Understanding	
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 centres in tree – Rooted and binary trees.									
UNIT II TREES, CONNECTIVITY & PLANARITY						9			
Spanning trees – Fundamental circuits – Spanning trees in a weighted graph – cut sets – Properties of cut set – All cut sets – Fundamental circuits and cut sets – Connectivity and separability – Network flows – 1-Isomorphism – 2-Isomorphism – Combinational and geometric graphs – Planer graphs – Different representation of a planer graph.									
UNIT III MATRICES, COLOURING AND DIRECTED GRAPH						8			
Chromatic number – Chromatic partitioning – Chromatic polynomial – Matching – Covering – Four color problem – Directed graphs – Types of directed graphs – Digraphs and binary relations – Directed paths and connectedness – Euler graphs.									
UNIT IV PERMUTATIONS & COMBINATIONS						9			
Fundamental principles of counting - Permutations and combinations - Binomial theorem - combinations with repetition - Combinatorial numbers - Principle of inclusion and exclusion - Derangements - Arrangements with forbidden positions.									
UNIT V GENERATING FUNCTIONS						10			
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.									

	LECTURE	TUTORIAL	TOTAL
	45	0	45
REFERENCES			
<ol style="list-style-type: none"> 1. Narsingh Deo, "Graph Theory: With Application to Engineering and Computer Science", Prentice Hall of India, 2003. 2. Grimaldi R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", AddisonWesley, 1994. 3. Clark J. and Holton D.A, "A First Look at Graph Theory", Allied Publishers, 1995. 4. Mott J.L., Kandel A. and Baker T.P. "Discrete Mathematics for Computer Scientists and Mathematicians", Prentice Hall of India, 1996. 5. Liu C.L., "Elements of Discrete Mathematics", McGraw Hill, 1985. 6. Rosen K.H., "Discrete Mathematics and Its Applications", McGraw Hill, 2007. 			
E-References:			
<ul style="list-style-type: none"> • https://nptel.ac.in/courses/106108054/ • https://nptel.ac.in/courses/111106086/51 			

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	1	1	1	0	1	0	0	0	0	1	2	2
CO 2	1	3	2	1	1	0	0	0	0	0	0	1	2	2
CO 3	1	2	3	1	0	0	0	0	0	0	0	1	2	2
CO 4	1	2	2	3	0	0	0	0	0	0	0	1	2	2
CO 5	0	2	3	3	0	0	0	2	0	0	0	1	2	2
Total	6	10	7	2	0	1	0	3	0	0	0	5	5	10

COURSE CODE	XCSE53	L	T	P	C
COURSE NAME	DATA COMMUNICATION	3	1	0	4

C	P	A			L	T	P	H
3.0	1.0	0.0			3	2	0	5
COURSE OUTCOMES					DOMAIN	LEVEL		
CO1	Understand the basic concepts for data communication				Cognitive	Knowledge,		
CO2	Understand the error detection and error correction in the data link layer.				Cognitive	Analysis		
CO3	Understand and analyze networks layer functions and subnet creation				Cognitive	Knowledge, Analysis		
CO4	Understand the concepts of transport layer				Cognitive	Knowledge		
CO5	Recognize the design issue of application layer				Cognitive	Analysis		
UNIT I DATA COMMUNICATIONS								9+3
Data Transmission – Transmission Media – Signal Encoding Techniques – Multiplexing – Spread Spectrum. Interfaces and modems - Digital data transmission - Parallel and Serial DTE / DCE interface data terminal equipment, data circuit terminating equipment - Standards RS 232, Transmission rate of modems, Modem standards.								
UNIT II DATA LINK LAYER								9+3
Types of errors and detection, redundancy, VRC, LRC, CRC techniques - Error correction - Forward and backward error correction - Single bit and multi bit error correction - Hamming code. Data link control: Need for data link control - Line discipline, ENQ / ACK, Flow control stop and wait sliding window protocol, Error control, ARQ, Stop and wait ARQ, Sliding window ARQ Protocols: Asynchronous and Synchronous communications - Asynchronous and Synchronous Protocol - Character oriented protocol, BSC, bit oriented protocols - HDLC frames - Link access procedures.								
UNIT III NETWORK LAYER								9+3
Network layer design issues, Congestion Control algorithm, Internetworks – Packet switching and Datagram approach – IP addressing methods – Subnetting – Routing – Distance Vector Routing – Link State Routing – Routers.								
UNIT IV TRANSPORT LAYER								9+3
Duties of Transport Layer – Multiplexing – De multiplexing – Sockets – User Datagram Protocol(UDP) – Transmission Control Protocol (TCP) – Congestion Control – Quality of Service (QOS) – Integrated Services., Connection management .								
UNIT V APPLICATION LAYER								9+3
Domain Name Space (DNS) – SMTP – POP 3 – FTP – HTTP – WWW- Security - Cryptography Case study on TCP/IP Architecture , Directory services - Common Management Information Protocol - TCP/IP: TCP/IP and the Internet - TCP/IP and OSI.								
					LECTURE	TUTORIAL		Total
					45	15		60
TEXT BOOKS:								
1. Behrouz A Forouzan “Data Communications Networking” 4 th Edition Tata McGraw								

Hill, 2008.
2. Andrew S. Tanenbaum, David J. Wetherall, "Computer Networks", 5th Edition, 2010, ISBN-10: 0132126958, ISBN-13: 978-0132126953
REFERENCES
1. William Schewber, "Data Communication", McGraw Hill, 2009.
2. Tanenbaum, "Computer Networks", PHI, 5th Edition, 2011
REFERENCES
1. http://people.du.ac.in/~ngupta/teach_networks.html
2. http://www.cs.hunter.cuny.edu/~saad/courses/networks/notes/note1_ho.pdf
3. http://www.vub.ac.be/BIBLIO/nieuwenhuysen/courses/chapters/network.pdf
4. http://lecturenotes.in/notes/engg/paper/dccn/page1.html

COURSE CODE	XCSE54	L	T	P	C
COURSE NAME	INFORMATION THEORY AND CODING	3	0	0	3
PREREQUISITES	Probability theory	L	T	P	H
C	P	A			
		3	0	0	4

3.0	0.0	0.0						
COURSE OUTCOMES						Domain	Level	
C01:	Describe the basic notions of information and channel capacity					Cognitive	Knowledge	
C02:	Describe the Pulse code Modulation Systems					Cognitive	Knowledge	
C03:	Explain and Apply the error control coding					Cognitive	Knowledge, Understand	
C04:	Describe and Analyze compression and decompression techniques					Cognitive	Knowledge, Understand	
C05:	Explain and Illustrate Multimedia communication Techniques					Cognitive	Knowledge, Understand	
UNIT I INFORMATION ENTROPY FUNDAMENTALS							9	
Uncertainty, Information and Entropy – Source coding Theorem – Huffman coding –Shannon Fano coding – Discrete Memory less channels – channel capacity – channel coding Theorem – Channel capacity Theorem.								
UNIT II DATA AND VOICE CODING							9	
Differential Pulse code Modulation – Adaptive Differential Pulse Code Modulation – Adaptive subband coding – Delta Modulation – Adaptive Delta Modulation – Coding of speech signal at low bit rates –Vocoders and LPC.								
UNIT III ERROR CONTROL CODING							9	
Linear Block codes – Syndrome Decoding – Minimum distance consideration – cyclic codes – Generator Polynomial – Parity check polynomial – Encoder for cyclic codes – calculation of syndrome – Convolutional codes.								
UNIT IV COMPRESSION TECHNIQUES							9	
Principles – Text compression – Static Huffman Coding – Dynamic Huffman coding – Arithmetic coding – Image Compression – Graphics Interchange format – Tagged Image File Format – Digitized documents – Introduction to JPEG standards.								
UNIT V AUDIO AND VIDEO CODING							9	
Linear Predictive coding – code excited LPC – Perceptual coding, MPEG audio coders – Dolby audio coders – Video compression – Principles – Introduction to H.261 & MPEG Video standards.								
					LECTURE	TUTORIAL	TOTAL	
					45	0	45	
TEXT								
1.R Bose, “Information Theory, Coding and Crptography”, TMH 2007								
2. Simon Haykin, Communication Systems, John Wiley & sons, 4th Edition, 2001.								
3. Fred Halsall, “Multimedia Communications, Applications Networks Protocols and Standards”, Pearson Education, Asia 2002; Chapters: 3,4,5.								
REFERENCES								
1. Mark Nelson, “Data Compression Book”, BPB Publication 1992.								

2. Watkinson J, "Compression in Video and Audio", Focal Press, London 2002.

E REFERENCE

1. NPTEL , Communication Engineering, Prof. Surendra Prasad, Department of Electrical Engineering Indian Institute of Technology, Delhi HauzKhas New Delhi -110 016

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	2	1	0	0	1	0	1	0	0	0	1	2
CO 2	3	2	1	1	0	0	0	0	1	0	0	0	2	2
CO 3	3	2	1	1	0	0	1	0	1	0	0	0	2	2
CO 4	3	2	2	0	0	0	1	0	1	0	0	0	2	2
CO 5	3	2	2	1	0	0	1	0	1	0	0	0	2	3
	15	10	8	4	0	0	4	0	5	0	0	0	9	11

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
Original value	15	10	8	4	0	0	4	0	5	0	0	0	9	11
Scaled to 0,1,2,3 scale	3	2	2	1	2	0	1	0	1	0	0	0	2	3

SUBCODE			XCSE61					L	T	P	C
SUB NAME			WEB AND INTERNET TECHNOLOGY					3	0	0	3
PREREQUISITES								L	T	P	H
C	P	A						3	0	0	3

3.0	0.0	0.0						
COURSE OUTCOMES						Domain	Level	
CO1:	Understand the technological foundations of the Internet and core Internet protocols					Cognitive	Knowledge	
CO2:	Understand the fundamental tools and technologies for web design.					Cognitive	Knowledge	
CO3:	Develop code to demonstrate, understanding of knowledge related to XML					Cognitive	Knowledge, Understand	
CO4:	Identify and outline the threats, firewalls and authentication mechanism.					Cognitive	Knowledge, Understand	
CO5:	Use fundamental skills to host a website.					Cognitive	Knowledge, Understand	
UNIT I INTRODUCTION TO INTERNET							9	
Introduction, Evolution of Internet, Internet Applications, Internet Protocol -TCP/IP, UDP, HTTP, Secure HTTP(SHTTP) Internet Addressing – Addressing Scheme – Ipv4 & IPv6, Network Byte Order, Domain Name Server and IP Addresses, Mapping, Internet Service Providers, Types Of Connectivity Such As Dial-Up Leaded Vsat Etc. Web Technologies: Three Tier Web Based Architecture; JSP, ASP, J2EE .Net Systems.								
UNIT II HTML CSS AND SCRIPTING							9	
HTML - Introduction, SGML, DTD(Document Type Definition, Basic Html Elements, Tags and usages, HTML Standards , Issues in HTML DHTML: Introduction Cascading Style Sheets: Syntax ,Class Selector, Id Selector DOM (Document Object Model) & DSO (Data Source Object) Approaches To Dynamic Pages: CGI, Java Applets, Plug Ins, Active X, Java Script – Java Script Object Model, Variables-Constant – Expressions, Conditions- Relational Operators- Data Types – Flow Control – Functions & Objects-events and event handlers – Data type Conversion & Equality – Accessing HTML form elements.								
UNIT III XML							9	
What is XML – Basic Standards, Schema Standards, Linking & Presentation Standards, Standards that build on XML, Generating XML data, Writing a simple XML File, Creating a Document type definition, Documents & Data ,Defining Attributes & Entities in the DTD ,Defining Parameter Entities & conditional Sections, Resolving a naming conflict, Using Namespaces, Designing an XML data structure, Normalizing Data, Normalizing DTDS.								
UNIT IV INTERNET SECURITY & FIREWALLS							9	
Security Threats From Mobile Codes, Types Of Viruses, Client Server Security Threats, Data & Message Security, Various electronic payment systems, Introduction to EDI, Challenges– Response System, Encrypted Documents And Emails , Firewalls: Hardened Firewall Hosts, IP- Packet Screening, Proxy Application Gateways, AAA (Authentication ,Authorization And Accounting)								
UNIT V WEBSITE PLANNING & HOSTING							9	
Introduction, Web Page Lay-Outing, Where To Host Site, Maintenance Of Site, Registration Of Site On Search Engines And Indexes, Introduction To File Transfer Protocol, Public Domain Software, Types Of FTP Servers (Including Anonymous),FTP Clients Common Command. Telnet Protocol, Server Domain, Telnet Client, Terminal Emulation. Usenet And Internet Relay Chat.								

	LECTURE	TUTORIAL	TOTAL
	45	0	45
TEXT			
1.Internet & Intranet Engineering- Daniel Minoli, TMH. 2. Alexis Leon and Mathews Leon – Internet for Every One, Tech World.3. Fred Halsall, “Multimedia Communications, Applications Networks Protocols andStandards”, Pearson Education, Asia 2002; Chapters: 3,4,5.			
REFERENCES			
1. Eric Ladd, Jim O’Donnel –“Using HTML 4, XML and JAVA”-Prentice Hall of India 1999. 2. “Beginning Java Script “– Paul Wilton – SPD Publications –2001. 3. Frontiers of Electronics of Commerce, Ravi kalakota & Andrew B. Whinston 4. Addison WesleyAdvance Java– Gajendra Gupta , firewall Media			
E REFERENCE			
1. NPTEL , Communication Engineering, Prof. Surendra Prasad, Department of Electrical Engineering Indian Institute of Technology, Delhi HauzKhas New Delhi -110 016			

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	3	3	1	0	0	0	0	0	0	0	3	2
CO 2	3	2	3	3	1	0	0	0	0	0	0	0	3	2
CO 3	1	1	2	2	0	0	0	0	0	0	0	0	0	0
CO 4	3	3	2	3	1	0	0	0	0	0	0	0	3	2
	10	8	10	11	3	0	0	0	0	0	0	0	9	6

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
Original	10	8	10	11	3	0	0	0	0	0	0	0	9	6
Scaled to 0,1,2,3 scale	2	2	2	3	1	0	0	0	0	0	0	0	2	2

COURSE CODE			XCSE62	L	T	P	C
COURSE NAME			Queuing Theory and Modelling	3	0	0	3
C	P	A		L	T	P	H
3.0	0.0	0.0		3	0	0	3
COURSE OUTCOMES				DOMAIN	LEVEL		
C01	<i>Define</i> discrete and continuous random variables and to <i>Find</i> the expected values and moment generating functions of discrete and continuous distributions.			Cognitive	Remembering		
C02	<i>Explain</i> the standard distribution and Identify the different distribution			Cognitive	Remembering Understanding		

C03	Explain the joint and Marginal distribution and to Find the Correlation and regression.	Cognitive	Remembering Understanding
C04	Explain the Markovian models and to Find the characteristics of the models	Cognitive	Remembering Understanding
C05	Explain the basic concepts of queuing theory	Cognitive	Remembering
UNIT I PROBABILITY AND RANDOM VARIABLE			9
Axioms of probability – Conditional probability – Total probability – Baye"s theorem – Random variable- Probability mass function – probability density function – properties – Moments – Moment generating function and their properties.			
UNIT II STANDARD DISTRIBUTIONS			9
Binomial, poisson, Geometric, Negative Binomial, Uniform, Exponential, Gamma, Weibull and Normal distributions and their properties- Function of a random variable. Probability density function and its properties			
UNIT III TWO DIMENSIONAL RANDOM VARIABLES			9
Joint distributions – Marginal and conditional distribution – Covariance – Correlation and regression – Transformation of random variables- Central limit theorem.			
UNIT IV RANDOM PROCESSES AND MARKOV CHAINS			9
Classification – Stationary process – Markov process –Poisson process- Birth and death process – Markov chains- transition probabilities – Limiting distributions.			
UNIT V QUEUEING THEORY			9
Markovian models – M /M/1, M/M/C, finite and infinite capacity- M/M/8 queues – Finite source model – M/G/1 queue (steady state solution only) – Pollaczek – Khintchine formula- Special cases.			
LECTURE			45 Hrs

TEXT BOOKS

1. Ross, S., "A first course in probability " , Sixth Edition , Pearson Education , Delhi , 2002.
2. Medhi j., "Stochastic Processes " , New Age Publishers, New Delhi, 1994. (Chapters 2,3 &
3. Taha, H.A., "Operations Research – An introduction", Seventh Edition, Pearson Education Edition Asia, Delhi, 2002.
4. Gupta .S.C and Kapoor .V.K, "Fundamentals of Mathematical Statistics", 11th
5. extensively revised edition, Sultan Chand & Sons, 2007.
6. Veerarajan .T, Probability, "Statistics and Random Processes", Tata McGraw
7. Hill,3rd edition, 2008.

REFERENCES

- 1.Veerarajan. T., "Probability, Statistics and Random. Processes", Tata McGraw – Hill, Second Edition, New Delhi, 2003.
2. Allen., A.O., " Probability , Statistics and Queuing Theory " , Academic press , New Delhi, 1981.
3. Gross, D. and Harris, C.M., "Fundamentals of Queuing theory " , John Wiley and Sons, Second Edition, New York, 1985.

E REFERENCES

- 1.Advanced Engineering Mathematics Prof. Somesh Kumar.Department of Mathematics, Indian Institute of Technology, Kharagpur.

Mapping of COs with POs:

	GA											
	1	2	3	4	5	6	7	8	9	10	11	12
CO 1	3	0	0	0	0	0	0	0	1	1	0	1
CO 2	3	0	0	0	0	0	0	0	1	1	0	1
CO 3	3	2	0	0	0	0	0	0	0	1	1	2
CO 4	3	2	0	0	1	0	0	0	1	1	1	2
CO 5	3	2	0	0	1	0	0	0	1	1	1	2
Total	15	6	0	0	2	0	0	0	4	5	3	8

SUBCODE			XCSE63	L	T	P	C
SUB NAME			DISTRIBUTED SYSTEMS	3	0	0	3
PREREQUISITES							
C	P	A		L	T	P	H
3.0	0.0	0.0		3	0	0	4
Course outcomes				Domain		Level	
CO1	Describe basics of Distributed Systems, Trends in Distributed Systems and Challenges.			Cognitive	Knowledge		
CO2	Define inter process communication and Explain internet protocols for external data representation and multi cast communication.			Cognitive	Knowledge, Understand		
CO3	Explain peer to peer services and illustrate different file system and naming.			Cognitive	Knowledge, Understand		
CO4	Describe Synchronization and replication in distributed system.			Cognitive	Knowledge		
CO5	Explain Process management and Resource management in distributed system.			Cognitive	Knowledge		
UNIT I INTRODUCTION						9	
Introduction - Examples of Distributed Systems-Trends in Distributed Systems - Focus on resource sharing - Challenges. Case study: World Wide Web.							
UNIT II COMMUNICATION IN DISTRIBUTED SYSTEM						9	
System Model - Inter process Communication - the API for internet protocols - External data representation and Multicast communication. Network virtualization: Overlay networks. Case study: MPI Remote Method Invocation And Objects: Remote Invocation - Introduction - Request-reply protocols - Remote procedure call - Remote method invocation. Case study: Java RMI – Group communication - Publish-subscribe systems - Message queues - Shared memory approaches - Distributed objects - Case study: Enterprise Java Beans -from objects to components							
UNIT III PEER TO PEER SERVICES AND FILE SYSTEM						9	
Peer-to-peer Systems - Introduction - Napster and its legacy - Peer-to-peer - Middleware - Routing overlays. Overlay case studies: Pastry, Tapestry- Distributed File Systems - Introduction - File service architecture - Andrew File system. File System: Features-File model -File accessing models - File sharing semantics Naming: Identifiers, Addresses, Name Resolution - Name Space Implementation - Name Caches - LDAP.							

UNIT IV SYNCHRONIZATION AND REPLICATION			9
Introduction - Clocks, events and process states - Synchronizing physical clocks- Logical time and logical clocks - Global states - Coordination and Agreement - Introduction - Distributed mutual exclusion - Elections - Transactions and Concurrency Control- Transactions -Nested transactions - Locks - Optimistic concurrency control - Timestamp ordering - Atomic Commit protocols -Distributed deadlocks - Replication - Case study - Coda.			
UNIT V PROCESS & RESOURCE MANAGEMENT			9
Process Management: Process Migration: Features, Mechanism - Threads: Models, Issues, Implementation. Resource Management: Introduction- Features of Scheduling Algorithms - Task Assignment Approach - Load Balancing Approach - Load Sharing Approach.			
	LECTURE	TUTORIAL	TOTAL
	45	0	45
TEXT			
1. George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and Design", Fifth Edition, Pearson Education, 2012.			
REFERENCES			
1. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.			
2. Tanenbaum A.S., Van Steen M., "Distributed Systems: Principles and Paradigms", Pearson Education, 2007.			
3. Liu M.L., "Distributed Computing, Principles and Applications", Pearson Education, 2004.			
4. Nancy A Lynch, "Distributed Algorithms", Morgan Kaufman Publishers, USA, 2003			
E REFERENCES			
1. http://nptel.ac.in/courses/106106107/			
2. https://www.cs.york.ac.uk/rts/books/.../distributedSystems.pdf			

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	3	2	0	0	0	0	0	0	0	0	2	2
CO 2	3	2	3	2	0	0	0	0	0	0	0	0	2	2
CO 3	3	3	2	2	0	0	0	0	0	0	0	0	2	2
CO 4	3	3	2	2	0	0	0	0	0	0	0	0	2	2
CO 5	3	3	2	2	0	0	0	0	0	0	0	0	2	2
	15	13	12	10	0	0	0	0	0	0	0	0	10	10

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
Original value	15	13	12	10	0	0	0	0	0	0	0	0	10	10
Scaled to 0,1,2,3 scale	3	3	3	2	0	0	0	0	0	0	0	0	2	2

COURSE CODE	XCSE64	L	T	P	C
COURSE NAME	CRYPTOGRAPHY AND NETWORK SECURITY	3	0	0	3
PREREQUISITES		L	T	P	H
C:P:A	3:0:0	3	0	0	3
COURSE OUTCOMES		Domain	Level		
CO1:	<i>Explain</i> the common network vulnerabilities and attacks	Cognitive	Understand		
CO2:	<i>Describe</i> and <i>compare</i> the security of different cryptographic algorithm	Cognitive	Knowledge, Understand		
CO3:	<i>Identify</i> the possible threats to each mechanism and ways to protect against these threats	Cognitive	Analyzing		
CO4:	<i>Outline</i> the requirements and mechanisms for identification and authentication.	Cognitive	Understand		
CO5:	<i>Explain</i> the requirements of real-time communication security and issues related to the security of web services.	Cognitive	Understand		
UNIT I INTRODUCTION					9
Basic concepts: confidentiality, integrity, availability, security policies, security mechanisms, assurance, Malicious Software ,Denial-of-Service Attacks, Intrusion Detection, Intrusion Prevention					
UNIT II CRYPTOGRAPHY					9
Simple DES – Differential cryptanalysis – DES – Modes of operation – Triple DES – AES – RC4 – RSA – Attacks – Primality test – factoring.					
UNIT III SECURITY MECHANISM					9
Discrete Logarithms – Computing discrete logs – Diffie-Hellman key exchange – ElGamal Public key cryptosystems – Hash functions – Secure Hash – Birthday attacks - MD5 – Digital signatures – RSA – ElGamal – DSA.					
UNIT IV NETWORK SECURITY					9
Authentication applications – Kerberos, X.509, PKI – Electronic Mail security – PGP, S/MIME – IP security – Web Security – SSL, TLS, SET.					
UNIT V SYSTEM SECURITY					9
System security – Intruders – Malicious software – viruses – Firewalls – Security Standards.					
		LECTURE	TUTORIAL	TOTAL	
		45	0	45	

TEXT														
<ol style="list-style-type: none"> 1. Network Security (2nd edition) by Kaufman, Perlman, and Speciner. ISBN 0130460192. 2. Wade Trappe, Lawrence C Washington, "Introduction to Cryptography with coding theory", 2nd ed, Pearson, 2007. 3. William Stallings, "Cryptography and Network security Principles and Practices", Pearson/PHI, 4th ed, 2006. 4. Computer Security: Principles and Practice (2nd Edition), Pearson Press 														
REFERENCES														
<ol style="list-style-type: none"> 1. W. Mao, "Modern Cryptography – Theory and Practice", Pearson Education, Second Edition, 2007. 2. Charles P. Pfleeger, Shari Lawrence Pfleeger – Security in computing Third Edition – Prentice Hall of India, 2006 														
E REFERENCE														
<ol style="list-style-type: none"> 1. NPTEL, Cryptography and Network Security, Dr.Debdeep Mukhopadhyay, IIT Kharagpur 														

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	2	3	0	1	2	0	1	0	1	1	1	2
CO 2	3	2	1	3	0	1	2	0	1	0	1	1	2	2
CO 3	3	2	1	3	0	1	2	1	1	0	1	1	2	2
CO 4	3	2	1	2	0	1	2	1	1	0	1	1	2	2
CO 5	3	2	1	2	0	1	2	0	1	0	1	1	2	1
	15	10	6	13	0	5	10	2	5	0	5	5	9	9

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
Original value	15	10	6	13	0	5	10	2	5	0	5	5	9	9
Scaled to 0,1,2,3 scale	3	2	2	3	0	1	2	1	1	0	1	1	2	2

COURSE CODE			XCSE65	L	T	P	C
COURSE NAME			DATA MINING	3	0	0	3
C	P	A		L	T	P	H
3.0	0.0	0.0		3	0	0	3
PREREQUISITES			DATABASE MANAGEMENT SYSTEM				
COURSE OUTCOMES				DOMAIN		LEVEL	
C01	Describe the different data mining techniques and compare data mining systems with database systems			Cognitive		Understand	
C02	Apply the concepts of pre-processing and characterization			Cognitive		Apply	
C03	Construct a classifier from the given dataset by using classification algorithms			Cognitive		Apply	
C04	Discover clusters for a given database by applying clustering algorithms			Cognitive		Apply	
C05	Describe the concepts of Knowledge Mining - Web Mining – Text Mining- Spatial Mining - Temporal Mining.			Cognitive		Understand	
UNIT – I INTRODUCTION						9 Hours	
Concepts of Data Mining- Issues and Challenges –Data Mining Functionalities- Migration of Data Mining to DataWarehouse- Machine Learning –Taxonomy of Data Mining Tasks – Steps in Data Mining Process – Overview of Data Mining techniques.							
UNIT – II DATA PRE-PROCESSING AND CHARACTERIZATION						9 Hours	
Data Cleaning – Data Integration and Transformation – Data Reduction –Discretization and Concept Hierarchy Generation – Primitives – Data Mining, Query Language –Generalization – Summarization – Analytical Characterization, and Comparison - Association Rule – Mining Multi Dimensional data from Transactional Database and Relational Database.							
UNIT – III CLASSIFICATION						9 Hours	
Classification – Decision Tree Induction – Bayesian Classification - SVM Classification – Prediction –Back Propagation.							
UNIT – IV CLUSTERING						9 Hours	
Introduction to Clustering- Cluster Analysis –K-Means Clustering– Hierarchical Method – Density Based Method – Grid Based Method – Outlier Analysis.							
UNIT – V ADVANCED TECHNIQUES AND APPLICATIONS						9 Hours	
Knowledge Mining - Web Mining –Text Mining- Spatial Mining - Temporal Mining- Tools – Applications – Case Study (at least two).							

TEXT BOOK:

1. Jiawei Han, Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufman Publishers, 2000.

REFERENCES:

1. Arun K.Pujari, "Data Mining Techniques", Second Edition, Universities Press, 2010.
2. K.P.Soman, Shyam Diwakar, V.Ajay, "Insight into Data Mining – Theory and Practice", Prentice Hall of India, 2006.
3. Usama M.Fayyad, Gregory Piatetsky Shapiro, Padhraí Smyth, Ramasamy Uthurusamy, "Advances in Knowledge Discovery and Data Mining", The M.I.T. Press, 1996.
4. D. Hand, H. Mannila and P. Smyth. Principles of Data Mining. Prentice-Hall. 2001
5. Alex Berson, Stephen Smith, Kurt Thearling, "Building Data Mining Applications for CRM", Tata McGraw Hill, 2000.
6. Margaret Dunham, "Data Mining: Introductory and Advanced Topics", Prentice Hall, 2002.
7. I.H. Witten and E. Frank. Data Mining: Practical Machine Learning Tools and Techniques. Morgan Kaufmann. 2000.
8. E-books - <http://www.kdnuggets.com/publications/books.html>

CO Vs PO Mapping

	PO										PSO	
	1	2	3	4	5	6	7	8	9	10	11	12
C01	3	2	1									
C02	3	2	1									
C03	2	1	1									
C04	3	2	3									
C05	3	2	3					1	1	1		1

Scale : 3-Strong 2- Medium 1 – Low

COURSE CODE			XCSE66	L	T	P	C
COURSE NAME			OPTIMIZATION TECHNIQUES	3	0	0	3
PREREQUISITES							
C	P	A		L	T	P	H
3.0	0.0	0.0		3	0	0	4
Course outcomes				Domain	Level		
CO1	Understandthe basic concepts of linear programming			Cognitive	Knowledge		
CO2	Define and Explainthe advancements in Linear programming techniques			Cognitive	Knowledge, Understand		
CO3	Explain the non-linear programming techniques			Cognitive	Knowledge, Understand		
CO4	Discuss the interior point methods of solving problems			Cognitive	Knowledge		
CO5	Describethethe dynamic programming method			Cognitive	Knowledge		
UNIT I LINEAR PROGRAMMING						9	
Introduction – formulation of linear programming model-Graphical solution–solving LPP using simplex algorithm – Revised Simplex Method.							
UNIT II ADVANCES IN LPP						9	
Duality theory- Dual simplex method – Sensitivity analysis--Transportation problems- Assignment problems-Traveling sales man problem -Data Envelopment Analysis.							
UNIT III NON LINEAR PROGRAMMING						9	
Classification of Non Linear programming – Lagrange multiplier method – Karush – Kuhn Tucker conditions–Reduced gradient algorithms–Quadratic programming method – Penalty and Barrier method.							
UNIT IV INTERIOR POINT METHODS						9	
Karmarkar’s algorithm–Projection Scaling method–Dual affine algorithm–Primal affine algorithm Barrier algorithm.							
UNIT V DYNAMIC PROGRAMMING						9	
Formulation of Multi stage decision problem–Characteristics–Concept of sub-optimization and the principle of optimality–Formulation of Dynamic programming–Backward and Forward recursion– Computational procedure–Conversion of final value problem into Initial value problem.							
				LECTURE	TUTORIAL	TOTAL	
				45	0	45	

TEXT
1. Hillier and Lieberman “Introduction to Operations Research”, TMH, 2000. 2. R.Panneerselvam, “Operations Research”, PHI, 2006 3. Hamdy ATaha, “Operations Research –An Introduction”, Prentice Hall India, 2003.
REFERENCES
1. Philips, Ravindran and Solberg, “Operations Research”, John Wiley, 2002. 2. Ronald L.Rardin, “Optimization in Operation Research” Pearson Education Pvt. Ltd. New Delhi, 2005.

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	3	3	1	0	0	0	0	0	0	0	0	2	0
CO 2	3	3	3	2	1	0	0	0	0	0	0	0	1	0
CO 3	3	3	3	0	1	0	0	0	0	0	0	0	3	3
CO 4	3	3	3	2	0	0	0	0	1	0	0	0	3	3
CO 5	3	3	3	2	0	0	0	0	1	0	0	0	3	2
	15	15	15	7	2	0	0	0	2	0	0	0	12	8

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
Original value	15	15	15	7	2	0	0	0	2	0	0	0	12	8
Scaled to 0,1,2,3 scale	3	3	3	2	1	0	0	0	1	0	0	0	3	2

COURSE CODE			XCSE67	L	T	P	C
COURSE NAME			Multi Agent Intelligent Systems	3	0	0	3
C	P	A					
3.0	0.0	0.0		L	T	P	H
				3	0	0	3
COURSE OUTCOMES				DOMAIN	LEVEL		
CO1	Describe the basic concepts of Context Awareness.			Cognitive	Remembering, Understanding		
CO2	Describe the concepts in Distributed and Heterogeneous context.			Cognitive	Remembering		
CO3	Describe the principles of Dynamic current negotiation			Cognitive	Remembering, Understanding		
CO4	Explain the concepts of Context aware mobile and pervasive systems			Cognitive	Understanding		
CO5	Describe the security issues in Context aware computing			Cognitive	Remembering		
UNIT I INTRODUCTION						9	
Definitions - Foundations - History - Intelligent Agents-Problem Solving-Searching - Heuristics -Constraint Satisfaction Problems - Game playing.							
UNIT II KNOWLEDGE REPRESENTATION AND REASONING						9	
Logical Agents-First order logic-First Order Inference-Unification-Chaining- Resolution Strategies-Knowledge Representation-Objects-Actions-Events.							
UNIT III PLANNING AGENTS						9	
Planning Problem-State Space Search-Partial Order Planning-Graphs-Nondeterministic Domains-Conditional Planning-Continuous Planning-MultiAgent Planning.							
UNIT IV AGENTS AND UNCERTAINTY						9	
Acting under uncertainty – Probability Notation-Bayes Rule and use - Bayesian Networks-Other Approaches-Time and Uncertainty-Temporal Models- Utility Theory - Decision Network – Complex Decisions.							
UNIT V HIGHER LEVEL AGENTS						9	
Knowledge in Learning-Relevance Information-Statistical Learning Methods-Reinforcement Learning-Communication-Formal Grammar-Augmented Grammars-Future of AI.							
				LECTURE		45 Hrs	
TEXT BOOKS							
1. Stuart Russell and Peter Norvig, “Artificial Intelligence - A Modern Approach”,2nd Edition, Prentice Hall, 2002							

REFERENCES:

1. Michael Wooldridge, "An Introduction to Multi Agent System", John Wiley, 2002.
2. Patrick Henry Winston, Artificial Intelligence, 3rd Edition, AW, 1999.
3. Nils.J.Nilsson, Principles of Artificial Intelligence, Narosa Publishing House, 1992

E REFERENCES

1. <http://cgi.csc.liv.ac.uk/~trp/COMP310.html>
2. <http://www.cs.utexas.edu/~patmac/cs344m/resources/index.html#week14>

Mapping of COs with POs:

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	2	3	2	3	2	1	0	0	2	1	0	2	3	2
CO 2	2	3	2	3	2	1	0	0	2	1	0	1	3	2
CO 3	1	3	3	2	1	1	0	0	1	1	0	2	3	2
CO 4	2	2	2	2	2	1	0	0	1	1	0	1	3	2
CO 5	2	3	3	1	1	1	0	0	1	1	0	1	3	2
Total	9	14	12	11	8	5	0	0	7	5	0	7	15	10

COURSE CODE			XCSE68			L	T	P	C
COURSE NAME			IMAGE PROCESSING			3	0	0	3
C	P	A							
3.0	0.0	0.0				L	T	P	H
PREREQUISITES			SIGNALS AND SYSTEMS			3	0	0	3
COURSE OUTCOMES					DOMAIN		LEVEL		
C01	Describe how digital images are represented and manipulated in a computer				Cognitive		Understand		
C02	Explain about various image transforms techniques.				Cognitive		Understand		
C03	Apply the knowledge of image enhancement and restoration techniques in different applications.				Cognitive		Apply		
C04	Apply the age segmentation methods for a particular application.				Cognitive		Apply		
C05	Compare various image compression techniques.				Cognitive		Apply		
UNIT – I DIGITAL IMAGE FUNDAMENTALS							8		
Introduction -- applications of digital image processing- Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – color models.									
UNIT – II IMAGE TRANSFORM							9		
1D and 2D DFT- DCT- Discrete Wavelet Transform – Discrete Hadamard transform– Walsh transform – SVD transform – Slant transform- Haar transform.									
UNIT – III IMAGE ENHANCEMENT AND RESTORATION							10		
Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering – Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.									
Image Restoration - Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering- Geometric transformations-spatial transformations.									
UNIT – IV IMAGE SEGMENTATION							9		
Pixel based approach – feature threshold – choice of feature - optimum threshold - threshold selection methods – Edge detection, Edge linking via Hough transform -region based									

approach – region growing – region splitting – region merging, split and merge.			
UNIT – V IMAGE COMPRESSION			9
Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG.			
	LECTURE	TUTORIAL	TOTAL
	45	0	45

TEXT BOOK:	9
1. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Pearson Education, Third Edition, 2010.	
REFERENCES:	
1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing Using MATLAB”, Tata McGraw Hill Pvt. Ltd., Third Edition, 2011.	
2. Anil Jain K. “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011.	
3. William K Pratt, “Digital Image Processing”, John Willey, 2002.	
4. Jayaraman S., Esaki Rajan S., T.Veera Kumar, “Digital Image Processing”, Tata McGraw Hill Pvt. Ltd., Second Reprint, 2010.	
5. Bhabatosh Chanda, Dwejesh Dutta Majumder, “Digital Image Processing and analysis”, PHI Learning Pvt. Ltd., Second Edition, 2011.	
6. Malay K. Pakhira, “Digital Image Processing and Pattern Recognition”, PHI Learning Pvt. Ltd., First Edition, 2011.	
7. http://eeweb.poly.edu/~onur/lectures/lectures.html	
8. http://www.caen.uiowa.edu/~dip/LECTURE/lecture.html	

CO Vs PO Mapping

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

Scale : 3-Strong 2- Medium 1 – Low

COURSE CODE			XCSE69		L	T	P	C
COURSE NAME			CONTEXT AWARE COMPUTING		3	0	0	3
C	P	A			L	T	P	H
3.0.	0.0	0.0			3	0	0	3
COURSE OUTCOMES					DOMAIN	LEVEL		
C01	Describe the basic concepts of Context Awareness.				Cognitive	Remembering, Understanding		
C02	Describe the concepts in Distributed and Heterogeneous context.				Cognitive	Remembering		
C03	Describe the principles of Dynamic current negotiation				Cognitive	Remembering, Understanding		
C04	Explain the concepts of Context aware mobile and pervasive systems				Cognitive	Understanding		
C05	Describe the security issues in Context aware computing				Cognitive	Remembering		
UNIT I INTRODUCTION							9	
Context Awareness – Surrounding Context – Activity on a Street – User Attention in a Meeting- Activity context from multiple sensors – I Badge- Media cup								
UNIT II DISTRIBUTED AND HETEROGENEOUS CONTEXT FOR AMBIENT INTELLIGENCE							9	
Fundamental Concepts – Ontology Representation and Reasoning about Context – Ontology Alignment Approaches – Campus Approach								
UNIT III DYNAMIC CURRENT NEGOTIATION IN WEB ENVIRONMENTS							9	
Ubiquitous web – System Description – System Deployment – Collaborative Optimizations- Context Acquisition – Provisioning.								
UNIT IV CONTEXT AWARE MOBILE AND PERVASIVE SYSTEMS							9	
Elements of a context aware pervasive system- Architecture- Infrastructure, Middleware, Tool Kits – context for mobile device users – Location based Services – Ambient services – context aware mobile services – Mobile code and policy – Multi agent technology.								
UNIT V CONTEXT AWARE SECURITY							9	
Traditional Security issues – models – context aware security systems – context aware safety.								
					LECTURE		45 Hrs	

REFERENCES

Context aware pervasive systems-Architecture for a new breed of applications

Sengloke, Auerbach publications, 2006.

2. Context Aware Computing and Self Managing systems ,Waltenegus Dargie,A chapman & Hall

Book/CRC press, 2010

3. Context-Aware Mobile and Ubiquitous Computing for Enhanced Usability: Adaptive Technologies

and Applications: Dragan Stojanović, IGI Global Snippet, 2009

4. Context Management for Distributed and Dynamic Context-Aware Computing, **Rocha,** Ricardo

Couto Antunes da, **Endler,** Markus, Springer, 2012.

5. Context-Aware Computing: A Special Triple Issue of Human-Computer Interaction, Thomas P. Moran Paul Dourish, www.Amazon.com, 2002.

6. Seeking a Foundation for Context-Aware Computing, Paul Dourish , University of California, Irvine

E REFERENCES

1. <https://sites.google.com/site/hprabhatgupta/teaching/cso303>

2. <https://www.cs.helsinki.fi/group/cbu-ict/SummerSchool09/context-and-location-awareness.pdf>

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	2	3	2	1	0	0	2	1	0	2	3	2
CO 2	2	3	2	3	2	1	0	0	2	1	0	1	3	2
CO 3	1	3	3	2	1	1	0	0	1	1	0	2	3	2
CO 4	2	2	2	2	2	1	0	0	1	1	0	1	3	2
CO 5	2	3	3	1	1	1	0	0	1	1	0	1	3	2
Total	9	14	12	11	8	5	0	0	7	5	0	7	15	10

COURSE CODE			XCSE71	L	T	P	C
COURSE NAME			INFORMATION RETRIEVAL	3	0	0	3
C	P	A		L	T	P	H
3.0.	0.0	0.0		3	0	0	3
COURSE OUTCOMES				DOMAIN		LEVEL	
C01	Define and Explain document and query structure.			Cognitive		Remember	
C02	Explain, Develop and Estimate query matching and text analysis.			Cognitive		Understand, Application	
C03	Explain and Measure information retrieval performances.			Cognitive		Understand, Evaluation	
C04	Explain and Estimate performance improvement measures.			Cognitive		Understand, Application	
C05	Explain web search, crawling and link analysis.			Cognitive		Understand.	
UNIT I		DOCUMENT AND QUERY STRUCTURE					9
Overview: Abstraction – Information System – Measures. Documents and Query Forms: document – data structures – document Surrogates – vocabulary control – structure of data – data compression – text documents – images and sounds. Query Structures: Matching criteria – Boolean queries – vector queries – extended boolean queries – fuzzy queries – probabilistic queries – natural language queries – information retrieval and database systems.							
UNIT II		QUERY MATCHING AND TEXT ANALYSIS					9
Matching Process: Relevance and similarity measures – Boolean based matching – vector based matching – missing terms and term relationship – probabilistic matching – fuzzy matching – proximity matching – effects of weighting – effects of scaling – data fusion. Text Analysis: Indexing – Matrix representation – term extraction and analysis – term association – lexical measures of term significance – document analysis – document similarity – stop lists – stemming.							
UNIT III		PERFORMANCE MEASURES					6
Binary versus N-ary measures – precision and recall – user oriented measures – average precision and recall – operating curves and single measures – expected search length.							
UNIT IV		PERFORMANCE IMPROVEMENT TECHNIQUES					12
Relevance feedback and query expansion - Text classification and Naive Bayes: Text classification problem - Naive Bayes text classification - The Bernoulli model - Properties of Naive Bayes - Feature selection - Vector space classification: Document representations and measures of relatedness in vector spaces - Rocchio classification - k nearest neighbor - Linear versus nonlinear classifiers - Classification with more than two classes - The bias-variance tradeoff - Flat clustering: Clustering in information retrieval - Problem statement - Evaluation of clustering - K-means - Model-based clustering - Hierarchical clustering: Hierarchical agglomerative clustering - Single-link and complete-link clustering - Group-average agglomerative clustering - Centroid clustering - Optimality of HAC - Divisive clustering - Cluster labeling - Implementation notes.							

UNIT V	WEB SEARCH AND LINK ANALYSIS	9
Web search basics: Background and history - Web characteristics - Advertising as the economic model - The search user experience - Index size and estimation - Near-duplicates and shingling - Web crawling and indexes: Overview - Crawling - Distributing indexes - Connectivity servers - Link analysis: The Web as a graph - PageRank - Hubs and Authorities.		
		LECTURE
		45
		TOTAL
		45
TEXT BOOKS		
<ol style="list-style-type: none"> 1. Robert R. Korfhage, <i>Information storage and retrieval</i>, John Wiley & Sons, Inc., New York, NY, 1997 2. C. Manning, P. Raghavan, and H. Schütze, <i>Introduction to Information Retrieval</i>, Cambridge University Press, 2008 		
REFERENCE BOOKS		
<ol style="list-style-type: none"> 1. Baeza-Yates and B. Ribeiro-Neto. <i>Modern Information. Retrieval. Addison Wesley</i>, 1999 2. Gerard Salton and M. J. McGill. <i>Introduction to Modern Information Retrieval. McGraw Hill Book Co.</i>, New York, 1983. 3. C. J. van RIJSBERGEN, <i>The geometry of information retrieval</i>, Cambridge University Press, 2004 		

Mapping of COs with POs:

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	2	1	1	1	1	0	0	0	1	1	2	2
CO 2	2	2	1	1	1	0	1	0	0	0	1	1	2	2
CO 3	2	2	2	1	1	1	1	0	0	0	1	1	2	2
CO 4	2	3	2	1	1	0	1	0	0	0	1	1	2	3
CO 5	2	2	2	1	1	1	1	1	0	0	1	1	3	2
	11	11	9	5	5	3	5	1	0	0	5	5	11	11

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
Original	11	11	9	5	5	3	5	1	0	0	5	5	11	11
Scaled to 0,1,2,3 scale	3	3	2	1	1	1	1	0	0	0	1	1	3	3

COURSE CODE			XCSE72			L	T	P	C	
COURSE NAME			CLOUD COMPUTING			3	0	0	3	
C	P	A				L	T	P	H	
3.0	0.0	0.0				3	0	0	3	
Objectives: The Cloud computing course objectives are to understand the current trend and basics of cloud computing, cloud enabling technologies and cloud security.										
COURSE OUTCOMES						DOMAIN		LEVEL		
CO1	Describe and understand the idea of evolution of cloud computing and its services available today.					Cognitive		Remember Understand		
CO2	Describe, Ability to develop, classify and analyze components of cloud computing and its business perspective					Cognitive		Understand Analyze		
CO3	Describe, apply, analyze and evaluate the various cloud development tools.					Cognitive		Understand Apply		
CO4	Explain, Analyze, Demonstrate knowledge on services, architecture, types of infrastructural models, disaster recovery and Virtualization					Cognitive		Understand Analyze		
CO5	Understand, Explain, develop and analyze the case studies to derive the best practice model to apply when developing and deploying cloud based applications.					Cognitive		Understand		
UNIT-I			CLOUD COMPUTING FUNDAMENTALS						9	
Understanding Cloud Computing: Origins and Influences, Basic Concepts and Terminology, Goals and Benefits, Risks and Challenges. Types of cloud, Cloud services: Benefits, challenges and issues of cloud computing, Evolution of Cloud Computing, usage scenarios and Applications - Fundamental Concepts and Models: Roles and Boundaries, Cloud Characteristics, Cloud Delivery Models, Cloud Deployment Models.										
UNIT -II			CLOUD COMPUTING MECHANISMS AND ARCHITECTURE						9	
Cloud-Enabling Technology: Broadband Networks and Internet Architecture, Data Center Technology, Virtualization Technology, Web Technology, Multitenant Technology, Service Technology. Fundamental Cloud Architectures: Architecture - Workload Distribution, Resource Pooling, Dynamic Scalability, Elastic Resource Capacity, Service Load Balancing, Cloud Bursting, Elastic Disk Provisioning, Redundant Storage.										
UNIT-III			CLOUD SERVICES AND FILE SYSTEM						9	
Software as a Service - Platform as a Service – Infrastructure as a Service - Database as a Service - Monitoring as a Service – Communication as services. Service providers- Google App Engine, Amazon EC2, Microsoft Azure, Sales force. Introduction to Map Reduce, GFS, HDFS, Hadoop Framework.										

UNIT -IV	WORKING WITH CLOUDS	9		
Cloud Delivery Model Considerations: Cloud Delivery Models: The Cloud Provider, Cloud Delivery Models: The Cloud Consumer, Case Study Example. Cost Metrics and Pricing Models: Business Cost Metrics, Cloud Usage Cost Metrics, Cost Management - Considerations Email Communication over the Cloud - CRM Management				
UNIT - V	VIRTUALIZATION FOR CLOUD AND SECURITY IN THE CLOUD	9		
Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization –System Vm, Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation and binary translation, HLL VM - Hypervisors – Xen, KVM , VMWare, Virtual Box, Hyper-V - Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security				
		LECTURE	PRACTICAL	TOTAL
		45	-	45
TEXT BOOKS				
2. Thomas Erl and RicardoPuttini "Cloud Computing- Concepts, Technology & Architecture," Pearson, 1st edition 2013.				
3. Cloud Computing "A Practical Approach" Anthony T. Velte, Toby J. Velte, Robert Elsenpeter. McGraw-Hill.				
4. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.				
5. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.				
6. James E Smith, Ravi Nair, "Virtual Machines", Morgan Kaufmann Publishers, 2006.				
REFERENCES				
5. Barrie Sosinsky, "Cloud Computing Bible," Wiley India Pvt Ltd, 1st edition, 2011.				
6. Rajkumar Buyya, James Broberg and Andrzej Goscinski, "Cloud computing principles and paradigms," john Wiley and sons, 2011.				
7. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH, 2009. Kumar Saurabh, "Cloud Computing – insights into New -Era Infrastructure", Wiley India,2011				
8. Haley Beard, "Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing", Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008				
E REFERENCES				
7. http://cloud-standards.org/wiki/index.php?title=Main_Page				
8. webpages.iust.ac.ir/hsalimi/.../89.../Cloud%20Common%20standards.ppt topennebula.org ,				
9. www.cloudbus.org/cloudsim/ , http://www.eucalyptus.com/				

COURSE CODE			XCSE73	L	T	P	C
COURSE NAME			FAULT TOLERANCE COMPUTING	3	0	0	3
PREREQUISITES				L	T	P	H
C	P	A		3	0	0	3
3.0	0.0	0.0					
COURSE OUTCOMES				Domain	Level		
CO1	Explain the definition, fundamentals and application of fault tolerance.			Cognitive	Remember		
CO2	Describe the availability, safety and fault prevention against the system.			Cognitive	Understand, Analysis		
CO3	Identify the possible failure rate and the process to clear the failure by the mechanism process.			Cognitive	Remember , Apply		
CO4	Outline the schemes of redundancy, evaluation and techniques to avoid redundancy.			Cognitive	Understand , Apply		
CO5	Explain the fault tolerance techniques and programming to avoid the fault tolerance			Cognitive	Understand, Apply		
UNIT I INTRODUCTION							9
Definition of fault tolerance, Redundancy, Applications of fault-tolerance, Fundamentals of dependability.							
UNIT II ATTRIBUTES							9
Reliability, availability, safety, Impairments: faults, errors and failures, Means: fault prevention, removal and forecasting							
UNIT III DEPENDABILITY EVALUATION							9
Common measures: failures rate, mean time to failure, mean time to repair, etc. Reliability block diagrams ,Markov processes.							
UNIT IV REDUNDANCY							9
Hardware redundancy, Redundancy schemes, Evaluation and comparison, Applications , Information redundancy, Codes: linear, Hamming, cyclic, unordered, arithmetic, etc. ,Encoding and decoding techniques ,Applications , Time redundancy							
UNIT V PROGRAMMING							9
Software fault tolerance, Specific features, Software fault tolerance techniques: N-version programming, recovery blocks, self-checking software, etc.							
				LECTURE	TUTORIAL		TOTAL
				45	0		45

TEXT

1. Anderson, T., and P.A. Lee, Fault-Tolerant Principles and Practices, Prentice-Hall
2. Hwang, K., and F.A. Briggs, Computer Architecture and Parallel Processing, McGraw-Hill.
3. Jalote, P.
4. Fault-Tolerance in Distributed Systems, ISBN 0-13-301367-7, Prentice-Hall,

REFERENCES

1. Johnson, B.W., Design and Analysis of Fault-Tolerant Systems, Addison Wesley
2. Leveson, Nancy G., Safe ware, system safety and computers, Addison Wesley.
3. Pradhan, D.K., Fault-Tolerant Computing — Theory and Techniques, (2 Volumes), Prentice-Hall.
4. Pradhan, Dhiraj K., Fault-Tolerant Computer System Design, ISBN 0-13-057887-8, Prentice-Hall

E REFERENCE

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	2	3	0	1	2	0	1	0	1	1	1	2
CO 2	3	2	1	3	0	1	2	0	1	0	1	1	2	2
CO 3	3	2	1	3	0	1	2	1	1	0	1	1	2	2
CO 4	3	2	1	2	0	1	2	1	1	0	1	1	2	2
CO 5	3	2	1	2	0	1	2	0	1	0	1	1	2	1
	15	10	6	13	0	5	10	2	5	0	5	5	9	9

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
Original value	15	10	6	13	0	5	10	2	5	0	5	5	9	9
Scaled to 0,1,2,3 scale	3	2	2	3	0	1	2	1	1	0	1	1	2	2

COURSE CODE			XCSE74	L	T	P	C
COURSE NAME			COMPUTER GRAPHICS	3	0	0	3
				L	T	P	H
C	P	A		3	0	0	3
3.0	0.0	0.0					
Prerequisites			Computer Fundamentals, Principles of Computer Programming, Problem Solving Methodologies				
COURSE OUTCOMES				DOMAIN		LEVEL	
C01	Illustrate the working of appropriate drawing and clipping algorithms for 2D objects.			Cognitive		Apply	
C02	Produce an object after applying the required 2D/ 3D transformation techniques.			Cognitive		Apply	
C03	Explain different color models like RGB and CMYK.			Cognitive		Understand	
C04	Identify the visible and invisible surfaces of 3D objects by applying a suitable surface detection algorithm.			Cognitive		Apply	
C05	Develop 2D/3D animation for a given scenario by applying the principles of animation.			Cognitive		Apply	
UNIT – I INTRODUCTION TO COMPUTER GRAPHICS					9 Hours		
Graphics types and its applications, Points and Lines, Line Drawing Algorithms- DDA, Bresenham Line Algorithm, Midpoint Circle drawing Algorithm, Ellipse generating Algorithm, Scan Line Polygon, Fill Algorithm, Boundary Fill Algorithm, Flood Fill Algorithm.							
UNIT – II 2D AND 3D GEOMETRIC TRANSFORMATIONS					9 Hours		
Basic Transformations- Translation, Rotation, Scaling, Reflection, Shearing, Composite Transformations							
UNIT – III 2D VIEWING AND CLIPPING					9 Hours		
Viewing Pipeline, Window to view-port coordinate Transformation, Clipping							
Operations- Point Clipping, Cohen Sutherland Line Clipping, Liang Barsky Line Clipping, Sutherland Hodgeman Polygon Clipping, Weiler - Atherton Polygon Clipping, Curve and Text Clipping							
UNIT – IV 3D VIEWING AND OBJECT REPRESENTATION					9 Hours		
Projections – Parallel and Perspective Projection, Bezier Curves and Surfaces, B-Spline Curves and Surfaces, Visible Surface Detection Algorithms- Back-Face Detection Algorithm, Depth Buffer Method, Scan line Method							

UNIT – V COLOR MODELS AND ANIMATION	9 Hours
RGB Color Model ,YIQ Color Model ,CMY Color Model, HSI Color Model, Animation - Principles of animation, Design of Animation Sequences, Key Frame Systems - Morphing and Simulating Accelerations, Motion Specifications .	
TEXT BOOK: 1. Donald Hearn and M. Pauline Baker: Computer Graphics, PHI/Pearson Education, Second Edition, 2004.	
REFERENCES : 1. F.S. Hill, Computer Graphics using OPENGL, Second edition, Pearson Education,2003. 2. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics- Principles and practice, Second Edition in C, Pearson Education, 2007. 3. Zigang Xiang and Roy A.Plastock “Schaum"s Outline of Computer Graphics” Second Edition, McGraw -Hill 2000. 4. D. F. Rogers, J. A. Adams – “Mathematical Elements for Computer Graphics (2nd Ed.)” – TMH	

CO Vs PO Mapping

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	2	1									
C02	3	2	1									
C03	2	1	1									
C04	3	2	3									
C05	3	2	3					1	1	1		1

Scale : 3-Strong 2- Medium 1 – Low

COURSE CODE			XCSE75	L	T	P	C
COURSE NAME			ADVANCED OPERATING SYSTEM	3	0	0	3
C	P	A		L	T	P	H
3.0	0.0	0.0		3	0	0	3
Objective: Objective of Advanced Operating systems course are to learn the fundamentals of Operating Systems, to gain knowledge on distributed operating system concepts that includes architecture, mutual exclusion algorithms, deadlock detection algorithms and agreement protocols and to gain insight on to the distributed resource management components viz. the algorithms for implementation of distributed shared memory, recovery and commit protocols.							
COURSE OUTCOMES				DOMAIN	LEVEL		
C01	Describe the various synchronization, scheduling and memory management issues			Cognitive	Remember, Understand		
C02	Demonstrate the mutual exclusion, deadlock detection and agreement protocols of Distributed operating system			Cognitive	Create, Analyze		
C03	Discuss the various resource management techniques issues and various deadlock detection algorithm and resolution for distributed systems.			Cognitive	Remember, Understand Apply		
C04	Describe and analyze the various agreement problems and solutions.			Cognitive	Remember, Understand		
C05	Understand and explain the various Mechanisms for building Distributed File Systems, Design issues and install open source kernel modify existing open source kernels in terms of functionality or features used.			Cognitive	Remember, Understand, Analyze, Apply.		
UNIT-I	FUNDAMENTALS OF OPERATING SYSTEMS						9
Overview – Synchronization Mechanisms – Processes and Threads - Process Scheduling – Deadlocks: Detection, Prevention and Recovery – Models of Resources – Memory Management Techniques.							
UNIT –II	DISTRIBUTED OPERATING SYSTEMS						9
Issues in Distributed Operating System – Architecture – Communication Primitives – Lamport’s Logical clocks – Causal Ordering of Messages – Distributed Mutual Exclusion Algorithms – Centralized and Distributed Deadlock Detection Algorithms – Agreement Protocols.							
UNIT-III	DISTRIBUTED RESOURCE MANAGEMENT						9
Distributed File Systems – Design Issues - Distributed Shared Memory – Algorithms for Implementing Distributed Shared memory-Issues in Load Distributing – Scheduling Algorithms – Synchronous and Asynchronous Check Pointing and Recovery – Fault Tolerance – Two-Phase Commit Protocol.							

UNIT -IV	REAL TIME AND MOBILE OPERATING SYSTEMS	9	
Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems – Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems – Micro Kernel Design - Client Server Resource Access – Processes and Threads - Memory Management - File system.			
UNIT V	CASE STUDIES	9	
Linux System: Design Principles - Kernel Modules - Process Management Scheduling - Memory Management - Input-Output Management - File System - Interprocess Communication. iOS and Android: Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer - File System.			
	LECTURE	PRACTICAL	TOTAL
	45	0	45
REFERENCES			
1. Mukesh Singhal and Niranjan G. Shivaratri, “Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems”, Tata McGraw-Hill, 2011.			
2. Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, “Operating System Concepts”, Seventh Edition, John Wiley & Sons, 2012			
3. Daniel P Bovet and Marco Cesati, “Understanding the Linux kernel”, 3rd edition, O’Reilly, 2005			
4. Rajib Mall, “Real-Time Systems: Theory and Practice”, Pearson Education India, 2006.			
5. Neil Smyth, “iPhone iOS 4 Development Essentials – Xcode”, Fourth Edition, Payload media, 2011.			
E REFERENCES			
10. https://nptel.ac.in/courses/106108101/			
11. https://www.researchgate.net/publication/2959795_Advanced_Operating_Systems			

Mapping of COs with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO1 0	PO1 1	PO12	PSO1	PSO 2
CO 1	1	0	0	0	0	0	0	0	0	0	1	0	0	0
CO 2	1	3	2	0	0	1	3	0	0	0	0	1	2	0
CO 3	1	3	0	0	0	1	0	0	0	0	1	3	3	0
CO 4	1	3	0	0	0	0	0	0	0	0	1	3	3	0
CO 5	1	0	0	0	3	1	1	0	0	0	2	3	0	0
	5	9	2	0	3	3	4	0	0	0	5	10	8	0

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Original value	5	9	2	0	3	3	4	0	0	0	5	10	8	0
Scaled to 0,1,2,3 scale	1	2	1	0	1	1	1	0	0	0	1	2	2	0

COURSE CODE	XCSE77	L	T	P	C
COURSE NAME	VIRTUALIZATION	3	0	0	3
PREREQUISITES	CLOUD COMPUTING	L	T	P	H
C:P:A	3:0:0	3	0	0	3
COURSE OUTCOMES		Domain		Level	
C01	Deploy legacy OSs on virtual machines	Cognitive		Understand	
C02	Understand the intricacies of server, storage, network, desktop and application virtualizations	Cognitive		Understand	
C03	Design new models for virtualization	Cognitive		Understand	
C04	Design and develop cloud applications on virtual machine platforms	Cognitive		Understand	
C05:	Design new models for Bigdata processing in cloud	Cognitive		Understand	
LEARNING OBJECTIVES					
<ul style="list-style-type: none">To understand the need of virtualization Explore the types of virtualizationTo understand the concepts of virtualization and virtual machinesTo understand the practical virtualization solutions and enterprise solutionsTo understand the security issues in cloud computing					
UNIT I INTRODUCTION TO VIRTUALIZATION					9
Basics of Virtualization – Virtualization Types – Model of Virtualization – Layers of Virtualization – Server Machine Virtualization - Application Virtualization – Goals of Virtualization – Taxonomy of Virtual Machines.					
UNIT II VIRTUALIZATION INFRASTRUCTURE					9
Hardware Virtualization- Virtual Hardware Overview – Virtual Machine Products - Sever Consolidation – Server Pooling - Types of Server Virtualization – Business cases for Sever-Virtualization –Selecting server Virtualization Platform					
UNIT III NETWORK VIRTUALIZATION					9
Virtual File Systems – Process Virtualization – Layers in Virtualization – Players in Virtualization - Virtualizing the Campus WAN Design – - Routing Protocols- Virtualization Aware Routing - Multi-Topology Routing – Case Studies of Network Virtualization.					
UNIT IV DESKTOP VIRTUALIZATION AND STORAGE VIRTUALIZATION					9
Virtualization- Preparing a Virtualization Machine Host- Storage Virtualization - iSCSI Architecture – Securing iSCSI – SAN backup and recovery techniques – RAID – SNIA Shared Storage Model – Classical Storage Model – Virtual Information Systems.					

UNIT V SECURITY												9
Secure Virtual Infrastructure- Protect Virtual Infrastructure-Prepare Business Continuity - Update Management Structure												
										LECTURE	TUTORIAL	TOTAL
										45	0	45
TEXT BOOK												
1. Dan Kusnetzky ,”Virtualization: A Manager’s Guide”, O’Reily,2011												
REFERENCES												
1. Danielle Ruest, Nelson Ruest,” Virtualization: A Beginner’s Guide”,McGraw Hill, 2009												
2. Chris 2Wolf, Erick M. Halter ,”Virtualization: From Desktop to the Enterprise”, A Press, 2006												
E REFERENCE												
1. http://www.ss.pku.edu.cn/vs/style/resources/Introduction%20to%20Virtualization.pdf												
2. http://www.vmware.com/in/virtualization												
3. http://bradhedlund.com/2013/01/28/network-virtualization-a-next-generation-modular-platform-forthe-virtual-network/												
4. http://en.wikipedia.org/wiki/Desktop_virtualization												

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PSO 1	PSO 2
CO 1	3	2	2	3	0	1	2	0	1	0	1	1	1	2
CO 2	3	2	1	3	0	1	2	0	1	0	1	1	2	2
CO 3	3	2	1	3	0	1	2	1	1	0	1	1	2	2
CO 4	3	2	1	2	0	1	2	1	1	0	1	1	2	2
CO 5	3	2	1	2	0	1	2	0	1	0	1	1	2	1
	15	10	6	13	0	5	10	2	5	0	5	5	9	9

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO 1	PSO 2
Original value	15	10	6	13	0	5	10	2	5	0	5	5	9	9
Scaled to 0,1,2,3 scale	3	2	2	3	0	1	2	1	1	0	1	1	2	2

COURSE CODE		XCSE79	L	T	P	C
COURSE NAME		ADHOC AND SENSOR NETWORKS	3	0	0	3
C:P:A		3:0:0	L	T	P	H
			3	0	0	3
COURSE OUTCOMES			DOMAIN	LEVEL		
CO1	Describe the design issues in ad hoc and sensor networks.		Cognitive	Remembering, Understanding		
CO2	Describe and distinguish the different types of MAC protocols.		Cognitive	Remembering		
CO3	Describe the different types of adhoc routing protocols.		Cognitive	Remembering, Understanding		
CO4	Explain the TCP issues in adhoc networks.		Cognitive	Understanding		
CO5	Describe the architecture and protocols of wireless sensor networks.		Cognitive	Remembering		
UNIT I INTRODUCTION					9	
Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio propagation Mechanisms – Characteristics of the Wireless Channel -mobile ad hoc networks (MANETs) and wireless sensor networks (WSNs) :concepts and architectures. Applications of Ad Hoc and Sensor networks. Design Challenges in Ad hoc and Sensor Networks.						
UNIT II MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS					9	
Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention based protocols-Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms – Multi channel MAC-IEEE 802.11						
UNIT ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS					9	
Issues in designing a routing and Transport Layer protocol for Ad hoc networks- proactive routing,reactive routing (on-demand), hybrid routing- Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks.						
UNIT IV WIRELESS SENSOR NETWORKS (WSNS) AND MAC PROTOCOLS					9	
Single node architecture: hardware and software components of a sensor node – WSN Network architecture: typical network architectures-data relaying and aggregation strategies -MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA						
UNIT V WSN ROUTING, LOCALIZATION & QOS					9	
Issues in WSN routing – OLSR- Localization – Indoor and Sensor Network Localization-absolute and relative localization, triangulation-QOS in WSN-Energy Efficient Design-Synchronization-Transport Layer issues.						
			LECTURE		45 Hrs	

TEXT BOOKS

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

REFERENCES

1. Carlos De Moraes Cordeiro, Dharma Prakash Agrawal "Ad Hoc & Sensor Networks: Theory and Applications", World Scientific Publishing Company, 2006.
2. Feng Zhao and Leonides Guibas, "Wireless Sensor Networks", Elsevier Publication – 2002.
3. Holger Karl and Andreas Willig "Protocols and Architectures for Wireless Sensor Networks", Wiley, 2005
4. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks-Technology, Protocols, and Applications", John Wiley, 2007.
5. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.

E REFERENCES

1. <https://lecturenotes.in/subject/396/adhoc-and-sensor-network-asn>

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	2	3	2	1	0	0	2	1	0	2	3	2
CO 2	2	3	2	3	2	1	0	0	2	1	0	1	3	2
CO 3	1	3	3	2	1	1	0	0	1	1	0	2	3	2
CO 4	2	2	2	2	2	1	0	0	1	1	0	1	3	2
CO 5	2	3	3	1	1	1	0	0	1	1	0	1	3	2
Total	9	14	12	11	8	5	0	0	7	5	0	7	15	10

COURSE CODE			XCSE7A	L	T	P	C
COURSE NAME			EMBEDDED SYSTEMS	3	0	0	3
				L	T	P	H
C	P	A		3	0	0	3
3.0	0.0	0.0					
Objective: Objective of Embedded systems course are to know the building blocks of embedded system, to educate in various embedded development strategies, to Introduce bus communication in processors, input/output interfacing. And to impart knowledge in various processor scheduling algorithms, basics of real time operating system tool.							
COURSE OUTCOMES				DOMAIN	LEVEL		
C01	Discuss the structural units in Embedded processor.			Cognitive	Remember, Understand		
C02	Understand and apply the embedded networking			Cognitive	Understand, Analyze		
C03	Discuss the development environment of embedded systems.			Cognitive	Remember, Understand		
C04	Describe the real time operating system based embedded system design.			Cognitive	Understand, Apply		
C05	Understand and develop embedded system applications.			Cognitive	Understand, Create		
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, Modeling 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, RT Linux.							

UNIT V	EMBEDDED SYSTEM APPLICATION DEVELOPMENT			9
Case Study of Washing Machine- Automotive Application- Smart card System Application				
	LECTURE	PRACTICAL	TOTAL	
	45	0	45	
TEXT BOOKS				
12. Rajkamal, ‘Embedded System-Architecture, Programming, Design’, Mc Graw Hill, 2013.				
13. Peckol, “Embedded system Design”, John Wiley & Sons,2010				
14. Lyla B Das,” Embedded Systems-An Integrated Approach”, Pearson, 2013				
REFERENCES				
1. Shibu. K.V, “Introduction to Embedded Systems”, Tata Mcgraw Hill,2009.				
2. Elicia White,” Making Embedded Systems”, O’ Reilly Series,SPD,2011.				
3. Tammy Noergaard, “Embedded Systems Architecture”, Elsevier, 2006.				
4. Han-Way Huang, ”Embedded system Design Using C8051”, Cengage Learning,2009.				
5. Rajib Mall “Real-Time systems Theory and Practice” Pearson Education, 2007.				

E- REFERENCES
1. https://nptel.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Embedded%20systems

Mapping of COs with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO1 0	PO1 1	PO12	PSO1	PSO 2
CO 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO 2	0	0	0	0	0	0	0	0	0	0	0	1	0	0
CO 3	1	0	3	3	0	0	1	0	0	0	2	1	2	0
CO 4	2	2	0	0	0	0	0	0	0	0	1	1	2	0
CO 5	1	3	0	0	1	1	3	0	0	0	3	3	3	0
	4	5	3	3	1	1	4	0	0	0	6	6	7	0

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
Original value	4	5	3	3	1	1	4	0	0	0	6	6	7	0
Scaled to 0,1,2,3 scale	1	1	1	1	1	1	1	0	0	0	2	2	2	0

COMMON SUBJECTS

SUBCODE	XUME706	L	T	P	C
SUB NAME	CYBER SECURITY	3	0	0	3
PREREQUISITES		L	T	P	H
C:P:A	3:0:0	3	0	0	3
LEARNING OBJECTIVES					
<ul style="list-style-type: none">To understand key terms and concepts in cyber law, intellectual property and cyber crimes, trademarks and domain theft.Able to examine secure software development practices.The learner will be able to incorporate approaches for risk management and best practices.To understand the basic knowledge of information security and security threats.					
COURSE OUTCOMES		Domain	Level		
CO1:	Able to <i>understand</i> the Cyber Security Policy, Laws and Regulations	Cognitive	Remember		
CO2:	Able to <i>discuss</i> the Cyber Security Management Concepts	Cognitive	Understand		
CO3:	Able to <i>understand</i> the Cyber Crime and Cyber welfare	Cognitive	Understand		
CO4:	Able to <i>discuss</i> on issues related to Information Security Concepts	Cognitive	Understand		
CO5:	Able to <i>understand</i> various security threats	Cognitive	Understand		
UNIT I INTRODUCTION					9
Cyber Security – Cyber Security policy – Domain of Cyber Security Policy – Laws and Regulations – Enterprise Policy – Technology Operations – Technology Configuration - Strategy Versus Policy – Cyber Security Evolution – Productivity – Internet – E commerce – Counter Measures – Challenges.					
UNIT II CYBER SECURITY OBJECTIVES AND GUIDANCE					9
Cyber Security Metrics – Security Management Goals – Counting Vulnerabilities – Security Frameworks – E Commerce Systems – Industrial Control Systems – Personal Mobile Devices – Security Policy Objectives – Guidance for Decision Makers – Tone at the Top – Policy as a Project– Cyber Security Management – Arriving at Goals – Cyber Security Documentation – The Catalog Approach – Catalog Format – Cyber Security Policy Taxonomy.					

UNIT III CYBER SECURITY POLICY CATALOG				9
Cyber Governance Issues – Net Neutrality – Internet Names and Numbers – Copyright and Trademarks – Email and Messaging - Cyber User Issues - Malvertising - Impersonation – Appropriate Use – Cyber Crime – Geo location – Privacy - Cyber Conflict Issues – Intellectual property Theft – Cyber Espionage – Cyber Sabotage – Cyber Welfare				
UNIT IV INFORMATION SECURITY CONCEPTS				9
Information Security Overview: Background and Current Scenario - Types of Attacks - Goals for Security - E-commerce Security - Computer Forensics – Steganography				
UNIT V SECURITY THREATS AND VULNERABILITIES				9
Overview of Security threats -Weak / Strong Passwords and Password Cracking - Insecure Network connections - Malicious Code - Programming Bugs - Cyber crime and Cyber terrorism - Information Warfare and Surveillance				
	LECTURE	TUTORIAL	TOTAL	
	45	0	45	
REFERENCES				
1.Jennifer L. Bayuk, J. Healey, P. Rohmeyer, Marcus Sachs , Jeffrey Schmidt, Joseph Weiss “Cyber Security Policy Guidebook” John Wiley & Sons 2012.				
2. Rick Howard “Cyber Security Essentials” Auerbach Publications 2011.				
3. Richard A. Clarke, Robert Knake “Cyberwar: The Next Threat to National Security & What to Do About It” Ecco 2010				
4. Dan Shoemaker Cyber security The Essential Body Of Knowledge, 1st ed. Cengage Learning 2011				
5. Rhodes-Ousley, Mark, “Information Security: The Complete Reference”, Second Edition, McGraw- Hill, 2013.				
E REFERENCE				
1. https://www.coursera.org/specializations/cyber-security				
2. www.nptel.ac.in				
3. http://professional.mit.edu/programs/short-programs/applied-cybersecurity				

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PSO 1	PSO 2
CO 1	3	2	2	3	0	1	2	0	1	0	1	1	1	2
CO 2	3	2	1	3	0	1	2	0	1	0	1	1	2	2
CO 3	3	2	1	3	0	1	2	1	1	0	1	1	2	2
CO 4	3	2	1	2	0	1	2	1	1	0	1	1	2	2
CO 5	3	2	1	2	0	1	2	0	1	0	1	1	2	1
	15	10	6	13	0	5	10	2	5	0	5	5	9	9

	PO 1	PO 2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	P O 10	PO 11	PO1 2	PSO 1	PSO 2
Origin al value	15	10	6	13	0	5	10	2	5	0	5	5	9	9
Scaled to 0,1,2,3 scale	3	2	2	3	0	1	2	1	1	0	1	1	2	2

		L	T	P	C
COURSE NAME	E-WASTE MANAGEMENT	3	0	0	0
C:P:A	3:0:0	L	T	P	H
		3	0	0	3
LEARNING OBJECTIVES: <ul style="list-style-type: none">• To classify waste sources• To identify methods of waste disposal• To study various energy generation methods• To analyze recycling of e-waste					
COURSE OUTCOMES		DOMAIN	LEVEL		
C01	Able to find the technologies for waste electrical and electronic equipment	Cognitive	Remember		
C02	Able to explain the methods of Mechanical Processing of waste disposal	Cognitive	Remember		
C03	Able to classify the sources of Hydrometallurgical Processing	Cognitive	Remember, Understand		
C04	Able to summarize the Electronic Waste Recycling	Cognitive	Remember , Understand		
C05	Able to demonstrate the methods for Batteries disposal	Cognitive	Remember , Understand		
UNIT I					9
Introduction, Electronic Waste, Generation and Management ,Electronic Waste in the World, The Problem of WEEE, WEEE Management Leaching Processes, Acid and Alkaline Leaching, Leaching Using Supercritical Fluids, Bioleaching.					
UNIT II					10
Mechanical Processing, Comminution, Size Separation, Density Separation, Separation by Dense Medium, Separation via Suspensions, Jigs, Flowing Film Concentrators, Air Separation, Magnetic Separation, Dry Separators, Wet Separators,Electrostatic Separation, Electrification by Contact or Friction, Electrification by Ion Bombardment, Eddy Current (Foucault Current)					
UNIT III					8
Hydrometallurgical Processing:, Liquid-Liquid Extraction, Supercritical Extraction, Cementation, Electrometallurgical Processing: , Pyrometallurgical Processing					
UNIT IV					9
Electronic Waste Recycling: Materials Recycling Considerations, Polymers, Ceramics, Printed Circuit Boards, Mechanical Processing, Hydrometallurgical Processing, Bio hydro metallurgical Processing, Pyro metallurgical Processing, Monitors, Cathode Ray Tube, Liquid Crystal Displays/Light Emitting Diodes					
UNIT V					9
Batteries: Nickel–Cadmium (NiCd) Batteries, Manual Sorting, Component Separation by Unity Operations of Mineral Treatment, Pyro metallurgical Route, Hydrometallurgical Route, Nickel Metal Hydride (NiMH) Batteries, Characteristics of Nickel Metal Hydride Batteries—NiMH, Recycling NiMH Batteries, Lithium Ion Batteries, Constituents of Rechargeable Lithium-Ion					

Batteries (LIBs), Cathode Materials, Anode Materials, Electrolytes, Separator, Recycling LIBs Batteries, Zinc-Manganese Dioxide Systems,

	LECTURE	TUTORIAL	TOTAL
	45	-	45

TEXT BOOKS

1. Hugo Marcelo Veit Andréa Moura Bernardes ,Electronic Waste Recycling Techniques, Springer International Publishing Switzerland 2015.
2. "E-waste in India: Research unit, Rajya Sabha Secretariat, New Delhi, June 2011"

GOOGLE BOOKS:

1. e-waste Management: From waste to Resource Klaus Hieronymi, Ramzy Kahnat, Eric williams Tech. & Engg.-2013(Publisher: Earthscan 2013).
2. What is the impact of E-waste: Tamara Thompson
3. E-waste poses a Health Hazard: Sairudeen Pattazhy

WEBLINKS :

- www.unep.org
- www.routledge.com
- www.amazon.com
- www.bookdepository.com
- www.ecoactiv.com