DEPARTMENT OF INFORMATION TECHNOLOGY

Vision

The department aspires to transform individuals in pursuit of lifetime learning and service into highly motivated professionals through educational, cultural and professional opportunities.

Mission

1. To provide academic programs that equip, enlighten and empower the students to learn technology through practice, service and outreach
2. To educate the students about social responsibilities and entrepreneurship
3. To encourage research through continuous improvement in infrastructure, curriculum and faculty development in collaboration with industry and institutions

Programme Educational Objectives (PEOs)

1 Graduates will have progressive learning and successful career in Information, Communication Technologies and their applications.

2 Graduates will be leaders in their chosen field.

3 Graduates will practice the acquired technical skills and knowledge for the benefit of society.

Programme Outcomes (POs)

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

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

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

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

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

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

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

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

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

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

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

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

CBCS – UG Curriculum Design	
Name of the UG Programme:	**INFORMATION TECHNOLOGY**

Semester - 1									
	Course Code	**Course Title**	**Category**	**Contact Hours**	**Hrs/Week & Credits**				**Pre-requisites**
					L	**T**	**P**	**C**	
Theory									
1.	U15ENT101	Technical English	HS	3	3	0	0	3	
2.	U15MAT101	Engineering Mathematics – I	BS	5	3	2	0	4	
3.	U15PHT101	Engineering Physics	BS	3	3	0	0	3	
4.	U15CHT101	Engineering Chemistry	BS	3	3	0	0	3	
5.	U15MET101	Engineering Graphics	ES	5	1	4	0	4	
6.	U15ITT101	Foundations of Information Technology	PC	3	3	0	0	3	
Practicals									
7.	U15CHP101	Chemistry Laboratory	BS	2	0	0	2	1	
8.	U15MEP101	Engineering Practices Laboratory	ES	3	0	0	3	1	
9	U15ITP101	Computer Hardware and Peripherals Laboratory	PC	3	0	0	3	1	
10.	U15GHP101	Personal Values -1	HS	2	0	0	2	1	
Total credits				32				24	

Semester - 2									
	Course Code	**Course Title**	**Category**	**Contact Hours**	**Hrs/Week & Credits**				**Pre-requisites**
					L	**T**	**P**	**C**	
Theory									
1.	U15ENT201	Business Communication and Presentation Skills	HS	4	0	0	4	2	
2.	U15MAT201	Engineering Mathematics – II	BS	5	3	2	0	4	

3.	U15PHT203	Materials Science	BS	3	3	0	0	3	
4.	U15EET212	Electrical and Electronic Circuits	ES	3	3	0	0	3	
5.	U15CHT203	Chemistry for Circuit Engineering	BS	3	3	0	0	3	
6.	U15CST201	Structured Programming using 'C'	ES	4	2	2	0	3	
. **Practicals**									
7.	U15PHP201	Physics Laboratory	BS	2	0	0	2	1	
8.	U15EEP212	Electrical and Electronic Circuits Laboratory	ES	3	0	0	3	1	
9	U15CSP201	Structured Programming Laboratory using 'C'	ES	3	0	0	3	1	
10.	U15SIP201	Social Immersion Project	HS	4	0	0	4	2	
11.	U15GHP201	Personal Values -2	HS	2	0	0	2	1	
Total credits				36				24	

Semester - 3									
	Course Code	**Course Title**	**Category**	**Contact Hours**	**Hrs/Week & Credits**				**Pre-requisites**
					L	**T**	**P**	**C**	
Theory									
1.	U15MAT307	Probability and Statistics for Data Analysis	BS	5	3	2	0	4	
2.	U15ITT301	Data Structures and Algorithms	PC	3	3	0	0	3	
3.	U15ITT302	Digital Systems and Design	PC	3	3	0	0	3	EET212
4.	U15ITT303	Object Oriented Methodologies and Programming	PC	3	3	0	0	3	
5.	U15EST005	Environmental Science	BS	3	3	0	0	3	
. **Practicals**									
6.	U15ITP301	Data Structures and Algorithms Laboratory	PC	3	0	0	3	1	CSP201
7.	U15ITP302	Digital Systems and Design Laboratory	PC	3	0	0	3	1	EEP212

8.	U15ITP303	Object Oriented Methodologies and Programming Laboratory	PC	3	0	0	3	1	CSP201
9.	U15ITP304	Web Design Project Lab	PC	3	0	0	3	1	
10.	U15GHP301	Family Values	HS	2	0	0	2	1	
Total credits				31				21	

Semester – 4

	Course Code	Course Title	Category	Contact Hours	Hrs/Week & Credits				Pre-requisites
					L	T	P	C	
Theory									
1.	U15MAT403	Discrete Mathematics	BS	5	3	2	0	4	
2.	U15ITT401	Database Management Systems	PC	3	3	0	0	3	
3.	U15ITT402	Computer Networks	PC	3	3	0	0	3	
4.	U15ITT403	Computer Architecture	PC	3	3	0	0	3	ITT302
5.	U15ITT404	Operating Systems	PC	3	3	0	0	3	
6.	U15GST008	Foundation Skills in Integrated Product Development	ES	3	3	0	0	3	
Practicals									
7.	U15ITP401	Database Management Systems Laboratory	PC	3	0	0	3	1	
8.	U15ITP402	Networks Laboratory	PC	3	0	0	3	1	
9.	U15GHP401	Professional Values	HS	1	1	0	0	1	
Total credits				27				22	

Semester – 5

	Course Code	Course Title	Category	Contact Hours	Hrs/Week & Credits				Pre-requisites
					L	T	P	C	
Theory									
1.	U15ECT511	Digital Signal Processing	ES	4	3	1	0	4	
2.	U15ITT501	Software Engineering	PC	3	3	0	0	3	ITT401
3.	U15ITT502	Internet and Java Programming	PC	3	3	0	0	3	ITT303
4.	U15ITT503	Cryptography and Network Security	PC	3	3	0	0	3	ITT402
5.		Open Elective –I	OE	3	3	0	0	3	

6.		Professional Elective –I	PE	3	3	0	0	3	
7.		One Credit Course	EEC	1	1	0	0	1	
Practicals									
8.	U15ITP501	Software Engineering Laboratory	PC	3	0	0	3	1	ITP401
9.	U15ITP502	Java Programming Laboratory	PC	3	0	0	3	1	ITP303
10.	U15ENP501	Communication Skills Laboratory	EEC	2	0	0	2	1	
11.	U15GHP501	Social Values	HS	1	1	0	0	1	
Total credits				29				24	

Semester – 6									
	Course Code	**Course Title**	**Category**	**Contact Hours**	**Hrs/Week & Credits**				**Pre-requisites**
					L	**T**	**P**	**C**	
Theory									
1.	U15ITT601	Web Technology	PC	3	3	0	0	3	ITT502
2.	U15ITT602	Embedded Systems	PC	3	3	0	0	3	ITT302
3.	U15ITT603	Mobile & Pervasive Computing	PC	3	3	0	0	3	ITT402
4.	U15ITT604	Data Warehousing and Data Mining	PC	5	3	0	2	4	ITT401
5.		Professional Elective –II	PE	3	3	0	0	3	
6.		Open Elective –II	OE	3	3	0	0	3	
7.		One Credit Course	EEC	1	1	0	0	1	
. **Practicals**									
8.	U15ITP601	Web Technology Laboratory	PC	3	0	0	3	1	ITP502
9.	U15ITP602	Embedded Systems Laboratory	PC	3	0	0	3	1	ITP302
10.	U15GHP601	National Values	HS	1	1	0	0	1	
Total credits				28				23	

Semester – 7									
	Course Code	**Course Title**	**Category**	**Contact Hours**	**Hrs/Week & Credits**				**Pre-requisites**
					L	**T**	**P**	**C**	
Theory									
1.	U15GST005	Engineering Economics and Financial Management	HS	3	3	0	0	3	
2.	U15ITT701	Graphics and Multimedia	PC	3	3	0	0	3	

3.	U15ITT702	Internet of Things	PC	3	3	0	0	3	ITT402
4.	U15ITT703	Data Analytics	PC	3	3	0	0	3	ITT604
5.		Open Elective –III	OE	3	3	0	0	3	
6.		Professional Elective –III	PE	3	3	0	0	3	
. **Practicals**									
7.	U15ITP701	Graphics and Multimedia Laboratory	PC	3	0	0	3	1	CSP201/ ITP502
8.	U15ITP702	Internet of Things Laboratory	PC	3	0	0	3	1	ITT402, ITT602
9.	U15ITP703	Project Work - Phase I	EEC	4	0	0	4	2	
10.	U15GHP701	Global Values	HS	2	1	0	1	1	
Total credits				30				23	

Semester – 8

	Course Code	Course Title	Category	Contact Hours	Hrs/Week & Credits				Pre-requisites
					L	T	P	C	
Theory									
1.		Professional Elective –IV	PE	3	3	0	0	3	
2.		Professional Elective –V	PE	3	3	0	0	3	
3.		Professional Elective –VI	PE	3	3	0	0	3	
. **Practicals**									
4.	U15ITP801	Project Work - Phase II	EEC	24	0	0	24	12	
Total credits				33				21	

Total credits: 182

Professional Electives (PE)

	Course Code	Course Title	Category	Contact Hours	Hrs/Week & Credits				Pre-requisites
					L	T	P	C	
1	U15ITE001	Theory of Computation	PE	3	3	0	0	3	MAT403
2	U15ITE002	TCP/ IP Socket Programming	PE	3	3	0	0	3	ITT402
3	U15ITE003	Distributed Systems	PE	3	3	0	0	3	ITT402
4	U15ITE004	Principles of Compiler Design	PE	3	3	0	0	3	-
5	U15ITE005	User Interface Design	PE	3	3	0	0	3	-
6	U15ITE006	Cloud Computing	PE	3	3	0	0	3	ITT402
7	U15ITE007	Ad Hoc & Sensor Networks	PE	3	3	0	0	3	ITT402

8	U15ITE008	High Speed Networks	PE	3	3	0	0	3	ITT402
9	U15ITE009	Computational Intelligence	PE	3	3	0	0	3	ITE024, MAT403
10	U15ITE010	Service Oriented Architecture	PE	3	3	0	0	3	ITT601
11	U15ITE011	Real Time Systems	PE	3	3	0	0	3	ITT404
12	U15ITE012	Information Coding Techniques	PE	3	3	0	0	3	-
13	U15ITE013	Software Architecture	PE	3	3	0	0	3	ITT501
14	U15ITE014	Digital Image Processing	PE	3	3	0	0	3	ECT511
15	U15MCE708	Mobile Robotics	PE	3	3	0	0	3	-
16	U15GST002	Total Quality Management	HS	3	3	0	0	3	-
17	U15GST003	Principles of Management	HS	3	3	0	0	3	-
18	U15GST004	Operation Research	BS	3	3	0	0	3	-
19	U15ITE015	C # and .NET Programming	PE	3	3	0	0	3	ITT303
20	U15ITE016	Building Enterprise Applications	PE	3	3	0	0	3	ITT502
21	U15ITE017	Business Intelligence	PE	3	3	0	0	3	ITT604
22	U15ITE018	Information Retrieval	PE	3	3	0	0	3	ITT604
23	U15ITE019	Software Quality Assurance & Testing	PE	3	3	0	0	3	ITT501
24	U15ITE020	Software Project Management	PE	3	3	0	0	3	ITT501
25	U15ITE021	Management Information System	PE	3	3	0	0	3	-
26	U15ITE022	Information Security	PE	3	3	0	0	3	-
27	U15ITE023	Open Source Technologies	PE	3	3	0	0	3	-
28	U15ITE024	Artificial Intelligence	PE	3	3	0	0	3	MAT403

Open Electives (OE)

	Course Code	Course Title	Category	Contact Hours	Hrs/Week & Credits				Pre-requisites
					L	T	P	C	
1.	U15ITOE01	Object Oriented Programming using C++ and Java	OE	3	3	0	0	3	-
2.	U15ITOE02	Internet of Things	OE	3	3	0	0	3	-
3.	U15ITOE03	Multimedia Systems	OE	3	3	0	0	3	-
4.	U15ITOE04	Foundations of Information Technology	OE	3	3	0	0	3	-

ONE CREDIT COURSES

1.	U15ITIN01	Innovation and Entrepreneurship	EEC	1	1	0	0	1	-
2.	U15ITIN02	ERP and Business Applications	EEC	1	1	0	0	1	-
3.	U15ITIN03	Agile Software Development	EEC	1	1	0	0	1	-
4.	U15ITIN04	UX/UI Design	EEC	1	1	0	0	1	-

S.NO	Category	Credits
1	**Humanities and Social Sciences (HS)**	17
2	**Basic Sciences (BS)**	33
3	**Engineering Sciences (ES)**	20
4	**Professional Core (PC)**	68
5	**Professional Electives (PE)**	18
6	**Open Electives (OE)**	9
7	**Employability Enhancement Courses (EEC)**	17
Total credits		182

SEMESTER III

U15MAT307 PROBABILITY AND STATISTICS FOR DATA ANALYSIS

L	T	P	C
3	2	0	4

Course Outcomes:
After successful completion of this course, the students should be able to

CO1	Compute measures of central tendencies, dispersions.	K2
CO2	Correlate the dependent variables and fit the curves for prediction using chronological data.	K2
CO3	Analyze random or unpredictable experiments and investigate important features of random experiments.	K3
CO4	Construct probabilistic models for observed phenomena through Normal distribution which play an important role in many engineering applications.	K2
CO5	Analyze sample data and interpret the same for population.	K3
CO6	Analyze the experimental designs for one way, two way and three way classified data and for a factorial design.	K3

Pre-requisite: Frequency distribution, Method of Least Square, Sample and Population.

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M							M	M		
CO2	S	M							M	M		
CO3	S	M							M	M		
CO4	S	S							M	M		
CO5	S	S							M	M		
CO6	S	S							M	M		

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignment 3. Case Study	1. Course Exit Survey

STATISTICAL MEASURES **9 Hours**

Measures of central tendency: Arithmetic Mean, Median and Mode – Quartiles – Measures of variation: Range, Quartile deviation, standard deviation and coefficient of variation – Five number summaries – Box Plot technique.

CORRELATION , REGRESSION AND CURVE FITTING **9 Hours**

Correlation – Scatter Diagram, Karl Pearson's coefficient of correlation – Spearman's Rank Correlation – Regression lines (For Discrete data). Curve fitting – Straight line ($y = ax+b$) – Second degree parabola ($Y= ax^2+bx+c$) – Exponential curve ($y = ab^x$, $y = ax^b$ and $y = ae^{bx}$) – Growth curves – Modified Exponential curve ($y = a+bc^x$) – Logistic curve ($k/(1+e^{a+bx})$) .

PROBABILITY **4 Hours**

Probability - Axioms of probability - Conditional probability – Total probability – Baye's theorem.

RANDOM VARIABLES **5 Hours**

Random variable – Distribution function – properties – Probability mass function – Probability density function – Mathematical expectation – Normal distribution – Applications.

TESTING OF HYPOTHESIS **9 Hours**

Testing of hypothesis for large samples (single mean, difference of means, single proportion, difference of proportions) – Small samples tests based on t and F distributions (single mean, difference of means, paired *t*- test and variance ratio test) – Chi-square test for independence of attributes.

DESIGN OF EXPERIMENTS **9 Hours**

Analysis of Variance (ANOVA) – Completely Randomized Design (CRD) – Randomized Block Design (RBD) – Latin Square Design (LSD) – Factorial Design – 2^2 design.

Theory:45hours **Tutorial:15 hours** **Total Hours: 60**

REFERENCES

1. Veerarajan T., Probability, Statistics and Random Processes, Tata McGraw Hill, 3rd edition, 2008.
2. Gupta S. P, "Statistical Methods", Sultan Chand & Sons Publishers, 2004.
3. Johnson R. A., Miller & Freund's "Probability and Statistics for Engineers", Sixth Edition, Pearson Education, Delhi, 2000.
4. Gupta.S.C and Kapoor.V.K, Fundamentals of Mathematical Statistics, 11th extensively revised edition, Sultan Chand & Sons, 2007.
5. Walpole R. E., Myers S.L. & Keying Ye, "Probability and Statistics for Engineers and Scientists", Pearson Education Inc, 2002.
6. Gupta S.C, and KapurV.K "Fundamentals of Applied Statistics", Sultan Chand, New Delhi, 4th Edition, 2014.
7. Charles Henry Brase and Corrinne Pellillo Brase "Understandable Statistics", D.C. Heath and Company, Toronto, 1987.

L	T	P	C
3	0	0	3

U15ITT301 DATA STRUCTURES AND ALGORITHMS

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Explain the analysis of algorithms	K2
CO2	Explore linear and non linear data structures	K2
CO3	Compare various sorting and searching techniques	K3
CO4	Outline different algorithm design strategies	K3

Pre-requisite: Nil

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M										
CO2	M	M										
CO3	S	M							M	M		
CO4	S	M	M	M					M	M		M

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. End Semester Exam 3. Assignment 4. Case Study	1. Course Exit Survey

LINEAR STRUCTURES	**12 Hours**
Fundamentals of algorithmic problem solving- algorithm design techniques- analyzing an algorithm - Analysis Framework-Asymptotic notations and basic efficiency classes. Abstract Data Types (ADT)– List ADT – array based implementation linked list implementation – doubly-linked lists -applications of lists-Stack ADT – Queue ADT – circular queue-implementation – Applications of stacks and queues	
NON LINEAR STRUCTURES	**9 Hours**
Tree ADT – tree traversals – left child right sibling data structures for general trees –	

Binary Tree ADT– expression trees – applications of trees – binary search tree ADT – AVL trees – binary heaps

GRAPHS	**6 Hours**

Graphs-Definitions – Topological sort – breadth-first traversal - shortest-path algorithms – minimum spanning tree –Prim's and Kruskal's algorithms – Depth-first traversal – Breadth first Traversal

SORTING AND SEARCHING	**9 Hours**

Hashing – Separate chaining – open addressing – rehashing – extendible hashing -Preliminaries – Insertion Sort- Shell sort- Heap sort- Merge sort- Quick sort- External Sorting- Searching –Linear Search- Binary Search

ALGORITHM DESIGN AND ANALYSIS	**9 Hours**

Introduction to algorithm design techniques: Greedy algorithms, Divide and Conquer, Dynamic Programming, backtracking, branch and bound, Randomized algorithms – NP-omplete problems. Case Study on design techniques

Theory: 45 hours **Tutorial : 0 hours** **Total hours:45**

REFERENCES

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012
2. M. A. Weiss, "Data Structures and Algorithm Analysis in C++", Fourth Edition, Pearson Education, 2013.
3. M. M. Raghuwanshi, "Algorithm and Data Structures", Narosa Publishing house, 2016
4. V. Aho, J. E. Hopcroft, and J. D. Ullman, "Data Structures and Algorithms", Pearson Education, 2009
5. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to algorithms", Third Edition, Prentice Hall of India Ltd, 2009.

U15ITT302 DIGITAL SYSTEMS AND DESIGN

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Demonstrate the knowledge of logic gates, Boolean algebra and apply optimal minimization techniques to simplify the Boolean function	K2
CO2	Analyze and design a combinational circuit	K3
CO3	Analyze and design a sequential circuit	K3
CO4	Compare various programmable devices and digital logic families.	K2

Pre-requisite: Electrical and Electronic Circuits

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M										
CO2	S	M	W		M							M
CO3	M	M	W		M							M
CO4	M	M										M

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. End Semester Exam 3. Assignments	1. Course Exit Survey

NUMBER SYSTEM AND BASIC LOGIC **10 Hours**

Number systems - Binary, Octal, Hexadecimal, Number base conversions, Binary codes: Weighted codes - BCD - 8421-2421, Non Weighted codes - Gray code - Excess 3 code, Binary arithmetic, 1's complements, 2's complements, and Code conversions. Study of logic gates- Boolean algebra, Boolean postulates and laws –De-Morgan's Theorem- Principle of Duality – Minterm- Maxterm- Canonical forms - Conversion between canonical forms, Karnaugh map Minimization – Don't care conditions, Tabulation method.

COMBINATIONAL CIRCUITS **9 Hours**

Problem formulation and design of combinational circuits, adder, subtractor, Serial adder/ Subtractor - Parallel adder/ Subtractor- Carry look ahead adder- BCD adder- Magnitude

comparator, parity checker, Encoder, decoder, Multiplexer/ Demultiplexer, code converters, Function realization using gates and multiplexers.

SEQUENTIAL CIRCUIT **8 Hours**

Flip flops SR, JK, T, D and Master slave – Characteristic table and equation –Application table – Edge triggering –Level Triggering –Realization of one flip flop using other flip flops – Register – shift registers - Universal shift register - Classification of sequential circuits- Moore and Mealy.

DESIGN OF SEQUENTIAL CIRCUITS **10 Hours**

Design of synchronous sequential circuits: state diagram - State table – State minimization – State assignment. Counters: Synchronous Binary counters – Modulo n counter - Decade - BCD counters, Asynchronous counter, Ring counters. Hazards: Static – Dynamic.

DIGITAL LOGIC FAMILIES AND PLD **8 Hours**

Memories – ROM, PROM, EEPROM, RAM.– Programmable Logic Devices: Programmable Logic Array (PLA)- Programmable Array Logic (PAL)- Implementation of combinational logic using PROM, PLA and PAL. Introduction to FPGA. Digital logic families: TTL, ECL, CMOS.

Theory: 45 hours **Tutorial: 0 hour** **Total Hours:45**

REFERENCES

1. M. Morris Mano, Digital Logic and Computer Design, 3rd Edition., Pearson Education, 2013
2. S. Salivahanan and S. Arivazhagan, “Digital Circuits and Design”,SecondEdition, Vikas Publishing House Pvt. Ltd, New Delhi, 2010
3. Charles H.Roth. “Fundamentals of Logic Design”, Cengage Learning India Pvt Ltd, New Delhi, 2010.
4. Donald P.Leach and Albert Paul Malvino, “Digital Principles and Applications”, 5th Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2015.
5. Thomas L. Floyd, “Digital Fundamentals”, Pearson Education, Inc, New Delhi, 2013
6. Donald D.Givone, “Digital Principles and Design”, Tata Mc-Graw-Hill Publishing company limited, New Delhi, 2013.

U15ITT303 **OBJECT ORIENTED METHODOLOGIES AND PROGRAMMING**

L	T	P	C
3	0	0	3

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1	Interpret the need of object oriented concepts and its fundamentals	K3
CO2	Develop solutions for the problems using basic OOPS concepts	K3
CO3	Explain virtual and template concepts	K2
CO4	Outline the basics of object oriented methodologies	K2

Pre-requisite: Nil

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	W										
CO2	S	M			W							
CO3	M	M			W							
CO4	M	W										

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Model Exam 3. Assignment 4. Seminar 5.Quiz	1. Course Exit Survey

INTRODUCTION **9 Hours**

Principles of Object Oriented Programming –Fundamentals of C++- Functions in C++: Inline functions-Default arguments –Function overloading (Without class)-Classes and Objects.

CLASSES AND OBJECTS **9 Hours**

Constructors and its types-Destructors-Operator overloading : Unary operator overloading – Binary operator overloading-Operator overloading using friend functions-Type conversions

POLYMORPHISM & INHERITANCE **9 Hours**

Inheritance –Types- Virtual Base classes –Abstract classes-Nesting of classes-Introduction to pointers- this pointer-Virtual destructors-Virtual functions-Polymorphism

ADVANCED FEATURES OF C++ AND INTRODUCTION TO OOSD **9Hours**

Templates- Class templates –Function templates- Exception handling Basics: Keywords-Throwing and catching and exception-Introduction to STL library-Object Oriented System Development

OBJECT ORIENTED METHODOLOGIES &UML **9 Hours**

Object Oriented Methodologies- Types of methodologies (Booch, Rumbaugh, Jacobson)-Unified Approach- Introduction to UML Diagrams-UML Dynamic Modelling

Theory: 45 hours **Tutorial: 0 hour** **Total Hours:45**

REFERENCES

1. E.Balagurusamy "Object Oriented Programming with C++", 6th Edition, TMH 2013
2. Ali Bahrami ,"Object Oriented System Development using UML" ,Second reprint, TMH, 2008
3. Robert Lafore, "Object Oriented Programming with C++",4th edition,TMH,2015
4. K.R.Venugopal, RajkumarBuyya, T.Ravishankar, "Mastering C++", Second Edition, TMH, 2013.
5. Ira Pohl, "Object oriented programming using C++", Pearson Education Asia, 2004
6. BjarneStroustrup, "The C++ programming language", Addison Wesley, fourth edition, 2014
7. John R.Hubbard, "Programming with C++", Schaums outline series, TMH, 2003

U15EST005 ENVIRONMENTAL SCIENCE

L	T	P	C
3	0	0	3

Course Objectives:

- To understand what constitutes the environment, what are precious resources in the environment, how to conserve these resources,
- To realize the role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity
- To identify the major challenges in environmental issues and evaluate possible solutions.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1	Analyze the impact of engineering solutions in a global and societal context	K4
CO2	Discuss contemporary issues that results in environmental degradation and would attempt to provide solutions to overcome those problems	K3
CO3	Highlight the importance of ecosystem and biodiversity	K2
CO4	Ability to consider issues of environment and sustainable development in his personal and professional undertakings	K3
CO5	Paraphrase the importance of conservation of resources.	K2
CO6	Play an important role in transferring a healthy environment for future generations	K3

Pre-requisite: Nil

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M					S	S		W	W		
CO2							S		W	W		
CO3							S		W	W		
CO4	W						S		W	W		
CO5	W						S	M	W	W		W
CO6	W						S		W			W

Course Assessment Methods:

Direct	Indirect
1. Internal Tests 2. Assignment 3. Group presentation 4. End semester exam	1. Course Exit Survey

INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES **14 Hours**

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 overutilization of surface and ground water, conflicts over water, dams benefits and problems - Water conservation, rain water harvesting, watershed management

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, 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, Wasteland reclamation – Role of an individual in conservation of natural resources

ECOSYSTEMS AND BIODIVERSITY **9 Hours**

ECOSYSTEM : Concept of an ecosystem – Structure and function of an ecosystem: Producers, consumers and decomposers, Food chain, Food web, Energy flow in the ecosystem and Ecological pyramids - Ecological succession – Introduction, types, characteristic features, structure and function of the (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

BIODIVERSITY : Introduction to Biodiversity – Definition: genetic, species and ecosystem diversity – Bio geographical classification of India – Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic values – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

ENVIRONMENTAL POLLUTION **10 Hours**

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Marine pollution (d) Noise pollution (e) light pollution (f) Nuclear hazards – Role of an individual in prevention of pollution – Pollution case studies - Solid waste Management: E-Waste management – Recycling of computing devices, Mobile phones, PCB, Servers – Effect of Radiation from computing devices - Causes, effects and control measures of pollution and waste generation due to IT sectors . Green computing – Disaster management and IT involvement: floods, earthquake, cyclone and landslides.

SOCIAL ISSUES AND THE ENVIRONMENT **7 Hours**

From Unsustainable to Sustainable development – Urban problems related to energy – Resettlement and rehabilitation of people; its problems and concerns, case studies – Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion – 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 – Human Rights

HUMAN POPULATION AND THE ENVIRONMENT **5 Hours**

Population growth and explosion – Women and Child Welfare Programme - Environment and human health – Communicable disease – Role of Information Technology in Environment and human health – Case studies.

Field Work

Visit to local area to document environmental assets- river / grassland / hill / mountain, visit to local polluted site- urban / rural / industrial / agricultural, study of common plants, insects, birds, study of simple ecosystems-pond, river, hill slopes etc.,

Theory: 45 hours **Tutorial : 0 hour** **Total hours:45**

REFERENCES

1. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co., 2013
2. Masters G.M., and Ela W.P., Introduction to Environmental Engineering and Science, Pearson Education Pvt., Ltd., Second Edition.
3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad India., 2002
4. Trivedi R.K and Goel P.K., "Introduction to Air pollution" Techno-science Pubications. 2003
5. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media. 1996
6. Cunningham, W.P., Cooper, T.H.., & Gorhani E., Environmental Encyclopedia, Jaico Publ., House, Mumbai, 2001
7. Wager K.D., Environmental Management, W.B. Saunders Co., Philadelphia, USA, 1998
8. Townsend C., Harper J and Michael Begon, "Essentials of Ecology", Blackwell science Publishing Co., 2003
9. Syed Sahabudeen, P.S. Environmental chemistry, Inder Publishers, Coimbatore. 2013

L	T	P	C
3	0	0	3

U15ITP301 DATA STRUCTURES AND ALGORITHMS LABORATORY

Course Outcomes (COs):

After Successful completion of this course, the students will be able to:

CO1	Demonstrate the various linear data structures using simple applications.	K3
CO2	Demonstrate the various Non Linear data structures using simple applications.	K3
CO3	Implement various sorting and searching Techniques.	K3

Pre-requisite: Structured Programming Laboratory using C

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S										S
CO2	S	S										S
CO3	S	S										S

Course Assessment methods:

Direct	Indirect
1.Mid Model Tests 2. Model Exam	1. Course Exit Survey

LIST OF EXPERIMENTS:

1. Array based implementation of stack and queue.
2. Linked list implementations and problems related to linked list such as inverting list, concatenation, etc.
3. Linked list based implementation of stack and queue
4. Problems related to applications of stack
5. Search Tree ADT - Binary Search Tree and traversal
6. AVL tree implementation
7. Implementation of Hash Tables
8. Implementation of graph traversal
9. Implementation of Dijkstra's algorithm
10. Implementation of minimum spanning tree algorithm
11. Sorting – Heap sort, Quick sort, Merge sort
12. Searching – Linear search, Binary search

Total Hours:45

U15ITP302 DIGITAL SYSTEMS AND DESIGN LABORATORY

L	T	P	C
0	0	3	1

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Simplify digital logic function using optimal minimization techniques.	K2
CO2	Construct, analyze and troubleshoot the digital circuits.	K3
CO3	Solve the real time problems related to digital circuits.	K3
CO4	Simulate the designed digital circuits using VHDL.	K2

Pre-requisite: Electrical and Electronic Circuits

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M										
CO2	S	M	W						M			
CO3	M	M	W						M			
CO4	M	M	W		M				M			

Course Assessment methods:

Direct	Indirect
1. Model Exam 2. End Semester Exam	1. Course Exit Survey

LIST OF EXPERIMENTS

1.Verification of Boolean theorems using digital logic gates

2. Design and implementation of combinational circuits using basic gates for arbitrary functions, code converters, etc.

3. Design and implementation of 4-bit binary adder / subtractor using basic gates and MSI devices

4. Design and implementation of parity generator / checker using basic gates and MSI devices

5. Design and implementation of magnitude comparator

6. Design and implementation of application using multiplexers

7. Design and implementation of shift registers

8. Design and implementation of synchronous and asynchronous counters

9. Simulation study of any combinational and sequential circuit using VHDL.

Total Hours:45

U15ITP303 **OBJECT ORIENTED METHODOLOGIES AND PROGRAMMING LABORATORY**

L	T	P	C
0	0	3	1

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1	Apply class components that protect data integrity and produce classes that are re-usable	K2
CO2	Construct a simple application using object oriented concepts	K3
CO3	Design UML diagrams for an application	K3

Pre-requisite courses: Structured Programming Laboratory using C

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M										
CO2	M	W										
CO3	S	M										

Course Assessment methods:

Direct	Indirect
1. Mid Model Exam 2. Model Exam 3. Viva voce	1. Course Exit Survey

1. Simple class, objects and array of objects.
2. Function overloading
   - Using class
   - Without class
3. Constructor, Destructor, Constructor overloading
4. Static data and Static function
5. Unary and binary operator overloading
   - Using friend function
   - Without using friend function

6. Program for simple inheritance
7. Program for inheritance using constructors in derived classes ,virtual base classes and virtual functions
8. Data conversions
9. Virtual function and virtual base class
10. Class templates, Function templates
11. Exception handling
12. UML Diagrams for an application

Total Hours: 45

U15ITP304 **WEB DESIGN PROJECT LAB**

L	T	P	C
0	0	3	1

Outcomes (COs):

After successful completion of this course, the students should be able to

CO1	Define the basics in web design	K1
CO2	Visualize the basic concept of HTML.	K2
CO3	Recognize the elements of HTML & CSS	K3

Pre-requisite courses: Nil

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					M			M		M		M
CO2	M							M				M
CO3	S				M			M		M		M

Course Assessment methods:

Direct	Indirect
1. Mini Project Presentation 2. Viva voce	1. Course Exit Survey

Module 1

Web Design Principles

Basic principles involved in developing a web site
Planning process
Five Golden rules of web designing
Designing navigation bar
Page design
Home Page Layout
Design Concept.

Module 2

What is HTML
HTML Documents
Basic structure of an HTML document
Creating an HTML document

Mark up Tags
Heading-Paragraphs
Line Breaks
HTML Tags.

Module 3
Elements of HTML
Introduction to elements of HTML
Working with Text
Working with Lists, Tables and Frames
Working with Hyperlinks, Images and Multimedia
Working with Forms and controls.

Module 4
Introduction to Cascading Style Sheets
Concept of CSS
Creating Style Sheet
CSS Properties
CSS Styling(Background, Text Format, Controlling Fonts)
Working with block elements and objects
Working with Lists and Tables
CSS Id and Class
Box Model(Introduction, Border properties, PaddingProperties, Margin properties)
CSS Advanced(Grouping, Dimension, Display,Positioning, Floating, Align,Pseudo class,Navigation Bar,Image Sprites, Attribute sector)
CSS Color
Creating page Layout and Site Designs.

Module 5
Introduction to Web Publishing or Hosting
Creating the Web Site
Saving the site
Working on the web site
Creating web site structure
Creating Titles for web pages
Themes-Publishing web sites.

REFERENCES

1. Kogent LearningSolutions Inc.HTML 5 in simple stepsDreamtech Press
2. Steven M. SchaferHTML, XHTML, and CSS Bible, 5edWiley India
3. Ian Pouncey, Richard York Beginning CSS: Cascading Style Sheets forWeb Design Wiley India

L	T	P	C
0	0	2	1

U15GHP301 FAMILY VALUES

(Common to all branches of Engineering and Technology)

Objectives

1. To understand the importance of family and to contribute to it
2. To lead spiritual development through good family life.
3. To respect womanhood
4. To lead a healthy and disease free life

Course outcomes:

After successful completion of the course, the student would be able to:

1. The students shall understand the importance of a family
2. The students shall acquire skills in simplified Kundalini yoga for sound health.
3. The students shall learn about greatness of womanhood
4. The students shall learn about the importance of Blessings and relationship
5. The students shall know about simplified Kundalini yoga, its methodology and its benefits

Pre-requisite: Nil

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1						M		M	S	W		M		
CO2						S	M		W			S		
CO3						W						M		
CO4						M			M			S		
CO5						M						M		

Course Assessment methods:

Direct	Indirect
1.Individual Assignment 2.Group Assignment 3.Presentation 4.Surprise Test 5.Practical Assessment 6.End Semester Assessment	1.Attendance and Behavioural Assessment

Introduction to Family Life – An Overall Perspective 1 Periods

Personal & Spiritual development through good Family life 1 Periods

Importance of Relationships & Blessings 3 Periods

Food as Medicine – Quantum Healing	3 Periods
Greatness of womanhood	2 Periods
Simplified Physical Exercises (Kundalini Exercises)	5 Periods

Total Periods: 15

REFERENCES

1. Vethathiri's Maharishi's, "Yoga for Modern Age", The World Community Service Centre, Vedhathiri Publications, 2009.
2. Swami Vivekananda, "The Man Making Message" The Ramakrishna Tapovanam, Published 1972.
3. Vethathiri's Maharishi's, "Manavalakalai part 1,2&3" 1^{1th} edition, The World Community Service Centre, Vethathiri Publications,2005.
4. Brian L Weiss, "Only Love is Real" by Grand Central Publishing, Published 1997.

SEMESTER IV

U15MAT403 **DISCRETE MATHEMATICS**

L	T	P	C
3	2	0	4

Course Outcomes:
After successful completion of this course, the students should be able to

CO1	Have a better understanding of sets and application of set theory.	K2
CO2	Acquire the knowledge of relations, equivalence relations and their properties.	K2
CO3	Understand different kinds of functions.	K2
CO4	Understand logical arguments and constructs simple mathematical proofs.	K2
CO5	Know various graphs and learn different algorithms.	K2
CO6	Acquire the knowledge of partially ordered sets, lattices, Boolean algebra and able to apply in circuits.	K2

Pre-requisite: Set theory, Functions.

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M							M	M		
CO2	S	M							M	M		
CO3	S	M							M	M		
CO4	S	S							M	M		
CO5	S	S							M	M		
CO6	S	S							M	M		

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignment 3. Case Study	1. Course Exit Survey

SET THEORY 4 Hours

Algebra of sets – The power set – Ordered pairs and Cartesian product – principle of inclusion and exclusion.

RELATIONS 5 Hours

Relations on sets –Types of relations and their properties –Relational matrix and the graph of relation – Operations on relations - Transitive closure - Warshall's algorithm- Equivalence relations.

FUNCTIONS 9 Hours

Functions – Classification of functions –Type of functions – Injective, surjective and bijective functions –Composition of functions – Inverse functions – Characteristic function of a set – Permutation functions.

LOGIC 9 Hours

Propositions- Logical operators- Normal forms –Rules of inference-Consistency and inconsistency-Propositional logic- Proofs-Predicates- Quantifiers- Universe of discourse – Logical equivalences and implications for quantified statements-Rules of specification and generalization – Validity of arguments.

GRAPH THEORY 9 Hours

Graphs- Handshaking theorem- Types of graphs- Sub-graphs-Matrix representation of graphs-Graph isomorphism- Operation on graphs-Path- Cycles- Eulerian graphs -Hamiltonian graphs-Planar graphs- Euler formula- Shortest path algorithms.

BOOLEAN ALGEBRA AND LATTICES 9 Hours

Partial order relations- Posets- Hasse diagram- Lattices- Properties of lattices- Boolean Algebra and Boolean Functions- Introduction to Boolean algebra and Boolean functions- Different representations of Boolean functions- Application of Boolean functions to synthesis of circuits.

Theory: 45 hours **Tutorial : 0 hour** **Total Hours: 45**

REFERENCES

1. Liu C.L, "Elements of Discrete Mathematics, Second Edition, Mc Graw Hill 1985.
2. Mott J.L, Kandel A. and Baker T.P., "Discrete Mathematics for Computer Scientists and Mathematicians, Second Edition, Prentice Hall India, 1986.
3. Harary F, Graph Theory, Narosa, 1969.
4. Thomas H.C., A Leiserson C.E., Rivest R.L, Stein C.A., "Introduction to a Algorithms (2^{nd} Edition), MIT press and McGraw-Hill, 2001.

U15ITT401 **DATABASE MANAGEMENT SYSTEMS**

L	T	P	C
3	0	0	3

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1	Outline an ER model for a defined problem	K3
CO2	Explain the basic concepts of query processing, transaction and storage management	K2
CO3	Explain the basic concepts of distributed databases, XML and Database Security.	K2
CO4	Design a database for a given problem.	K3

Pre-requisite: Nil

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M					M					
CO2	M											
CO3	M											
CO4	S	M			M		M		S	S		M

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Mini project 3. Assignment	1. Course Exit Survey

INTRODUCTION **9 Hours**

Database system Architecture - Relational Databases-Formal Relational Query Languages-Introduction to SQL

DATABASE DESIGN **9 Hours**

Advanced SQL: Accessing SQL from a Programming Languages-Functions and Procedures-Triggers.

Database Design and E-R Model: Overview-Entity Relationship Model-Constraints-Removing Redundant Attributes in Entity Sets-E-R Diagrams -Case study

Relational Database Design –Normalization- Features of Good Relational Database Design – Informal Guide Lines For Relational Schemas- Decomposition Using Functional Dependencies-Functional Dependency Theory-First, Second, Third And Boyce Codd Normal Forms. –case study

DATA STORAGE AND QUERYING 9 Hours

Data Storage: Overview of Physical Storage Media-RAID-File Organization-Organization of Records in Files-Data Dictionary Storage.

Data Indexing and Hashing: Basic Concepts-Ordered Indices-B+ Tree Index Files-Multiple Key Access-Static and Dynamic Hashing.

Query Processing: Overview-Measures of Query Cost-Selection, Sorting and Join Operations-Other Operations-Evaluations of Expressions.

TRANSACTION MANAGEMENT 9 Hours

Transaction Management: Transaction Concept-Transaction Model-Transaction Atomicity, Durability and Isolation-Serializability

Concurrency Control: Lock Based Protocols-Time Stamped Based Protocols-Deadlock Handling

Recovery System: Failure Classification-Storage-Log Based Recovery-Shadow Paging

ADVANCED TOPICS 9 Hours

Distributed Databases–Homogeneous and Heterogeneous Databases– Distributed Data Storage–Distributed Transactions–Commit Protocols- concurrency control-

XML-Structure-Document Schema- Querying and Transformation-Storage of XML data

Database Security- Issues-Granting and Revoking Privileges-Encryption and Public Key Infra Structure.

Theory: 45 hours **Tutorial: 0 hour** **Total hours:45**

REFERENCES

1. Abraham Silberschatz, Henry Korth, and S. Sudarshan, "Database System Concepts", Sixth edition, McGraw-Hill.2011.
2. R. Elmasri and S. Navathe, "Fundamentals of Database Systems", Sixth Edition, Pearson Education,2011
3. Thomas M. Connolly and Carolyn E. Begg, "Database Systems - A Practical Approach to Design, Implementation, and Management", fifth edition, Pearson Education, 2010.
4. C.J.Date, A.Kannan and S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.

U15ITT402 COMPUTER NETWORKS

L	T	P	C
3	0	0	3

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1	Explain the functionality of each layer of OSI reference model.	K2
CO2	Explain the protocols operating in each layer of OSI model.	K2
CO3	Summarize the internet congestion control and QoS mechanisms.	K2
CO4	Analyze Network traffic.	K4

Pre-requisite: Nil

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											M
CO2	M					M						
CO3	M											M
CO4	M	M			M							M

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Model Exam 3. Assignment 4. Workshop – Traffic Analysis (CO4)	1. Course Exit Survey

DATA COMMUNICATIONS **7 Hours**

Data Communication- Networks-The OSI Model- Layers in the OSI Model – TCP/IP Protocol Suite – Addressing

APPLICATION LAYER **9 Hours**

Domain Name System – Electronic Mail : SMTP and MIME – File Transfer: FTP - WWW : HTTP

TRANSPORT LAYER **9 Hours**

UDP – TCP – TCP Congestion Control – Congestion Avoidance Mechanisms – Quality of Service : Integrated Services – Differentiated Services.

NETWORK LAYER 9 Hours

WAN Protocols: Circuit Switching – Packet Switching – LAN: Bridges, Hubs and Switches – Internetworking – IPV4 Addressing - Routing Techniques: Distance vector (RIP) – Link state (OSPF) – Inter domain Routing (BGP).

DATA LINK LAYER 11 Hours

Flow control: Go back n ARQ - Selective repeat- Sliding window – Error control: Parity-CRC-Hamming code – IEEE Standards: CSMA - Token bus - FDDI – Network Traffic Analysis.

Theory: 45 hours **Tutorial: 0 hour** **Total hours:45**

REFERENCES

1. Behrouz A. Forouzan, "Data communication and Networking", Tata McGraw-Hill, Fifth Edition, 2012.
2. William Stallings, "Data and Computer Communications", Tenth Edition, Pearson Education, 2014.
3. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers Inc., 2011.
4. James F. Kurose, Keith W. Ross, "Computer Networking, A Top-Down Approach Featuring the Internet", Sixth Edition, Pearson Education, 2012.
5. Nader F. Mir, "Computer and Communication Networks", First Edition, Pearson Education, 2007.
6. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill Publisher, 2011.

U15ITT403 COMPUTER ARCHITECTURE

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Understand micro level operations of computer using the concepts of hardware and software coordination.	K2
CO2	Compare different types of memories and their performances.	K3
CO3	Apply the knowledge of binary arithmetic operations to understand the design of hardware components	K3
CO4	Enumerate various control methodologies using programming and their effect on the hardware components	K3
CO5	Understand the performance enhancement techniques for data handling and I/O handling	K2

Pre-requisite: Digital Systems and Design

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2	M	M										M
CO3	S											
CO4	S	M										
CO5		S										

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. End Semester Exam 3. Assignment / Seminar	1. Course Exit Survey

BASIC STRUCTURE OF COMPUTERS 7 Hours

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.

MEMORY SYSTEM 8 Hours

Basic Concepts - Semiconductor RAM- ROM- Speed, Size and Cost - Cache Memories - Performance Considerations - Virtual Memory- Memory Management Requirements.

ARITHMETIC UNIT 11 Hours

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.

BASIC PROCESSING UNIT 10 Hours

Fundamental Concepts - Execution of a Complete Instruction - Multiple Bus Organization - Hardwired Control – Microprogrammed Control – Microinstructions- Microprogram Sequencing-Wide Branch Addressing-Microinstructions with Next-Address Field

PIPELINING AND I/O ORGANIZATION 9 Hours

Pipelining - Basic Concepts - Data Hazards - Instruction Hazards - Influence on Instruction Sets- Data path and Control considerations- Superscalar operation. Accessing I/O Devices - Interrupts - Direct Memory Access.

Theory: 45 hours **Tutorial: 0 hour** **Total Hours: 45**

REFERENCES

1. Carl Hamacher, ZvonkoVranesic and SafwatZaky, “Computer Organization”, 5th Edition McGraw-Hill, 2014.
2. R.D.Dowsing, F.W.D.Woodhams and Ian Marshall, “Computers From Logic To Architecture”, Mcgraw Hill Publishing Company, UK, 2000
3. Ian East, “Computer Architecture And Organization”, Pitman Publishing, (A Division Of Longman Group UK Limited), Taylor & Francis E-Library, 2005
4. William Stallings, “Computer Organization and Architecture - Designing for Performance”, 9th Edition, Prentice Hall, 2012.
5. David A.Patterson and John L.Hennessy, “Computer Organization and Design: The hardware / software interface”, 4th Edition, Morgan Kaufmann, 2008.
6. John P.Hayes, “Computer Architecture and Organization”, 3rd Edition, McGraw Hill, 2002.

U15ITT404 **OPERATING SYSTEMS**

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Experiment with various CPU scheduling algorithms with the understanding of operating system concepts	K3
CO2	Explain the need for process coordination	K2
CO3	Apply the various memory management strategies	K3
CO4	Illustrate the various file management strategies	K2
CO5	Explain about disk management	K2

Pre-requisite: Nil

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M										M
CO2	M	M										M
CO3	S	M										M
CO4	M	M										M
CO5	M	M										M

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. End Semester Exam 3. Assignment	1. Course Exit Survey

INTRODUCTION AND PROCESS MANAGEMENT 10 Hours

Introduction: Operating System Structure – Operating System Operations – Process Management – Memory Management – Storage Management – Protection and Security – Computing Environments – Operating System Structures: Operating System Services – User and Operating System Interface – System Calls – Types of System Calls – System Programs – Process Concept- Process Scheduling – Operations on Processes – Inter-process Communication–**Threads:** Overview – Multithreading Models – Threading Issues.

Process Scheduling: Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Multiple-Processor Scheduling

PROCESS COORDINATION 10 Hours

Synchronization – The Critical-Section Problem – Peterson's Solution – Synchronization Hardware – Semaphores – Classic problems of Synchronization – Monitors–Deadlocks: System Model – Deadlock Characterization – Methods for Handling Deadlocks – Deadlock Prevention – Deadlock Avoidance – Deadlock Detection – Recovery from Deadlock

MEMORY MANAGEMENT 10 Hours

Main Memory: Swapping – Contiguous Memory Allocation – Paging – Structure of the Page Table – Segmentation.

Virtual Memory: Demand Paging – Copy on Write – Page Replacement – Allocation of Frames – Thrashing.

FILE MANAGEMENT 8Hours

File System Interface: File Concept – Access Methods – Directory and Disk Structure – File Sharing – Protection- **File System Implementation:** File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free-space Management.

SECONDARY-STORAGE MANAGEMENT 7 Hours

Mass Storage Structure: Disk Structure – Disk Scheduling – Disk Management – Swap-Space Management. Devices – Device controllers–Device drivers.

Case Study: Linux system, Windows 7

Theory: 45 hours **Tutorial: 0 hour** **Total Hours:45**

REFERENCES

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", John Wiley & Sons (Asia) Pvt. Ltd, Ninth Edition, 2013.
2. Gary Nutt, "Operating Systems- A Modern Perspective", Pearson Education Pvt. Ltd, Second Edition, 2002.
3. Andrew S. Tanenbaum, "Modern Operating Systems", 3rd edition Prentice Hall of India Pvt. Ltd, 2010.
4. Harvey M. Deitel, "Operating Systems", Pearson Education Pvt. Ltd, Third Edition, 2003.
5. William Stallings, "Operating System", Pearson Education, Sixth edition, 2012.

U15GST008 FOUNDATIONS SKILLS IN INTEGRATED PRODUCT DEVELOPMENT

L	T	P	C
3	0	0	3

Course Objectives:

- To facilitate the acquisition of the foundation skills in the process- tools and techniques in the Integrated Product Development area of the Engineering Services industry.
- To provide the requisite understanding towards application of academic topics from engineering disciplines into real world engineering projects

Course Outcomes (CO):

After Successful completion of this course, the students will be able to :

CO1	Analyze various factors affecting the product development decision and their importance on new product development	K4
CO2	Comparison of various products and services, types and methods of product development, its planning and management.	K4
CO3	Analyze and apply the requirement based on critical parameters and develop system models.	K4
CO4	Apply and analyze the conceptualization, design prototyping ,testing certification and documentation processes related to product development	K3/K4
CO5	Apply and analyze concepts of product maintenance and strategies for obsolescence management, replacement and disposal.	K3/K4
CO6	Demonstrate understanding of product development in academic and real life situations, breakeven and tradeoff analysis in product development, IPR and security aspects related to product development.	K2

Pre-requisite: Nil

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S		S		S		W	W	M	W	S
CO2	M		S			W			M	M	W	
CO3		M	S	W	M							
CO4			S						M	S		
CO5			M	S				M				
CO6							M					M

Course Assessment Methods:

Direct	Indirect
1. Assignment 2. Internal Text 3. Group presentation 4. End Semester Exam	Course end survey

FUNDAMENTALS OF PRODUCT DEVELOPMENT **10 Hours**

Global Trends Analysis and Product decision: Types of various trends affecting product decision - Social Trends (Demographic, Behavioral, Psychographic), Technical Trends (Technology, Applications, Tools, Methods), Economical Trends (Market, Economy, GDP, Income Levels, Spending Pattern, target cost, TCO), Environmental Trends (Environmental Regulations and Compliance), Political/Policy Trends (Regulations, Political Scenario, IP Trends and Company Policies); PESTLE Analysis.

Introduction to Product Development Methodologies and Management: Overview of Products and Services (Consumer product, Industrial product, Specialty products etc); Types of Product Development (NPD/ Re-Engineering (Enhancements, Cost Improvements)/ Reverse Engineering/ Design Porting & Homologation); Overview of Product Development methodologies (Over the Wall/ Waterfall/ V-Model/ Stage-Gate Process/ Spiral/Systems Engineering/ Agile); Product Life Cycle (S- Curve, Reverse Bathtub Curve); Product Development Planning and Management (Budgeting, Risk, Resources and Design Collaboration, Scheduling, Change Management, Product Cost Management).

REQUIREMENTS AND SYSTEM DESIGN **8 Hours**

Requirement Engineering: Types of Requirements (Functional, Performance, Physical, Regulatory, Economical, Behavioral, Technical, Stakeholder, Environmental, Industry specific, Internal-Company Specific); Requirement Engineering (Gathering (VOC), Analysis (QFD), Design Specification); Traceability Matrix and Analysis; Requirement Management.

System Design & Modeling: Introduction to System Modeling; System Optimization; System Specification; Sub-System Design; Interface Design.

DESIGN AND TESTING **13 Hours**

Conceptualization: Industrial Design and User Interface Design; Introduction to Concept generation Techniques; Concept Screening & Evaluation - Concept Design, S/W Architecture, Hardware Schematics and simulation.

Detailed Design: Component Design and Verification; High Level Design/Low Level Design of S/W Programs, S/W Testing; Hardware Schematic, Component design, Layout and Hardware Testing. **Prototyping:** Types of Prototypes (Mockups, Engineering Assessment Prototype, Alpha, Beta, Gama); Introduction to Rapid Prototyping and Rapid Manufacturing.

System Integration, Testing, Certification and Documentation: Manufacturing/Purchase and Assembly of Systems; Integration of Mechanical, Embedded and S/W systems; Introduction to Product verification processes and stages – Industry specific (DFMEA, FEA, CFD); Introduction to Product validation processes and stages - Industry specific

(Sub-system Testing/ Integration Testing/ Functional Testing/ Performance Testing / Compliance Testing); Product Testing standards and Certification – Industry specific; Product Documentation (Compliance Documentation, Catalogue, Brochures, user manual, maintenance Manual, Spares Parts List, Warranty, Disposal Guide, IETMS, Web Tools).

SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT 6 Hours

Sustenance: Maintenance and Repair; Enhancements. **Product EoL:** Obsolescence Management; Configuration Management; EoL Disposal.

BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY 8 Hours

The Industry: Engineering Services Industry – Overview; Product development in Industry versus Academia.

The IPD Essentials: Introduction to vertical specific product development processes; Product development Trade-offs; Intellectual Property Rights and Confidentiality; Security and Configuration management.

Theory: 45 hours **Tutorials: 0 hour** **Total Hours: 45**

REFERENCES

1. Foundation Skills in Integrated Product Development (FSIPD), First Edition, 2013, Published by NASSCOM.
2. Ulrich, Karl T. and Eppinger, Steven D, "Product Design and Development", McGraw-Hill, Fifth Edition, 2012.
3. Kevin N. Otto, "Product design – Techniques in Reverse Engineering and New Product Development", PEARSON, New Delhi, 2011.

L	T	P	C
0	0	3	1

U15ITP401 DATABASE MANAGEMENT SYSTEMS LABORATORY

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1	Demonstrate the basic RDBMS commands	K2
CO2	Design a simple database application using E-R Model	K3
CO3	Develop a database using RDBMS	K3

Pre-requisite: Nil

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M										
CO2	S	S										S
CO3	S	S			S				S	S	S	S

Course Assessment methods:

Direct	Indirect
1.Mid Model Tests 2. Model Exam	1. Course Exit Survey

EXPERIMENTS

1. DDL and DML commands
2. Transaction control commands and aggregate functions
3. Joins and Nested Queries
4. Constraints and Views
5. High level programming language extensions (Control structures, Procedures and Functions).
6. Cursors and Triggers
7. Embedded SQL
8. Database Design and implementation with any one front end tool (Mini Project)

SAMPLE LIST OF PROJECTS

1. Hospital management
2. Railway ticket reservation
3. Student Mark list processing
4. Employee pay roll processing
5. Inventory control

Total Hours:45

U15ITP402 NETWORKS LABORATORY

L	T	P	C
0	0	3	1

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1	Develop skills to use network simulation tools.	K2
CO2	Analyze the network traffic.	K3
CO3	Analyze the performance of network protocols.	K3
CO4	Implement network protocols.	K2

Pre-requisite courses: Nil

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W- Weak

COs	Programme Outcomes(POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	M				M							
CO2	S				M							M
CO3	S				M							M
CO4	M											

Course Assessment methods:

Direct	Indirect
1.Mid Model Tests 2. Model Exam	1. Course Exit Survey

LIST OF EXPERIMENTS

1. Study of network simulation tools such as Wireshark/IPTrace/NS2/QUALNET.
2. Analyze the network traffic using Wireshark tool.
   Extract telnet password from a packet
   Extract image from a packet
   Capture packet sent from a particular IP
   Capture the packets of a specific protocol
3. Design and study the performance of Network topology using simulator.
4. Performance analysis of TCP/UDP protocol using simulation tool
5. Demonstrate the working of network tools such as Ping, TCPDump, Traceroute, Netstat, IPconfig.
6. Implementation of distance vector routing protocol
7. Implementation of link state routing protocol.
8. Implementation of bit stuffing and CRC protocol.
9. Implementation of sliding window protocol that uses Go Back N ARQ.
10. Implementation of sliding window protocol that uses Selective Repeat ARQ

Total Hours: 45

L	T	P	C
1	0	0	1

U15GHP401 PROFESSIONAL VALUES

(Common to all branches of Engineering and Technology)

Objectives

1. To sensitize students about being professional
2. To sensitize about the importance of being ethical in one's profession
3. To understand various leadership theories
4. To understand the concept of karma yoga (Self less Work)
5. To be aware of the current strengths and weakness and how to develop on strengths

Course outcomes:

After successful completion of the course, the student would be able to:

1. The Students shall acquire knowledge on the Clarity, courage, confidence, commitment, compassion this required for a good professional
2. The Students shall understand the concept of Karma Yoga and lead his/her life accordingly
3. The Students shall understand the importance of ethics in ones profession and practice it
4. The Students shall get acquainted with leadership theories and use them in his/her profession appropriately
5. The Student shall learn how to be an empowered professional and how to empower colleagues

Pre-requisite: Nil

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M	W			W	M	M	M			M
CO2		W				M	S	M	M			S
CO3					M		S	S	W	W		M
CO4		W				M	M	M	S	W		M
CO5		W				M	M	W	M			M

Course Assessment methods:

Direct	Indirect
1.Individual Assignment 2.Group Assignment 3.Presentation 4.Surprise Test 5.Practical Assessment 6.End Semester Assessment	1.Attendance and Behavioural Assessment

Introduction to Professional Values	1 Period
Concept of Integral Karma Yoga	3 Periods
Professional Ethics	3 Periods
Eastern and Western Leadership Theories	2 Periods
Empowerment of a Professional	4 Periods
Advanced Contemplative Practices with Demonstrations	2 Periods
	Total Periods: 15

REFERENCES

1. Rishabhchand, "Integral Yoga of Sri Aurobindo", Sri Aurobindo Ashram Publication Department, Pondicherry, Published 2001.
2. Charles E Harris, "Engineering Ethics: Concepts and Cases", 4th edition, Western Michigan University, Published 2009.
3. Devdas Menon, "Spirituality at Work", professor of structural engineering at IIT Madras.
4. Ameeta Mehra, "Karma Yoga: Perfection in Work", The Gnostic Centre, New Delhi, Published 2000.
5. Winthrop Sargeant,"The Bhagavad Gita", State University of New York, Published 1994.
6. D.R Kiran, "Professional Ethics& Human Values", The Mc Graw Hill/BSP Books, Published 2013.
7. S. Bhaskar, "Professional Ethics& Human Values", The Aunradha Agencies, Chennai, Published 2005.
8. Keith Ward & Cliff Bowman, "Extraordinary performance from ordinary people", Routledge, Published 2007.
9. Stephen Robbins, "Organization Behavior", The Prentice Hall; 15 editions, 2012.

SEMESTER V

U15ECT511 DIGITAL SIGNAL PROCESSING

L	T	P	C
3	1	0	4

Course Outcomes (COs):
After successful completion of this course, the students should be able to

CO1	Classify the various types of signals systems and perform basic operations on signals	K3
CO2	Analyze the Discrete time signals & systems using DTFT and Z transform	K4
CO3	Apply DFT to analyze signals and systems.	K3
CO4	Apply computationally efficient algorithms for DFT calculations	K3
CO5	Design and analyze FIR filters	K4
CO6	Design and analyze IIR filters	K4

Pre-requisite: Nil

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M										
CO2	M	M	M		M							
CO3	S	M	M									
CO4	M				M							
CO5	M	M										
CO6	M	M										

SIGNALS AND SYSTEMS 9 Hours

Introduction to signals - Continuous time and discrete time signals- Classification of signals - periodic and aperiodic, energy and power, odd and even signal- Transformation of independent variable – Shifting, scaling, folding – Continuous time and discrete time systems – Properties - Classification of systems – Convolution – Properties.

TRANSFORM AND SYSTEM ANALYSIS 9 Hours

Introduction to Fourier Transform and Discrete Time Fourier Transform - Z transform – Forward Transform - Inverse Transform using Partial Fractions - Properties – Pole-Zero plot – Difference Equations - Transfer function - Analysis of Discrete Time systems using DTFT and Z Transform.

DISCRETE FOURIER TRANSFORM 9 Hours

Introduction to Discrete Fourier Transform – Properties of DFT – Efficient computation of DFT – Fast Fourier Transform algorithms – Radix-2 FFT – Decimation-in-Time - Decimation–in-Frequency algorithms – Butterfly diagram.

DESIGN OF FIR FILTERS 9 Hours

FIR filter design: Linear phase characteristics - Windowing Technique –Rectangular and Hamming, windows - FIR filter structures Direct form and cascade forms – Linear phase realization.

DESIGN OF IIR FILTERS 9 Hours

IIR filter design: Analog filter design - Butterworth and Chebyshev approximations – Impulse invariance and Bilinear transformations - IIR filter structures – Direct form I and II - cascade and parallel forms.

Theory: 45 hours **Tutorial: 15 hours** **Total Hours: 60**

REFERENCES

1. Alan V. Oppenheim, Alan S. Willsky with S. Hamid Nawab, "Signals and Systems", Pearson Education, 2nd Edition, Re-print 2014.
2. John G. Proakis and Dimitris G. Manolakis, "Digital Signal Processing, Principles, Algorithms and Applications", PHI, 3rd Edition 2000.
3. Mrinal Mandel and Amir Asif, ―Continuous and Discrete Time Signals and Systems‖, Cambridge International Student Edition, Cambridge University Press, 2007.
4. Johny R.Johnson, ―Introduction to Digital Signal Processing‖, PHI, 2009.
5. Steven W. Smith, ―The Scientists and Engineer's Guide to Digital Signal Processing, California

U15ITT501 SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Compare various software development models.	K2
CO2	Translate end-user requirements into system requirements.	K2
CO3	Explain the importance of SQA, testing and cost estimation	K2
CO4	Identify software project planning and management activities	K2
CO5	Develop a simple automated system following software engineering principles	K3

Pre-requisite: Data Base Management Systems

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	W										
CO2	M	W										
CO3	M	W			M							
CO4	M	W										
CO5	S	M	M						M	W		W

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. End Semester Exam 3. Assignment 4. Seminar 5.Case study 6.Developing any application software	1. Course Exit Survey

INTRODUCTION 9 Hours

Expanding roles for computers, the place of Software, Software Engineering Discipline, Computer Based Systems, Increasing size and scope of software, Generic vs. Custom-made software products-distinctive characteristics of software products.

Software Development Models: Life cycle models-Linear Sequential, Evolutionary, Unified models, Agile development approach-Case study in processing model.

REQUIREMENTS ENGINEERING 9 Hours

Classification of Requirements-System Requirements and Software Requirements, Functional and Non-Functional requirements, Requirement Engineering Tasks.

System Models: Domain Analysis and Modeling, Data Models, Functional Models-Structured Analysis Model, Object Oriented Models- Cloud, State, Use Case Models, Sequence and Activity diagrams, Relationship among the Object Oriented Models, Building Object Oriented Analysis Models

SOFTWARE DESIGN AND IMPLEMENTATION 9 Hours

Architectural Design-Decomposition strategy, Partitions and Layers, Structured System Design-Use of Heuristics for Design Refinements, Object-Oriented Design- User Interface Design-Reusable Components, Patterns, Frame works, Coding – Choice of Programming Language, Coding Standards

SOFTWARE TESTING 9 Hours

Software Testing: Conventional Testing and SDLC Testing, Formal Technical Reviews, Walkthroughs, Inspections, Black-Box vs. Glass-Box Testing, Testing Strategies , Testing-Quality Dimensions, Process Quality and Product Quality, Quality Assurance Planning, Quality Measurements, Software Configuration Management.

SOFTWARE PROJECT MANAGEMENT 9 Hours

Software Projects, Project Feasibility Study, Project Planning, Project Organization, Estimation of Project Effort-Measuring Software Attributes and Productivity, COCOMO for Effort Estimation. Risk Management. Project Scheduling, Project Monitoring and Control-Assessment of Project Progress, Measurement during Software Projects.

Software Maintenance: Planning for Maintenance, maintenance Activities, Reengineering

Theory: 45 hours **Tutorial: 0 hour** **Total hours:45**

REFERENCES

1. R.S. Pressman, “Software Engineering – A Practitioner’s Approach”, Eighth edition, McGraw Hill International Edition, 2014.
2. Stephen Schach, “Software Engineering”, Seventh edition, TMH, New Delhi, 2007.
3. PankajJalote, “An Integrated Approach to Software Engineering”, Third edition, Narosa Publishing House, 2005.
4. M.Blaha and J.Rumbaugh, “Object Oriented Modeling and Design with UML”, Second edition, Prentice-Hall India, 2006.
5. I Sommerville, “Software Engineering”, Seventh edition, Pearson Education, 2004

U15ITT502 INTERNET AND JAVA PROGRAMMING

L	T	P	C
3	0	0	3

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1	Write a code for a webpage/website by understanding the basics of internet and HTML	K3
CO2	Analyze the salient features of Java over C++ and write programs using fundamental concepts.	K3
CO3	Understand the need of util, io packages in java and write simple programs for storing the data in database	K2
CO4	Apply the knowledge of event driven programming and GUIs to design & write program using applets and swings	K3

Pre-requisite: Object Oriented Methodologies and Programming

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	S	S	M						M	M		
CO2	S	S	M		M				M	M		
CO3	M	M										
CO4	S	S			M				M	M		

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Model Exam 3. Assignment 4.Group Projects	1. Course Exit Survey

INTERNET AND HTML-BASICS **9 hours**

Internet Addressing, Browsers, Servers, Protocols – Web Application Architectures, Development – Scripting Languages – Databases – Search Engines – Web Services – Collective Intelligence – Mobile Web – Features of Web 3.0

Style Sheets: HTML-CSS - Introduction to Cascading Style Sheets – Types- Core Syntax – Positioning-Text Effects-Filters -Animation

JAVA FUNDAMENTALS-I **8 Hours**

Java Fundamentals – Control Structures – Classes – Methods - Garbage Collection – Inheritance- String Handling

JAVA FUNDAMENTALS-II **10 Hours**

Packages -Interfaces – Exception Handling -– Thread model - Life Cycle – Synchronization - Inter-thread Communication-Annotation-Basics

I/O PACKAGE,UTIL PACKAGE AND JDBC **9 Hours**

File class – Stream classes – Util package: Collection Interfaces – Collection classes
Creating and Manipulating database-Row set Interface-Prepared Statements-Stored Procedures-Transaction Processing.

GUI PROGRAMMING IN JAVA **9 Hours**

Introduction-Applet class- Event handling-AWT Controls-Layout Managers-Introduction to Swing-SwingComponents:JButton-JTextField-JRadioButton-JcheckBox-JComboBox-JList-JPanel-JTextArea

Theory: 45 hours **Tutorial: 0 hour** **Total Hours:45**

REFERENCES

1. Herbert Schildt, "The Complete Reference– Java", Tata McGraw Hill, Ninth edition,2014
2. Deitel&Deitel , et.al "Internet & World Wide Web - How To Program", Pearson Education, Fifth Edition, 2011.
3. Deitel and Deitel, Java: How to Program, Ninth Edition, Prentice Hall, Tenth Edition,2014
4. Bruce Eckel , "Thinking in Java", Fourth Edition, Pearson Education, 2006
5. Cay S. Horstmann, Gary Cornell, "Core Java, Volume I—Fundamentals", Eighth Edition, Sun Microsystems,2011.
6. Cay S. Horstmann , "Core Java, Volume II—Advanced Features", Ninth Edition, Sun Microsystems,2012
7. Ying Bai "Practical Database Programming with Java", Wiley Publication, 2011.
8. Marc Loy, Robert Eckstein, Dave Wood, James Elliott, Brian Cole," Java Swing", Second Edition,2012

U15ITT503 **CRYPTOGRAPHY AND NETWORK SECURITY**

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Explain security attacks and issues in computer systems and networks.	K2
CO2	Describe symmetric and asymmetric algorithms related to cryptography.	K2
CO3	Explain the purpose and working of authentication and system level security algorithms.	K2
CO4	Identify & Apply the appropriate security mechanism for different computing environment and information systems.	K3

Pre-requisite: Computer Networks

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											W
CO2	M											M
CO3	M											M
CO4	S	M			S			M				M

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. End Semester Exam 3. Assignment /Case studies 4. Seminar – Security related tools	1. Course Exit Survey

INTRODUCTION **10 Hours**

OSI Security Architecture - Classical Encryption Techniques – CipherPrinciples– DataEncryptionStandard–BlockCipherDesignPrinciples and Modes of Operation– Evaluation Criteria for AES–AES Cipher– Triple DES– Placement of Encryption Function–Traffic Confidentiality.

PUBLICKEYCRYPTOGRAPHY **9 Hours**

Introduction to Number Theory -Key Management - Diffie-Hellman Key Exchange – Elliptic Curve Architecture and Cryptography – Confidentiality using Symmetric Encryption– Public Key Cryptography and RSA.

AUTHENTICATIONANDHASHFUNCTION **9 Hours**

Authentication Requirements – Authentication Functions – Message Authentication Codes–Hash Functions–Security of Hash Functions and MACs – Secure Hash Algorithm – HMAC Digital Signatures – Authentication Protocols–Digital Signature Standard.

NETWORKSECURITY **9 Hours**

Authentication Applications: Kerberos – X.509 Authentication Service– Electronic Mail Security–PGP–S/MIME-IP Security–Web Security.

SYSTEMLEVELSECURITY **8 Hours**

Intrusion Detection —Firewall Design Principles–Trusted Systems. Case study: Biometric authentication and Ethical Hacking

Theory: 45 hours **Tutorial: 0 hour** **Total Hours:45**

REFERENCES

1.William Stallings, "Cryptography and Network Security – Principles and Practices", Fifth edition, Prentice Hall of India, 2010.

2. AtulKahate, "Cryptography and Network Security", 2nd Edition, Tata McGraw Hill, 2008

3. Bruce Schneier, "Applied Cryptography", JohnWiley & Sons Inc, 2001.

4.Charles P fleeger and Shari Lawrence P fleeger, "Security in Computing", Fourth edition, PearsonEducation,2015.

U15ITP501 SOFTWARE ENGINEERING LABORATORY

L	T	P	C
0	0	3	1

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Design a software requirement specification for the application	K2
CO2	Identify classes, methods, data flow (designing) for the application	K2
CO3	Develop the code and test cases for the specific problem	K2
CO4	Develop an automated system for the applications	K3

Pre-requisite: Data Base Management Systems Lab

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M										
CO2	M	M	M									
CO3	M	W			M							
CO4	S	S							M	W		W

Course Assessment methods:

Direct	Indirect
1. Mid Model Test 2. End Semester Exam 3. Mini Projects	1. Course Exit Survey

LIST OF EXPERIMENTS

SOFTWARE PROJECT DEVELOPMENT:

Develop a software development project using Rational Suite CASE Tool.

1. Problem Analysis and Project Planning

Thorough study of the problem – Identification of project scope, objectives and preparation of abstract.

2. Software Requirement Analysis

Describe the individual phases / modules of the project, identify deliverables. Prepare test plan and test cases.

3. Modelling

Use relevant work products like data dictionary, use case diagram, sequence diagram,

activity diagram, class diagram etc

4. Coding (using appropriate language)

5. Software Testing

Perform verification & validation at each stage and generate appropriate reports.

SUGGESTED LIST OF SAMPLE PROJECTS:

Develop the following using Software Engineering Methodology:

1. College Information System
2. Super Market Automation System
3. Restaurant Automation System
4. Judiciary Information System
5. Student Academic Record Management System
6. Medicine Shop Automation
7. Automobile Parts Shop Automation
8. Quiz System
9. ATM Systems
10. Railway Ticket Reservation System
11. Payroll Processing System
12. Inventory System
13. Library Management System
14. Book Shop Automation System
15. Online shopping

Total Hours:45

U15ITP502 JAVA PROGRAMMING LABORATORY

L	T	P	C
0	0	3	1

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Write programs and design a website using HTML	K3
CO2	Develop programs using the fundamental concepts in java	K3
CO3	Develop applications to write programs using inbuilt packages and store the data in the database	K3
CO4	Design GUI using applets/Swing and write events to handle it	K3

Pre-requisite: Object Oriented Methodologies and Programming

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S			M							
CO2	S	S	M		M							M
CO3	M	M										M
CO4	M	M										M

Course Assessment methods:

Direct	Indirect
1.Mid Model Test 2. End Semester Exam	1. Course Exit Survey

LIST OF EXPERIMENTS

1. Design a website using HTML tags
2. Simple animations using filters, text effects
3. Simple programs in java using classes and methods
4. Program for method overloading and method overriding
    - Use the concept of Multiple Packages and Interface Inheritance

5. Program using inbuilt methods of string class.
6. Program for user defined exception handling
7. Program for simple thread creation using Thread class, Runnable Interface
8. Program for inter-thread communication and synchronization
9. Program using input streams and output streams
10. Programs using JDBC for developing real time applications
11. Program for event handling and layouts in applets for AWT controls /Swing (2 experiments)

Total Hours: 45

U15ENP501 COMMUNICATION SKILLS LABORATORY

L	T	P	C
0	0	3	1

(Common to all branches of Engineering and Technology)

Course Outcomes (COs)
After successful completion of this course, the students should be able to

CO1	Imparting the role of communicative ability as one of the soft skills needed for placement	K2
CO2	Developing communicative ability and soft skills needed for placement	K2
CO3	Making students Industry-Ready through inculcating team-playing capacity	K2

Pre-requisite: Technical English, Business Communication and Presentation Skills

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				M		S			S			
CO2				W					S	S	S	M
CO3									S	S	S	M

Course Assessment methods:

Direct	Indirect
1. Presentation, Role Play, Mock interview, GD etc.	

GRAMMAR IN COMMUNICATION 9 Hours

Grammar and Usage – Building Blocks, Homonyms, Subject and Verb Agreement, Error Correction - Grammar Application, Framing Questions – Question words, Verbal Questions, Tags, Giving Replies –Types of Sentences, Listening Comprehension –Listening and Ear training.

ASSERTIVE COMMUNICATION 9 Hours

Listening Comprehension in Cross–Cultural Ambience, Telephonic Conversations/Etiquette, Role Play Activities, Dramatizing Situations- Extempore – Idioms and Phrases.

CORPORATE COMMUNICATION 9 Hours

Video Sensitizing, Communicative Courtesy – Interactions – Situational Conversations, Time Management, Stress Management Techniques, Verbal Reasoning, Current Affairs – E Mail Communication / Etiquette.

PUBLIC SPEAKING 9 Hours

Giving Seminars and Presentations, Nuances of Addressing a Gathering - one to one/ one to a few/ one to many, Communication Process, Visual Aids & their Preparation, Accent Neutralization, Analyzing the Audience, Nonverbal Communication.

INTERVIEW & GD TECHNIQUES 9 Hours

Importance of Body Language –Gestures & Postures and Proxemics, Extempore, Facing the Interview Panel, Interview FAQs, Psychometric Tests and Stress Interviews, Introduction to GD, Mock GD Practices.

Total Hrs: 45

REFERENCES

1. Bhatnagar R.P. & Rahul Bhargava, "English for Competitive Examinations", Macmillian Publishers, India, 1989, ISBN: 9780333925591
2. Devadoss K. & Malathy P., "Career Skills for Engineers", National Book Publishers, Chennai, 2013.
3. Aggarwal R.S., "A Modern Approach to Verbal & Non–Verbal Reasoning", S.Chand Publishers, India, 2012, ISBN : 8121905516

L	T	P	C
1	0	0	1

U15GHP501 **SOCIAL VALUES**

(Common to all branches of Engineering and Technology)

Objectives

1. To understand the genesis of society and social values
2. To understand the various sources of disparity among human beings
3. To empathize social issues and offer solutions wherever possible
4. To learn about social welfare organizations

Course outcomes:

After successful completion of the course, the student would be able to:

1. The students shall acquire knowledge about how societies are formed and social values are created
2. The students shall understand and empathize various social issues and contribute towards finding a solution
3. To understand the causes of disparity among human beings
4. To know about social welfare organizations and to use social media effectively
5. To understand various social parameters that influences individual and society at large

Pre-requisite: Nil

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		W				M	W	M	W			M
CO2		W	W			W	M	M		W		M
CO3		W				M	W	S				M
CO4		W				S		M	W	M		S
CO5			W		W	M	W			W		M

Course Assessment methods:

Direct	Indirect
1.Individual Assignment 2.Group Assignment 3.Presentation 4.Surprise Test 5.Practical Assessment 6.End Semester Assessment	1.Attendance and Behavioural Assessment

Introduction to Social Values – Society	2 Periods
Development of Science, Education, Politics & Economics	3 Periods
Disparity among human beings	3 Periods
Social Issues & Welfare	3 Periods
Social Welfare Organizations	2 Periods
Yogasanas & Meditation	2 Periods

Total Periods: 15

REFERENCES

1. Swami Vivekananda, "Prosperous India" 1st edition, The Ramakirshna Mission Institute of Culture, 1937.
2. Fritz Schumacher, "Small is Beautiful", The Blond & Briggs, Published 1973.
3. Vethathiri Maharishi, "Logical Solutions for the Problems of Humanity", The World Community Service Centre, Vethathiri Publications, 1999.
4. Sarvepalli Radhakrishnan, "The Source Book on Indian Philosophy", Princeton, N.J. : Princeton University Press, 1957.
5. Sarvepalli Radhakrishnan, "Religion, Science and Culture", The Orient Paperbacks, India, Published 1994.
6. Vethathiri's Maharishi's, "Vethathirian Principles of Life" The World Community Service Centre, Vethathiri Publications, 2003.

SEMESTER VI

U15ITT601 **WEB TECHNOLOGY**

L	T	P	C
3	0	0	3

Course Outcomes (COs):
After successful completion of this course, the students should be able to

CO1	Explain the need of java script and add various functionalities to a webpage using Javascript	K2
CO2	Interpret the role of XML and AJAX in web applications	K2
CO3	Illustrate the need of various server side technologies like PHP, JSP and Servlet to develop applications.	K3
CO4	Infer the knowledge of MVC architecture and web services	K2

Pre-requisite: Java Programming

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M										
CO2	M	M										
CO3	S	S	M		M				M	M		M
CO4	M	M										W

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Model Exam 3. Assignment 4. Seminar 5. Mini Projects	1. Course Exit Survey

CLIENT SIDE TECHNOLOGIES **8 Hours**

Introduction to HTML(Revision)-Client-Side Programming: Introduction to JavaScript – Functions – Objects – Arrays – Built - in Objects –Using JSON to represent Objects-DOM – Event Handling-Introduction to jQuery-Syntax

CLIENT SIDE TECHNOLOGIES:XML AND AJAX **9 Hours**

XML: Documents and Vocabularies –XML DTD-XML Schema-XSLT-XML parsers-AJAX:AJAX Framework-Web applications with AJAX-AJAX with databases.

SERVER SIDE TECHNOLOGIES -PHP **9 Hours**

PHP Basics-Arrays-Functions-Form handling with data- Pattern Matching -–Storing the data in DB

SERVER SIDE TECHNOLOGIES-SERVLETS AND JSP **9Hours**

Java Servlets-HTTP Protocol-Java Servlet API-Web Applications-Dynamic Web pages: JSP runtime architecture-tags-Expression Language

JSFAND WEBSERVICES **10Hours**

JSF: Introduction-MVC Architecture-Components of JSF-Tags-Restful Based Web services : Architecture-java. API for Restful Based Web Services-Developing and consuming Restful based web services in java - Introduction to enterprise beans-types-Lifecycle of enterprise beans

Theory: 45 hours **Tutorial: 0 hour** **Total hours:45**

REFERENCES

1. Deitel&Deitel , et.al "Internet & World Wide Web - How To Program", Pearson Education, Fifth Edition, 2011.
2. Dr.Danny Coward ,"Java EE7 :The Big picture",Mcgraw Hill Education,2014
3. Robert W. Sebesta,"Programming the World Wide Web", Eighth edition,, Pearson pulications,2015
4. Marty Hall and Larry Brown " Core Servlets and Java Server Pages , Volume1",Prentice Hall Education,Second Edition,2003
5. Uttam K Roy,"Web Technologies" Oxford University, 2011.
6. www.w3schools.com/jQuery
7. Frank P.Coyle,"XML,Web Services and the Data Revolution",Addison-Wesley,2002

U15ITTT602 **EMBEDDED SYSTEMS**

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Explain the characteristics and components of Embedded systems, their design tools and applications.	K2
CO2	Apply the fundamentals of digital system design and programming skills to develop Microcontroller based embedded applications.	K3
CO3	Understand the design life cycle of embedded applications.	K2

Pre-requisite: Digital Systems and Design

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M										
CO2	S				M							M
CO3	S								M			M

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. End Semester Exam 3. Assignment 4. Seminar	1. Course Exit Survey

INTRODUCTION OF EMBEDDED SYSTEM DESIGN **9 Hours**

Introduction to Embedded Systems – categories, specialities and recent trends – Selection of Embedded Processors, Microprocessors, Microcontrollers, DSP and ASICs, Comparative Assessment of Embedded processors. Embedded devices: Memory Devices, ROM and RAM Family, Interfacing Memory, I/O devices.

AN 8 BIT EMBEDDED PLATFORM **9 Hours**

PIC Microcontroller - Architecture of PIC Mid range series 16F – PIC16F877A – Memory organization – Special Function Registers(SFR) and General Purpose Registers(GPR) – Instruction set – FSR - Addressing modes – EEPROM – System peripherals - WDT

EMBEDDED SYSTEM SOFTWARE **9 Hours**

Real-Time Operating Systems **(RTOS):** Introduction, Real Time Issues – Modelling Timing Constraints – Scheduling - Memory Management, I/O Management and Device Drivers. Introduction to software design -Software Development life cycle, Software modelling. Tools for design, development and testing of embedded software.

EMBEDDED I/O AND COMMUNICATION 9 Hours

User peripherals - Input-Output Ports and Interfacing, Simple I/O Programming, Interrupts and their Servicing, Timing Devices and Interfacing, Analog I/O Techniques - Embedded Communication - Parallel Bus Standards, Serial Bus Standards, Networking Standards, Wireless Standards.

DESIGN AND APPLICATIONS 9 Hours

Field Programmable Devices and Applications, Introduction to Hardware Description Languages, Design of systems using Embedded Processors and Components, Design - Case Studies.

Theory: 45 hours **Tutorial: 0 hour** **Total Hours:45**

REFERENCES

1. Raj Kamal, "Embedded Systems Architecture, Programming and Design", Second edition, Tata McGraw-Hill, 2012.
2. Ajay V Deshmukh, "Microcontroller Theory and Applications", Tata McGraw-Hill, 2012.
3. Prasad K.V.K.K, "Embedded/Real-Time Systems: Concepts, Design and Programming", Dream Tech Press, Reprint, 2014.
4. David E.Simon, "An Embedded Software Primer", Pearson Education, 2013.
5. Daniel W Lewis, "Fundamentals of Embedded Software", Pearson Education Asia, 2011.
6. John B Peatman, "Designing with PIC Microcontroller", Pearson, 2013.

U15ITT603 MOBILE & PERVASIVE COMPUTING

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Explain the concepts and features of mobile computing and transmission technologies.	K2
CO2	Describe the architecture and working of wireless communication networks and protocols.	K3
CO3	To explore the characteristics of different types of wireless LAN networks.	K3
CO4	Explain the working of wireless routing protocols.	K2
CO5	Outline the characteristics of pervasive computing applications.	K2

Pre-requisite: Computer Networks.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2	M		M		M							
CO3	M	M					M		M			
CO4	M											
CO5	M											

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. End Semester Exam 3. Assignment 4. Seminar	1. Course Exit Survey

WIRELESS COMMUNICATION **9 Hours**

Cellular systems- Frequency Management and Channel Assignment- Types of Handoff and their Characteristics -Dropped Call Rates & their Evaluation - MAC - SDMA - FDMA - TDMA - CDMA - Cellular Wireless Networks.

MOBILE COMMUNICATION SYSTEMS **10 Hours**

GSM – Architecture -Location Tracking and Call Setup - Mobility Management- Handover- Security-GSM SMS –International roaming for GSM- call recording functions-subscriber

and service data management –Mobile Number portability -VoIP service for Mobile Networks –GPRS –Architecture-GPRS procedures-attach and detach procedures-PDP context procedure-combined RA/LA update procedures-Billing.

WIRELESS NETWORKS 9 Hours

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

MOBILE NETWORK AND TRANSPORT LAYERS 9 Hours

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

PERVASIVE COMPUTING 8Hours

Pervasive Computing- Principles, Characteristics- Interaction Transparency, Context aware, Automated Experience Capture. Architecture for Pervasive Computing- Pervasive devices- Embedded controls- Smart Sensors and Actuators -Context Communication and Access Services.

Theory: 45 hours **Tutorial: 0 hour** **Total Hours:45**

REFERENCES

1. Jochen Schiller, “Mobile Communications”, Second Edition, Pearson Education, 2003.
2. William Stallings, “Wireless Communications and Networks”, Pearson Education, 2009.
3. KavehPahlavan, Prasanth Krishnamoorthy, “Principles of Wireless Networks”, First Edition, Pearson Education, 2003.
4. Andreas F. Molisch, “Wireless Communications”, 2nd Edition, Wiley 2010.
5. SengLoke, “Context-Aware Computing Pervasive Systems”, Auerbach Pub., New York, 2007.
6. UweHansmannetl , “Pervasive Computing”, Springer, New York, 2001.

U15ITT604 DATA WAREHOUSING AND DATA MINING

L	T	P	C
3	0	2	4

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Identify the characteristics of data warehouse	K2
CO2	Explore the various data mining algorithms	K2
CO3	Extract knowledge using classification techniques.	K3
CO4	Explore various data mining tools.	K3

Pre-requisite: Database Management System

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M										
CO2	M	M										
CO3	S	S	M	M		M	M			M		
CO4	M	M	M		S					M		S

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Case study 3. Assignment 4. Mini project	1. Course Exit Survey

DATA WAREHOUSING **9 Hours**

Data warehouse and OLAP technology – Types of Database – Multidimensional data model – Data warehouse architecture.

DATA MINING PRIMITIVES AND CONCEPT DESCRIPTION **9 Hours**

Data preprocessing-Data mining primitives – Data mining query language - Concept description – Data generalization and characterization – Analytical characterization – Mining descriptive statistical measures in large databases- Mining frequent patterns, Associations, and Correlations

CLASSIFICATION AND PREDICTION 9 Hours

Introduction – Decision tree induction – Bayesian classification – Back propagation – Lazy learners – Other classification methods – Prediction – Evaluating the accuracy-Case study in social media analysis

CLUSTERING TECHNIQUES 9 Hours

Similarity and distance measures – Hierarchical algorithms – Partition algorithms – Outlier analysis

ADVANCED TOPICS 9 Hours

Web mining – Web content mining – Structure and Usage mining – Spatial mining – Time series and sequence mining – Graph mining

List of Experiments 15 Hours

1. Exercise on Data warehouse design for an enterprise
2. Exercise on Classification algorithms
3. Exercise on Clustering algorithms
4. Exercise on Discovering Association Rules
5. Exercises on Data mining tools

Theory: 45 hours Practical : 15 hours Total Hours:60

REFERENCES

1. J. Han, M Kamber, "Data Mining: Concepts and Techniques", Third edition, Elsevier, New Delhi, 2011.
2. Dunham M, "Data Mining: Introductory and Advanced Topics", Prentice Hall, New Delhi, 2002.
3. Trevor Hastie, Robert Tibshirani, Jerome Friedma, "The Elements of Statistical Learning: Data Mining, Inference and Prediction", Prentice Hall, New Delhi, Second Edition, 2009.
4. Hand.D, Mannila H, Smyth.P, "Principles of Data Mining", MIT press, USA, 2001.

U15ITP601 WEB TECHNOLOGY LABORATORY

L	T	P	C
0	0	3	1

Course Outcomes (COs):
After successful completion of this course, the students should be able to

CO1	Demonstrate the creation of interactive web pages	K3
CO2	Develop distributed java applications and XML documents based on AJAX	K3
CO3	Create applications using different types of web services and frameworks	K3

Pre-requisite: Java Programming Laboratory

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	W		S				M	M		
CO2	M	W			M							
CO3	M	M	W		M				M	M		M

Course Assessment methods:

Direct	Indirect
1.Mid Model Exam 2.Model exam 3. Viva voce 4. Projects	1. Course Exit Survey

LIST OF EXPERIMENTS:

1. Client side scripts for validating web form controls and creating events using Java Script
2. Program using JSON and Javascript
3. Program using XML Schema
4. Program using XSLT/XSL and AJAX
5. Web application development using PHP(2 experiments)
6. Web application development using JSP with JDBC
7. Session tracking and cookies management using Servlet
8. Creation of Restful based web services and consume it an application
9. Study of Struts/Spring Frameworks
10. Creation of web enabled applications using Struts/Spring Framework (2 experiments)

Total Hours:45

U15ITP602 **EMBEDDED SYSTEMS LABORATORY**

L	T	P	C
0	0	3	1

Course Outcomes (COs):
After successful completion of this course, the students should be able to

CO1	Understand the microcontroller programming and interfacing	K2
CO2	Develop skills related to designing embedded systems applications	K3
CO3	Apply the various tools for designing Embedded Systems	K3

Pre-requisite: Digital System and Design

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S	S										
CO2	S	M	M								1.	2.
CO3	M	M	M		M						3.	4.

Course Assessment methods:

Direct	Indirect
1.Mid Model Exam 2.Model exam 3. Viva voce 4. Projects	1. Course Exit Survey

LIST OF EXPERIMENTS:

1. Programming exercises using PIC Microcontrollers
2. Interfacing exercises using PIC Microcontrollers
   i) I/O Programming, Timers, Interrupts, Serial port programming
   ii) PWM Generation, Motor Control, ADC/DAC, LCD and RTC Interfacing, Sensor Interfacing
3. Study of one type of Real Time Operating Systems (RTOS).
4. Familiarity with Programmable Logic Devices using Xilinx/Altera FPGA and CPLD.
5. Simulation of simple applications of embedded processors in signal processing, real time control and consumer electronics using MATLAB/ LABVIEW.

Total hours: 45

L	T	P	C
1	0	0	1

U15GHP601 NATIONAL VALUES

(Common to all branches of Engineering and Technology)

Objectives

1. To enlighten students about responsible citizenship and polity
2. To sensitize the greatness of India and Indian Culture and to encourage students to uphold them
3. To be aware of the India's messages to world and propagate them as when possible
4. To understand about the uniqueness of India
5. To know about famous Indian personalities and their characteristics and to know about their contributions

Course outcomes:

After successful completion of the course, the student would be able to:

1. The Students shall acquire knowledge on the Enlightened Citizenship.
2. The Students shall know skills the greatness of India and Indian Culture.
3. The students shall be aware of the messages of India to the world
4. The Students shall be aware of the uniqueness of India
5. The students shall know about the inspiring Indian personalities and emulate them

Pre-requisite: Nil

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1		W				M		M				M		
CO2		W				S	W	S	M	M		M		
CO3		W	W		W	M	W	M	M	M		M		
CO4		W				M	W	M	W	W		M		
CO5						W	M	W	W	W		S		

Course Assessment methods:

Direct	Indirect
1.Individual Assignment 2.Group Assignment 3.Presentation 4.Surprise Test 5.Practical Assessment 6.End Semester Assessment	1.Attendance and Behavioural Assessment

Enlightened Citizenship	2 Periods
Greatness of India & Indian Culture	2 Periods
Uniqueness of India	2 Periods
Famous Indian Personalities	2 Periods
India's messages to the world	3 Periods
Meditation & Yogasanas	4 Periods

Total Periods: 15

REFERENCES

1. Gurcharan Das, "India Grows at Night", Penguin Books India, Published September 2012.
2. Swami Vivekananda, "Prosperous India" 1st edition, The Ramakirshna Mission Institute of Culture, 1937.
3. Sarvepalli Radhakrishnan, "The Source Book on Indian Philosophy", Princeton, N.J. : Princeton University Press, 1957.
4. Amartya Sen, "The Argumentative Indian", Allen Lane, Published 2005.

SEMESTER VII

U15GST005 ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT

L	T	P	C
3	0	0	3

Course outcomes:

After successful completion of this course, the students will be able to

CO1	Evaluate the economic theories, Cost concepts and pricing policies	K3
CO2	Analyze the market structures and integration concepts	K3
CO3	Apply the concepts of national income and understand the functions of banks and concepts of globalization	K3
CO4	Apply the concepts of financial management for project appraisal and working capital management	K3
CO5	Understand accounting systems	K2
CO6	Analyze financial statements using ratio analysis	K3

Pre-requisite: Nil

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M				M					M	
CO2				M		M					M	
CO3						M					M	
CO4				M							S	
CO5											S	
CO6		M		M							S	

Course assessment methods:

Direct	Indirect
1. Assignment 2. Internal Test 3. Group presentation 4. End Semester Examination	1. Course End Survey

ECONOMICS, COST AND PRICING CONCEPTS **9 Hours**

Economic theories – Demand analysis – Determinants of demand – Demand forecasting – Supply – Actual cost and opportunity cost – Incremental cost and sunk cost – Fixed and variable cost – Marginal costing – Total cost – Elements of cost – Cost curves – Breakeven point and breakeven chart – Limitations of break even chart – Interpretation of break even chart – Contribution – P/V-ratio, profit-volume ratio or relationship – Price fixation – Pricing policies – Pricing methods

CONCEPTS ON FIRMS AND MANUFACTURING PRACTICES **9 Hours**

Firm – Industry – Market – Market structure – Diversification – Vertical integration – Merger – Horizontal integration

NATIONAL INCOME, MONEY AND BANKING, ECONOMIC ENVIRONMENT **9 Hours**

National income concepts – GNP – NNP – Methods of measuring national income – Inflation – Deflation – Kinds of money – Value of money – Functions of bank – Types of bank – Economic liberalization – Privatization – Globalization

CONCEPTS OF FINANCIAL MANAGEMENT **9 Hours**

Financial management – Scope – Objectives – Time value of money – Methods of appraising project profitability – Sources of finance – Working capital and management of working capital

ACCOUNTING SYSTEM, STATEMENT AND FINANCIAL ANALYSIS **9 Hours**

Accounting system – Systems of book-keeping – Journal – Ledger – Trail balance – Financial statements – Ratio analysis – Types of ratios – Significance – Limitations

Theory: 45 Hours **Tutorial : 0 hour** **Total Hours: 45**

REFERENCES

1. Prasanna Chandra, " Financial Management (Theory & Practice) ,"TMH
2. Weston & Brigham, " Essentials of Managerial Finance"
3. Pandey, I. M., "Financial Management"
4. Fundamentals of Financial Management- James C. Van Horne.
5. Bhaskar S. "Engineering Economics and Financial Accounting", (2003) Anuradha Agencies, Chennai
6. Financial Management & Policy -*J*ames C. Van Horne
7. Management Accounting & Financial Management- M. Y. Khan & P. K. Jain
8. Management Accounting Principles & Practice -P. Saravanavel
9. Ramachandra Aryasri.A., and Ramana Murthy V.V.,"Engineering Economics & Financial Accounting"-Tata McGraw Hill, New Delhi, 2006.
10. Varshney R.L., and Maheswari K.L.,"Managerial Economics" – Sultan Chand & Sons, New Delhi, 2001
11. Samvelson and Nordhaus,"Economics"-Tata McGraw Hill, New Delhi, 2002

U15ITT701 **GRAPHICS AND MULTIMEDIA**

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Explain graphics input and output primitives.	K2
CO2	Apply 2D geometric transformations on objects.	K3
CO3	Summarize the graphics modeling process.	K2
CO4	Describe the basics of multimedia, compression, communication and authoring.	K2
CO5	Model a simple application with animation.	K4

Pre-requisite: Nil

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	S	M										
CO3	M											
CO4	M											
CO5	S	S			S	S			S	S	S	S

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignment 3. Mini Project 4. Certification Course	1. Course Exit Survey

2D PRIMITIVES **9 Hours**

Elements of pictures created in Computer Graphics – Graphics input primitives and devices – OpenGL basic Graphics primitives – Output Primitives – Line, Circle and Ellipse drawing Algorithms – Attributes of output primitives – Line drawings in OpenGL

2D GEOMETRIC TRANSFORMATIONS **9 Hours**

Two Dimensional Geometric Transformations – 2D Viewing – Window-Viewport Transformations – Line, Polygon, Curve and Text Clipping algorithms – 2D Geometric

Transformations using OpenGL

3D CONCEPTS 9 Hours

Three Dimensional Object Representation – Polygons, Curved Lines, Splines, Quadric Surfaces - 3D affine transformations - Parallel and perspective projections – Visualization of data sets – Viewing – Visible Surface Identification - Color Models

MULTIMEDIA BASICS 9 Hours

Introduction and Definitions – Applications – Elements – Animations – Compression – Types of Compression: Lossy and Lossless – Video Compression – Image Compression – Audio Compression – Data and file format – Multimedia Data Structures: KD Trees – R Trees

MULTIMEDIA COMMUNICATION AND AUTHORING 9 Hours

Protocol – QoS Issues – Conferencing - Creating Interactive Multimedia – Multimedia Authoring Systems – – Multimedia On Demand – Virtual Reality – Augmented Reality – Content Based Retrieval

Theory: 45 hours **Tutorial: 0 hour** **Total hours:45**

REFERENCES

1. Donald Hearn, M. Pauline Baker and Warren Caritthers, "Computer Graphics with OpenGL", Fourth edition, Prentice Hall, 2010.
2. Ze-Nian Li and Mark S. Drew, "Fundamentals of Multimedia", First Edition, Pearson Education, 2004.
3. PrabhatK.Andleigh, KiranThakrar , "Multimedia Systems Design", PHI, 2013.
4. Ralf Steinmetz and Klara, "Multimedia Computing, Communications and Applications", Pearson Education, 2012.
5. F.S. Hill, "Computer Graphics using OpenGL", Third Edition, Pearson Education, 2006.

U15ITT702 **INTERNET OF THINGS**

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Explain the characteristics and enabling technologies of IoT	K2
CO2	Describe about packages, frameworks and cloud services	K2
CO3	Analyze real time data stored in a cloud server using data analytics tool	K3
CO4	Design IoT based real time applications	K4

Pre-requisite: Computer Networks,

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M										
CO2	M	M										
CO3	M				M				M			M
CO4	M				M				M			M

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. End Semester Exam 3. Assignment 4. Case studies	1. Course Exit Survey

INTRODUCTION TO IoT **9 Hours**

Introduction -Definition and Characteristics of IoT —Physical design of IoT- Logical design of IoT- IoT enabling technologies- IoT levels and Deployment templates

DEVELOPING INTERNET OF THINGS **9Hours**

IoT design methodology - Motivation for using Python- Logical Design using Python - Data Types & Data Structures — Control Flow — Functions — Modules — Packages — File Handling — Date/Time Operations — Classes — Python Packages of Interest for IoT - Case Study on Weather Monitoring.

DOMAIN SPECIFIC IoTs 9 Hours

Home Automation — Cities — Environment — Energy — Retail — Logistics — Agriculture — Industry — Health and Lifestyle — IoT and M2M

IoT PHYSICAL DEVICES, ENDPOINTS, PHYSICAL SERVERS AND CLOUD OFFERINGS 9 Hours

IoT Device — Raspberry Pi — Raspberry Interfaces — Programming Raspberry Pi with Python — Other IoT Devices —Cloud Storage Models and Communication APIs - WAMP — Xively Cloud for IoT— Django — Amazon Web Services for IoT — SkyNetIoT Messaging Platform -Case Study on smart parking and air pollution monitoring

DATA ANALYTICS FOR IoT 9 Hours

Introduction — Apache Hadoop — Using HadoopMapReduce for Batch Data Analysis — Apache Oozie — Apache Spark — Apache Storm — Using Apache Storm for Real-time Data Analysis — Case Study on weather monitoring.

Theory: 45 hours **Tutorial: 0 hour** **Total hours:45**

REFERENES

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

2.Charalampos Doukas ,” Building Internet of Things With the Arduino: Volume 1 “,published by Createspace,2012

3.Andrian McEwen, Hakim Cassimally, " Designing the Internet of Things", 1st edition, John Wiley & Sons Ltd, 2014.

4. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", 1st edition, CRC Press, 2013

U15ITT703 **DATA ANALYTICS**

L	T	P	C
3	0	0	3

Course Outcomes:
After successful completion of this course, the students should be able to

CO1	Explain the fundamentals of Big Data Analysis.	K2
CO2	Summarize the techniques for mining Data Streams	K2
CO3	Analyze the Hadoop and Map Reduce techniques associated with Big Data Analytics.	K4
CO4	Prepare Big Data application reports using Pig and Hive	K3
CO5	Explain the Visualization techniques	K2

Pre-requisite: Data Warehousing and Data Mining, Computer Networks

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	M					M	M					
CO3	S	S			S							M
CO4	S	S			S					S		M
CO5	M				M							

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignment 3. Case Study 4. Certification Course	1. Course Exit Survey

INTRODUCTION **8 Hours**

Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis Vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

MINING DATA STREAMS 9 Hours

Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real Time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

HADOOP 10 Hours

History of Hadoop- The Hadoop Distributed File System – Components of Hadoop- Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS - Java interfaces to HDFS – Basics - Developing a Map Reduce Application - How Map Reduce Works - Anatomy of a Map Reduce Job run – Failures - Job Scheduling - Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features.

HADOOP ENVIRONMENT 9 Hours

Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation - Hadoop Configuration - Security in Hadoop - Administering Hadoop – HDFS – Monitoring – Maintenance - Hadoop benchmarks - Hadoop in the cloud.

FRAMEWORKS 9 Hours

Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - Fundamentals of HBase and ZooKeeper - IBM InfoSphere Big Insights and Streams. Visualizations - Visual data analysis techniques, interaction techniques, Systems and applications.

Theory: 45 hours **Tutorial: 0 hour** **Total hours:45**

REFERENCES

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2014.
2. Seema Acharya and Subhashini C, “Big Data and Analytics”, Wiley India, 2015
3. Tom White “Hadoop: The Definitive Guide” Third Edition, O”reilly Media, 2012.
4. AnandRajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2014.
5. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawHill Publishing, 2012.
6. Paul Zikopoulos ,Dirk deRoos , Krishnan Parasuraman, Thomas Deutsch , James Giles , David Corrigan , “Harness the Power of Big Data The IBM Big Data Platform”, Tata McGraw Hill Publications, 2012.

U15ITP701 **GRAPHICS AND MULTIMEDIA LABORATORY**

L	T	P	C
0	0	3	1

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Demonstrate graphics output primitives using various algorithms.	K2
CO2	Demonstrate 2D, 3D transformations and viewing on various objects.	K2
CO3	Demonstrate the compression algorithms on text and images.	K2
CO4	Develop simple scenes using image editing and animation software.	K3
CO5	Model a simple multimedia application.	K4

Pre-requisite: Structured Programming using C/ Java Programming

CO/PO Mapping												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	M											
CO3	M											
CO4	S	M			S							S
CO5	S	S			S	S			S	S	S	S

Course Assessment methods:

Direct	Indirect
1. Model Exam 2. Mini Project 3. End Semester Exam	1. Course Exit Survey

LIST OF EXPERIMENTS

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

1. Implementation of DDA and Bresenhams Line Algorithms for all slopes
2. Implementation of Midpoint Circle Algorithm
3. 2D Geometric Transformations – Translation, Rotation, Scaling, Reflection, Shearing
4. Cohen - Sutherland Line Clipping Algorithm

Implement the exercises from 5 to 7 using OpenGL

5. 3D Transformations - Translation, Rotation, Scaling
6. 3D Projections – Parallel, Perspective
7. Creating 3D Scenes
8. Compression Algorithms – To implement text and image compression algorithms
9. Image Editing and Manipulation - Basic operations on image using any image editing software, Creating gif animated images, Image optimization
10. 2D Animation – To create interactive animation using any authoring tool

Total Hours:45

U15ITP702 INTERNET OF THINGS LABORATORY

L	T	P	C
0	0	3	1

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1	Develop skills to integrate IoT devices	K3
CO2	Design and implement solutions to IoT based problems.	K4
CO3	Create an IoT based application	K4

Pre-requisite: Computer Networks, Mobile & Pervasive Computing

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S								M			S
CO2	S	M	M						M			S
CO3	S								M	M		S

Course Assessment methods:

Direct	Indirect
1.Mid Model Test 2. Model Exam	1. Course Exit Survey

LIST OF EXPERIMENTS

1. Setting up of an ad hoc network in infrastructure and ad hoc mode.
2. Measuring environmental parameters using sensors.
3. Interfacing sensors with Mobile / Web Application using Arduino / Raspberry pi
4. Developing simple Android application.
5. Acquiring location information from GPS/Google Maps.
6. Store sensed data in cloud database.

Sample list of IoT based projects

i. Home Automation System
ii. Traffic Light Controller
iii. Automatic Irrigation System
iv. Pollution Monitoring System
v. Health Monitoring System

Total Hours: 45

L	T	P	C
1	0	1	1

U15GHP701 GLOBAL VALUES

(Common to all branches of Engineering and Technology)

Objectives

1. To facilitate Students to think holistically
2. To empathize ecology and its benefits and thereby conserve it
3. To be aware of Issues related to Globalisation and how to mitigate it
4. To understand global economy and to know how economy driven world impacts happiness

Course outcomes:

After successful completion of the course, the student would be able to:

1. The Students shall understand importance of ecology and its preservations
2. The Students shall understand the various global issues and their causes and solutions
3. The Students shall approach any problem holistically as against giving a reductionist solution
4. The Students shall learn impact of globalization on various factors such as environment, local population etc
5. The Students shall learn to integrate and understand how an Individual peace impacts world peace

Pre-requisite: Nil

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		W					M	M	M	M		M
CO2		W				M	S	S	M	M		M
CO3		W	W		W	M	M	M	W	W		M
CO4		W				S	M	M	W	W		M
CO5						W	W	W				S

Course Assessment methods:

Direct	Indirect
1.Individual Assignment 2.Group Assignment 3.Presentation 4.Surprise Test 5.Practical Assessment 6.End Semester Assessment	1.Attendance and Behavioural Assessment

Introduction to Global Values	1 Period
Introduction to Systems Thinking	1 Period
Ecology, ecological imbalances and its solution	3 Periods
Globalisation Vs Localisation – an economic and Spiritual Perspective	3 Periods
Global Issues & Solutions	3 Periods
Advanced Contemplative Practices	4 Periods

Total Periods: 15

REFERENCES

1. Vethathiri's Maharishi's, "World peace" The World Community Service Centre, Vethathiri Publications,1957.
2. Fritz Schumacher, "Small is Beautiful", The Blond & Briggs, Published 1973.
3. Noam Chomsky, "Profit over People", Seven Stories Press, Published 1999.
4. Vethathiri's Maharishi's, "Atomic Poison" The World Community Service Centre, Vethathiri Publications, 1983.

PROFESSIONAL ELECTIVES (PE)

U15ITE001 **THEORY OF COMPUTATION**

L	T	P	C
3	0	0	3

Course Outcomes (CO):
After Successful completion of this course, the students will be able to :

CO1	Explain automata theory as the basis of all computer science languages design	K2
CO2	Construct automata for regular expression and perform minimization of automata	K3
CO3	Perform simplification in grammars and build normalized grammars.	K3
CO4	Construct Push Down Automata for simple Applications.	K3
CO5	Construct Turing machine for simple applications	K3
CO6	Explain undecidable problems and measure complexity	K2

Pre-requisite: Discrete Mathematics

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	S	W	W							W	W	
CO3	S	M	M							W	W	W
CO4	S	W	W							W	W	
CO5	S	M	M							W	W	
CO6	M									W	W	

Course Assessment Methods:

Direct	Indirect
• Internal Test • Assignment • Presentation • End semester exam	• Course End Survey

AUTOMATA **9 Hours**

Basic Machines Finite Automata (FA) - Deterministic Finite Automata (DFA) - Non-deterministic Finite Automata (NFA) - Finite Automata with Epsilon transitions- Equivalence of DFA and NFA- NFA to DFA conversion-Applications of finite automata.

REGULAR EXPRESSIONS AND LANGUAGES **9 Hours**

Regular Expression (RE) - Converting Regular Expression to FA- Converting FA to Regular Expression -Proving languages not to be regular – Closure and Decision properties of Regular Expression - Equivalence and minimization of Automata.

CONTEXT-FREE GRAMMAR AND LANGUAGES **9 Hours**

Context-Free Grammar (CFG) - Parse Trees - Ambiguity in grammars and languages - Definition of the Pushdown automata - Languages of a Pushdown Automata - Equivalence of Pushdown automata and CFG, Deterministic Pushdown Automata-Normal forms for CFG – Chomsky Normal Form (CNF) – Greibach Normal Form (GNF) - Pumping Lemma for Context Free Language (CFL) - Closure Properties of CFL.

TURING MACHINES **9 Hours**

Definitions of Turing machines – Models – Computable languages and functions –Techniques for Turing machine construction – Multi head and Multi tape Turing Machines - The Halting problem – Partial Solvability – Problems about Turing machine- Chomsky hierarchy of languages.

UNSOLVABLE PROBLEMS AND COMPUTABLE FUNCTIONS **9 Hours**

A Language that is not Recursively Enumerable (RE) – An Undecidable Problem that is RE – Undecidable Problems about Turing Machines – Post's Correspondence Problem.

Theory: 45 hours **Tutorials: 0 hour** **Total: 45 Hours**

References:

1. J.E.Hopcroft, R.Motwani and J.D Ullman, "Introduction to Automata Theory, Languages and Computations", Third Edition, Pearson Education, 2011
2. John C.Martin, "Introduction to Languages and the Theory of Computation", Fourth Edition, Tata McGraw Hill, 2010.
3. Kavi Mahesh, "Theory of Computation, A Problem-solving Approach" Wiley India Pvt, Ltd, 2012.
4. H.R.Lewis and C.H.Papadimitriou, "Elements of The theory of Computation", Second Edition, Pearson Education/PHI, 2003.
5. Micheal Sipser, "Introduction of the Theory and Computation", Thomson Brokecole, 1997

U15ITE002 TCP/IP AND SOCKET PROGRAMMING

L	T	P	C
3	0	0	3

Course Outcomes (COs):
After successful completion of this course, the students should be able to

CO1	Demonstrate systematic and critical understanding of network programming principles.	K2
CO2	Build client server applications using network programming constructs on linux platform.	K3
CO3	Understand the issues that are driving the development of new protocols to broaden and enhance the operation of the internet.	K2
CO4	Describe internet addressing schemes and design a sub network for an organization based on its requirement.	K3
CO5	Identify tools to analyze network performance.	K3

Pre-requisite: Computer Networks

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	M											M
CO3	M											M
CO4	M	M										M
CO5	M				M				M			M

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Model Exam 3. Assignment – Tools to demonstrate the working of network protocols (CO5).	1. Course Exit Survey

ELEMENTARY TCP SOCKETS 9 Hours

Introduction to sockets – Socket address structures – Byte ordering functions – Byte manipulation functions – Elementary TCP sockets – Socket, Connect, Bind, Listen, Accept, Read, Write, Close Functions – Iterative server – Concurrent server.

APPLICATION DEVELOPMENT 9 Hours

TCP echo server – TCP echo client – UDP echo server – UDP echo client – Server with multiple clients – Boundary conditions: Server process crashes - Server host crashes - Server crashes and reboots - Server shutdown – I/O multiplexing – I/O models – Select function – Shutdown function – Poll function.

INTERNET PROTOCOLS – I 9 Hours

Internetworking concept and architectural model – Mapping internet addresses to physical addresses (ARP) - Determining an internet address at startup (RARP) - Internet protocol: Routing IP datagrams - Error and control messages (ICMP) – Classful addressing – Subnetting - CIDR.

INTERNET PROTOCOLS – II 9 Hours

Reliable stream transport service (TCP) – Timeout and retransmission – Accurate measurement of round trip samples - Karn's algorithm and Timer backoff – Establishing a TCP connection – Closing a TCP connection – TCP connection reset – TCP state machine – Silly window Syndrome and small packets – Avoiding silly window syndrome - Internet multicasting - Internet Group Management Protocol (IGMP) - IGMP implementation - Group membership State transitions -IGMP message format - Auto configuration (DHCP)

INTERNET ADDRESSING 9 Hours

IPV4 address - Subnet addressing – Subnet mask representation – Unified forwarding algorithm – Classless addressing (CIDR) - IPv6 : Features of IPv6- general form of an IPv6 datagram - IPv6 base header format - IPv6 extension headers - Parsing an IPv6 datagram - IPv6 fragmentation and reassembly -The consequence of end to end fragmentation - IPv6 source routing - IPv6 options.

Theory: 45 hours **Tutorial: 0 hour** **Total hours:45**

REFERENCES

1. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff "Unix Network Programming, Volume 1: The Sockets Networking API", Third Edition, Addison Wesley, 2003.
2. Comer D.E., "Internetworking with TCP/IP Vol-I (Principles, Protocols and Architectures)", Fourth Edition, PHI, 2003.
3. Comer D.E., Stevens D.L., "Internetworking with TCP/IP Volume II: Design, Implementation, and Internals", Third edition, PHI, 1999.
4. Comer D.E., "Internetworking with TCP/IP Vol- III", (BSD Sockets Version), Second edition, PHI, 2003.
5. Behrouz A. Forouzan, "TCP / IP Protocol Suite", Third edition, Tata McGraw Hill, 2005.

U15ITE003 DISTRIBUTED SYSTEMS

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Explain the architecture of distributed systems	K2
CO2	Demonstrate the organization of client, server & implementation of naming system	K3
CO3	Explain various process synchronization methods & ways to achieve its consistency	K2
CO4	Explain the architecture, communication, synchronization, fault tolerance & security in object based distributed system	K3
CO5	Develop distributed application for real life problem using tools	K3

Pre-requisite: Computer Networks

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											M
CO2	M	W										
CO3	M	W										
CO4	M	W										
CO5	M	W			S				M	W		M

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. End Semester Exam 3. Assignment 4. Seminar	1. Course Exit Survey

INTRODUCTION 9 Hours

Introduction to Distributed systems-Examples of distributed systems- Resource sharing and the Web- Challenges-Architectural models- Fundamental models - Introduction to inter-process communications-External data representation and marshalling- Client server communication-Group communication.

DISTRIBUTED OBJECTS AND FILE SYSTEM 9 Hours

Introduction - Communication between distributed objects - Remote procedure call - Events and notifications - Java RMI case Study - Introduction to Distributed File System - File service

architecture - Sun network file system - Introduction to Name Services- Name services and DNS - Directory and directory services

DISTRIBUTED OPERATING SYSTEM SUPPORT **9 Hours**

The operating system layer – Protection - Process and threads - Communication and invocation - Operating system architecture - Introduction to time and global states - Clocks, Events and Process states - Synchronizing physical clocks - Logical time and logical clocks - Distributed debugging – Distributed mutual exclusion.

TRANSACTION AND CONCURRENCY CONTROL – DISTRIBUTED TRANSACTIONS **9 Hours**

Transactions – Nested transaction – Locks - Optimistic concurrency control - Timestamp ordering - Comparison of methods for concurrency control - Introduction to distributed transactions - Flat and nested distributed transactions - Concurrency control in distributed transactions - Distributed deadlocks - Transaction recovery

SECURITY AND REPLICATION **9 Hours**

Overview of security techniques - Cryptographic algorithms – Digital signatures - Cryptography pragmatics – Replication - Introduction to Distributed Multimedia systems.

Theory : 45 Hours **Tutorial: 0 hour** **Total Hours:45**

REFERENCES

1. George Coulouris, Jean Dollimore, Tim Kindberg, , "Distributed Systems: Concepts and Design", 5th Edition, Pearson Education, 2011.
2. A. S. Tanenbaum and M. V. Steen, "Distributed Systems: Principles and Paradigms", Second Edition, Prentice Hall, 2006.
3. Mukesh Singhal and N. G. Shivaratri, “Advanced Concepts in Operating Systems”, 1st Edition, McGraw-Hill, 2011.

U15ITE004 PRINCIPLES OF COMPILER DESIGN

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Describe the various phases of a compiler	K2
CO2	Construct DFA from a given regular expression	K3
CO3	Examine Top-down and Bottom-up parsing Techniques	K2
CO4	Write intermediate code	K3
CO5	Identify various types of optimizations on intermediate code and generate assembly code	K2

Pre-requisite: Nil

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	W										
CO2	S	M										
CO3	M	M										W
CO4	M	M										
CO5	M	M								M		

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. End Semester Exam 3. Assignment	1. Course Exit Survey

INTRODUCTION AND LEXICAL ANALYSIS 9 Hours

Language Processors – The Structure of Compiler – Applications of Compiler Technology – Programming Language Basics. Lexical Analysis – The Role of the Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – The Lexical-Analyzer Generator - LEX– Finite Automata – From Regular Expression to Automata – Design of a Lexical-Analyzer Generator – Optimization of DFA-based Pattern Matchers.

SYNTAX ANALYSIS 9 Hours

Introduction – Context-Free Grammars – Writing a Grammar – Top-Down Parsing – Recursive-Descent Parsing and Predictive Parsers - Bottom-up Parsing – Shift-Reduce Parsing and

Operator Precedence Parsing - Introduction to LR Parsing: Simple LR – More Powerful LR Parsers – Canonical LR and LALR Parsers.

INTERMEDIATE CODE GENERATION **9 Hours**

Variants of Syntax Trees – Three-Address Code – Types and Declarations – Translation of Expressions – Type Checking – Control Flow – Back patching – Switch-Statements – Intermediate Code for Procedures.

CODE GENERATION **9 Hours**

Issues in the Design of a Code Generator – The Target Language – Addresses in the Target Code – Basic Blocks and Flow Graphs – Optimization of Basic Blocks – A Simple Code Generator – Peephole Optimization.

CODE OPTIMIZATION AND RUN-TIME ENVIRONMENT **9 Hours**

The Principal Sources of Optimization – Introduction of Data-Flow Analysis – Loops in Flow Graphs Run-Time Environments – Storage Organization – Stack Allocation of Space – Heap Management.

Theory:45 hours **Tutorial: 0 hour** **Total hours:45**

REFERENCES

1. Alfred V. Aho et al “Compilers Principles, Techniques and Tools”, Second edition , Pearson Education,2011.
2. Allen I. Holub, “Compiler Design in C”, Prentice Hall of India, 2003.
3. Fischer C.N. and LeBlanc R.J. “Crafting a Compiler with C”, Benjamin Cummings, 2003.
4. Bennet J.P. “Introduction to Compiler Techniques”, Second edition, Tata McGraw-Hill, 2003.
5. Kenneth C. Louden, “Compiler Construction: Principles and Practice”, Thompson Learning, 2003.

U15ITE005 **USER INTERFACE DESIGN**

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Describe Human Computer Interaction	K2
CO2	Articulate and apply common design principles	K3
CO3	Create effective instructions for test users	K3
CO4	Identify cognitive mechanisms	K2
CO5	Outline the design process, both in oral and written form	K3

Pre-requisite: Nil

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	M	M	M									
CO3	M	M	W									
CO4	M	M										
CO5	S	M			M				M	M		

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. End Semester Exam 3. Assignment 4. Case studies/Mini Projects	1. Course Exit Survey

INTRODUCTION **8 Hours**

Introduction – Importance – Human - Computer interface - Characteristics of graphics interface -Direct manipulation graphical system - Web user interface - Popularity characteristic & principles.

USER INTERFACE DESIGN PROCESS **10 Hours**

User interface design process – Obstacles – Usability - Human characteristics in design - Human interaction speed - Business functions - Requirement analysis – Direct - Indirect

methods - Basic business functions - Design standards - System timings – Human consideration in screen design - Structures of menus - Functions of menus - Contents of menu - Formatting - Phrasing the menu - Selecting menu choice- Navigating menus – Graphical menus- Case studies to develop user interface design for application software

WINDOWS CHARACTERISTICS 9 Hours

Windows: Characteristics – Components - Presentation styles - Types managements- Organizations: Operations - Web systems –Device based controls: Characteristics -Screen based controls- Operate control - Text boxes - Selection control - Combination control – Custom control-Presentation control.

GUIDELINES AND FEEDBACK 9 Hours

Text for web pages - Effective feedback - Guidance & assistance- Internationalization accessibility – Icons – Image - Multimedia - Coloring.

WINDOWS LAYOUT 9 Hours

Windows layout - Test: Prototypes - Kinds of tests - Retest - Information search - Visualization - Hypermedia - WWW - Software tools.

Theory: 45 hours **Tutorial: 0 hour** **Total hours:45**

REFERENCES

1. Wilbent. O. Galitz , “The Essential Guide To User Interface Design”, John Wiley& Sons, Third Edition ,2007.
2. Ben Sheiderman, “Design - The User Interface”, Fourth Edition, Pearson Education, 2009.
3. Alan Cooper, “The Essential of User Interface Design”, Wiley - Dream Tech Ltd., 2014

U15ITE006 **CLOUD COMPUTING**

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Develop private cloud using tools	K3
CO2	Identify cloud service and its applications	K2
CO3	Illustrate functions of web service with cloud service.	K2
CO4	Apply virtualization concepts for real time problems	K3
CO5	Discuss various security and standard in cloud computing	K2

Pre-requisite: Computer Networks

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	W			S				S	M		W
CO2	M	W										
CO3	M	W										
CO4	M	W			S				S	M		M
CO5	M											

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. End Semester Exam 3. Assignment 4. Seminar	1. Course Exit Survey

CLOUD INTRODUCTION **9 Hours**

Cloud Computing Fundamentals: Cloud Computing definition, Types of cloud, Cloud services: Benefits and challenges of cloud computing, Evolution of Cloud Computing , usage scenarios and Applications , Business models around Cloud – Major Players in Cloud Computing - Issues in Cloud - Eucalyptus - Nimbus - Open Nebula, CloudSim

CLOUD SERVICES AND FILE SYSTEM **9 Hours**

Types of Cloud services: 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.

COLLABORATING WITH CLOUD 9 Hours

Collaborating on Calendars, Schedules and Task Management – Collaborating on Event Management, Contact Management, Project Management – Collaborating on Word Processing ,Databases – Storing and Sharing Files- Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services – Collaborating via Social Networks – Collaborating via Blogs and Wikis

VIRTUALIZATION FOR CLOUD 9 Hours

Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization – System Vm, Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation an and binary translation, HLL VM - Hypervisors – Xen, KVM , VMWare, Virtual Box, Hyper-V.

SECURITY, STANDARDS, AND APPLICATIONS 9 Hours

Security in Clouds: Cloud security challenges – Software as a Service Security, Common Standards: The Open Cloud Consortium – The Distributed management Task Force – Standards for application Developers – Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud binary translation.

Theory: 45 hours **Tutorial: 0 hour** **Total Hours:45**

REFERENCES

1. Bloor R., Kanfman M., Halper F. Judith Hurwitz “Cloud Computing for Dummies” (Wiley India Edition),2010
2. John Rittinghouse& James Ransome, “Cloud Computing Implementation Management and Strategy”, CRC Press, 2010.
3. Antohy T Velte ,Cloud Computing : “A Practical Approach”, McGraw Hill,2009
4. Michael Miller, Cloud Computing: “Web-Based Applications That Change the Way You Work and Collaborate Online”, Que Publishing, August 2008.
5. James E Smith, Ravi Nair, “Virtual Machines”, Morgan Kaufmann Publishers, 2006.
6. http://cloud-standards.org/wiki/index.php?title=Main_Page

U15ITE007 AD HOC AND SENSOR NETWORKS

L	T	P	C
3	0	0	3

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1	Explain the concept of ad hoc and sensor networks, their applications and typical node and network architectures.	K2
CO2	Compare wireless routing protocol's function and their implications on network performance.	K3
CO3	Explain various security threats to ad hoc networks and describe proposed solutions.	K2
CO4	Explain the sensor network characteristics, sensor databases and query processing.	K2

Pre-requisite: Computer Networks, Mobile & Pervasive Computing

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M					M						
CO2	M	M										
CO3	M											
CO4	M			M								M

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Model Exam 3. Case Study – Sensor Networks	1. Course Exit Survey

INTRODUCTION 9 Hours

Characteristics of wireless channel - Wireless local loop - IEEE 802.16 standard – HIPERACCESS -Ad hoc wireless networks: Introduction and issues - MAC protocols: Design issues - Goals and classification - MACAW: A media access protocol for wireless LANs- Distributed packet reservation multiple access protocol-Distributed priority scheduling and Medium access in Ad hoc networks- MAC protocol using directional antennas.

ROUTING PROTOCOLS 9 Hours

Design issues – Classification – Wireless routing protocol - Location aided routing- Zone

routing protocol - Hierarchical state routing protocol - Power aware routing protocol – Operation of multicast routing protocols - Classification of multicast routing protocols – Application-Dependent multicast routing.

SECURITY IN AD HOC NETWORKS **9 Hours**

Security in ad hoc wireless networks – Network security requirements - Issues and challenges in security provisioning – Network security attacks – key management – secure routing in Ad hoc networks.

WIRELESS SENSOR NETWORKS **9 Hours**

Architecture - Data dissemination - Date gathering - MAC protocols - Location discovery - Quality of sensor networks - Case study

SENSOR NETWORK DATABASE **9 Hours**

Sensor database challenges – Querying the physical environment – Query interfaces - High level database organization – In-Network aggregation – Temporal data – Emerging Applications.

Theory: 45 hours **Tutorial: 0 hour** **Total hours:45**

REFERENCES

1. Siva Ram Murthy. C and Manoj B.S, "Ad hoc Wireless Networks: Architectures And Protocols ", Prentice Hall PTR, 2004
2. Toh C.K., "Ad hoc Mobile Wireless Networks: Protocols And Systems", Prentice Hall PTR, First edition 2002
3. Mohammad Ilyas, "The Handbook Of Ad hoc Wireless Networks", CRC press, 2002
4. Charles E. Perkins, "Ad hoc Networking", Addison –Wesley,2000
5. Stefano Basagni , et al " Mobile Ad hoc Networking", Wiley –IEEE press,2004
6. Zhao, Guibas "Wireless Sensor Networks" ,Morgan Kaufmann Publications,2004

U15ITE008 **HIGH SPEED NETWORKS**

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Summarize the mechanisms to provide high speed networking through case studies of ATM and frame relay networks	K2
CO2	Construct queuing system with different arrival and service rates	K3
CO3	Analyze the performance of various congestion control and admission control mechanisms.	K3
CO4	Analyze various QoS parameters needed for real time traffic.	K3
CO5	Explain the protocols needed for QoS support.	K2

Pre-requisite: Computer Networks.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	S				W							
CO3	M											M
CO4	M										S	
CO5	M											

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. End Semester Exam 3. Assignment 4. Seminar	1. Course Exit Survey

HIGH PERFORMANCE NETWORKS **9 Hours**

Frame Relay Networks – Asynchronous Transfer Mode (ATM) – ATM Protocol Architecture - ATM logical connection - ATM cell – ATM service categories – ATM Adaptation Layer (AAL) - High Speed LANs: Fast ethernet - Gigabit ethernet - Fiber channel.

QUEUING MODELS AND CONGESTION MANAGEMENT 8 Hours

Queuing analysis- Queuing models – Single server queues – Effects of congestion – Congestion control – Traffic management – Congestion control in packet switching networks

ATM CONGESTION CONTROL 12 Hours

Performance of TCP over ATM - Traffic and congestion control in ATM – Requirements – Attributes – Traffic management frame work - Traffic control – Available Bit Rate (ABR) Traffic management – ABR rate control - Resource Management (RM) Cell formats - ABR capacity allocations.

INTEGRATED AND DIFFERENTIATED SERVICES 8 Hours

Integrated services architecture – Approach - Components - Services - Queuing discipline - Fair admission control - Traffic shaping - Resource reservation queuing (FQ) - Processor Sharing (PS) - Bit-Round Fair Queuing (BRFQ) - Generalized Processor Sharing (GPS) - Weighted Fair Queuing (WFQ) – Random early detection - Differentiated services DS code points – Per Hop Behaviour

PROTOCOLS FOR QOS SUPPORT 8 Hours

Resource Reservation (RSVP) – Goals & characteristics - Data flow - RSVP operations - Protocol mechanisms – Multiprotocol label switching – Operations - Label stacking - Protocol details – Real Time Protocol (RTP) – Protocol architecture - Data transfer protocol - Real Time Control Protocol (RTCP)

Theory: 45 hours **Tutorial: 0 hour** **Total hours: 45**

REFERENCES

1. William Stallings, “High Speed Networks and Internet”, Second edition, Pearson Education, 2002.
2. Warland & PravinVaraiya, “High Performance Communication Networks”, Second edition, Jean Harcourt Asia Pvt. Ltd., 2001.
3. IrvanPepelnjk, et al “MPLS and VPN architecture”, Cisco Press, Volume 1 and 2, 2003.

U15ITE009 COMPUTATIONAL INTELLIGENCE

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Discuss about the basics of computational Intelligence and Application areas	K2
CO2	Explain the basics of Evolutionary Computation	K2
CO3	Illustrate the Genetic Algorithms and Swarm Intelligence Techniques	K3
CO4	Describe the theory and applications of Neural Networks	K2
CO5	Explain about Fuzzy logic and the implementation of Fuzzy systems and performance Metrics	K2

Pre-requisite: Artificial Intelligence**,** Discrete Mathematics

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	M											
CO3	S	M								W		W
CO4	M											
CO5	M											

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. End Semester Exam 3. Assignment 4. Seminar	1. Course Exit Survey

COMPUTATIONAL INTELLIGENCE **9 Hours**

Myths about Computational Intelligence- Computational Intelligence Application Areas- Adaptation- Self-organization and Evolution- Historical Views of Computational Intelligence- Computational Intelligence as Adaptation and Self-organization- Computational Intelligence and Soft Computing versus Artificial Intelligence and Hard Computing

EVOLUTIONARY COMPUTATION CONCEPTS AND PARADIGMS — 9 Hours

History of Evolutionary Computation- Evolutionary Computation Overview- Genetic Algorithms- Evolutionary Programming- Evolution Strategies- Genetic Programming- Particle Swarm Optimization

NEURAL NETWORK CONCEPTS AND PARADIGMS — 9 Hours

Biological Basis for Neural Networks- Neural Network History- What Neural Networks Are and Why They Are Useful - Neural Network Components and Terminology- Neural Network Topologies- Neural Network Adaptation- Comparing Neural Networks and Other Information Processing Methods- Preprocessing- Post processing

FUZZY SYSTEMS CONCEPTS AND PARADIGMS — 9 Hours

History -Fuzzy Sets and Fuzzy Logic- The Theory of Fuzzy Sets- Approximate Reasoning- Developing a Fuzzy Controller

COMPUTATIONAL INTELLIGENCE IMPLEMENTATIONS AND PERFORMANCE METRICS — 9 Hours

Implementation Issues-Fuzzy Evolutionary Fuzzy Rule System Implementation-Choosing the Best Tools-Applying Computational Intelligence to Data Mining-Performance Metrics -General Issues- Percent Correct- Average Sum-squared Error- Absolute Error - Normalized Error - Evolutionary Algorithm Effectiveness Metrics- Mann–Whitney U Test - Receiver Operating Characteristic Curves - Recall and Precision- Other ROC-related Measures- Confusion Matrices - Chi-square Test

Theory: 45 hours **Tutorial: 0 hour** **Total hours:45**

REFERENCES

1. Russell Eberhart et al. “Computational Intelligence–Concepts to Implementations”, Morgan Kaufmann Publishers, 2007
2. Sivanandam S.N and Deepa S.N., “Principles of Soft Computing”, First edition, Wiley India (P) Ltd, 2007.
3. Simon Haykin, “Neural Networks, A Comprehensive Foundation”, Second edition, Addison Wesley Longman, 2005.
4. Timothy J.Ross, “Fuzzy Logic with Engineering Application “, McGraw Hill, 1977.
5. Rajasekaran S. and. Pai G.A.V, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI, 2003

U15ITE010 SERVICE ORIENTED ARCHITECTURE

L	T	P	C
3	0	0	3

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1	Demonstrate an understanding of architectural principles, architecture evolution processes, development methods with SOA, strengths and difficulties of service-oriented system development	K3
CO2	Organize the services to perform the service composition	K3
CO3	Model and design a service-oriented system using architectural principles, development methods with SOA and service-related technologies systematically and effectively	K3
CO4	Apply development methods with SOA and service-related technologies in service-oriented system development and demonstrate ability to work as a member of a software development project team	K3

Pre-requisite: Web Technology

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S										
CO2	S	S	M									
CO3	S	S	M		S				S	S		
CO4	M	M	M		M				S	S		

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Model Exam 3. Assignment 4. Seminar 5. Case study 6. Projects	1. Course Exit Survey

FUNDAMENTALS OF SOA **9 Hours**

Introduction-Defining SOA-Evolution of SOA-Service Oriented Enterprise-Comparing SOA to client-Server and distributed internet architectures-Basic SOA Architecture- concepts-Key Service characteristics-Technical Benefits-Business Benefits.

COMBINING SOA AND WEB SERVICES 9 Hours

Web services – Service descriptions – Messaging with SOAP –Message exchange Patterns- Web Service Platform-Service Contract-Service Level Data Model-Service Discovery-Service Level Security-Service Level Interaction Patterns-Atomic and Composite Services-Service Enabling Legacy System-Enterprise Service Bus Pattern.

MULTI CHANNEL ACCESS AND WEB SERVICES COMPOSITION 9 Hours

SOA for Multi-Channel Access-Business Benefits-Tiers-Business Process Management- Web Service Composition-BPEL-RESTFUL Services-comparison of BPEL and RESTFUL Services.

JAVA WEB SERVICES 9 Hours

SOA support in J2EE – Java API for XML-based web services(JAX-WS)-Java Architecture for XML binding (JAXB) – Java API for XML Registries(JAXR)-Java API for XML based RPC (JAX-RPC)- Web Services Interoperability- Web Services Enhancements (WSE)

WEB SERVICES SECURITY AND TRANSACTION 9 Hours

Meta Data Management-Advanced Messaging- Addressing – Reliable Messaging– Policies- WS-Policy– Security- WS-Security–Notification and Events-Transaction Management

Theory: 45 hours **Tutorial: 0 hour** **Total hours:45**

REFERENCES

1. Eric Newcomer, Lomow, “Understanding SOA with Web Services”, Pearson Education, 2005
2. James McGovern, Sameer Tyagi, Michael E Stevens, Sunil Mathew, “Java Web Services Architecture”,Elsevier, 2003.
3. Newcomer, Lomow, “Understanding SOA with Web Services”, Pearson Education, 2005.
4. Thomas Erl, “Service Oriented Architecture”,Pearson Education,2005
5. Sandeep Chatterjee, James Webber, “Developing Enterprise Web Services, An Architect’s Guide”, Pearson Education, 2005.
6. Dan Woods and Thomas Mattern, “Enterprise SOA Designing IT for Business Innovation” O’REILLY, First Edition, 2006

U15ITE011 **REAL TIME SYSTEMS**

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Apply the knowledge of operating system concepts to understand real time system concepts like tasks and scheduling.	K3
CO2	Analyze the various parameters related to the different types of scheduling in single processor and multiprocessor environments.	K3
CO3	Understand the various protocols for effective resource sharing.	K2

Pre-requisite: Operating Systems

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M										
CO2	S				M							M
CO3	S							M				M
CO4	S											
CO5	S		M									

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. End Semester Exam 3. Assignment 4. Seminar	1. Course Exit Survey

INTRODUCTION TO REAL TIME SYSTEM **7 Hours**

Typical RT applications - Hard and soft Real Time constraints - Hard and soft RTS - Reference modeling RTS - Issues in RTS - Structure of RTS

REAL TIME SCHEDULING **12 Hours**

Task, processes, processors - Task allocation algorithm - Single processor and multi processor scheduling - Clock driven and priority based scheduling algorithm

TIMING ANALYSIS AND RESOURCE CONTROL **12 Hours**

Prediction of Execution Time - Worst Case Execution Time(WCET) analysis – Assumptions on Resources and Their Usage – Resource Contention and Resource Access Control – Priority Ceiling Protocol – Priority Inheritance Protocol – Stack Based Priority Ceiling Protocol – Preemption Ceiling Protocol.

REAL TIME DATABASE AND FAULT TOLERANT TECHNIQUES 9 Hours

Transaction priority and concurrency control issues - Disk scheduling - Fault type and Detection Techniques - Redundancy management – Integration issues

REAL TIME SYSTEM CASE STUDIES 5 Hours

Examples of Hard, Soft and Firm real time systems like automatic chocolate vending machine, Smart Card and Adaptive Cruise Control System in a car or flight.

Theory: 45 hours **Tutorial: 0 hour** **Total hours:45**

REFERENCES

1. Jane .W. S. Liu, "Real Time Systems", Pearson Education 2000, Thirteenth impression, 2012.
2. Krishna .C.M, "Real Time Systems", Mc-Graw Hill Publication, 2010.
3. Prasad K.V.K.K, "Embedded/Real-Time Systems: Concepts, Design and Programming", Dream Tech Press, Reprint, 2014.
4. Sriram V Iyer , Pankaj Gupta, "Embedded Real Time Systems Programming", Tata McGraw Hill, 2010.

U15ITE012 INFORMATION CODING TECHNIQUES

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Describe about information, entropy and classify the coding schemes.	K3
CO2	Demonstrate the coding schemes for text.	K3
CO3	Describe and classify the compression schemes for video and image.	K2
CO4	Utilize various types of error control codes.	K2
CO5	Construct the code tree and state diagram for error control codes	K3

Pre-requisite: Nil

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M										
CO2	M	M										W
CO3	M	M										W
CO4	M	M	W									M
CO5	M	M	W									M

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. End Semester Exam 3. Assignment 4. Seminar	1. Course Exit Survey

INFORMATION THEORY 9 Hours

Information – Entropy - Information rate - classification of codes - Kraft McMillan inequality - Source coding theorem – Shannon - Fano coding - Huffman coding - Extended Huffman coding - Joint and conditional entropies - Mutual information - Discrete memory less channels – BSC - BEC – Channel capacity - Shannon limit.

SOURCE CODING: TEXT, AUDIO AND SPEECH 9 Hours

Text: Adaptive Huffman Coding - Arithmetic Coding - LZW algorithm – Audio: Perceptual coding - Masking techniques - Psychoacoustic model - MEG Audio layers I, II, III, Dolby AC3

- Speech: Channel Vocoder - Linear Predictive Coding.

SOURCE CODING: IMAGE AND VIDEO **9 Hours**

Image and Video Formats – GIF – TIFF- SIF – CIF - QCIF – Image compression: READ - JPEG – Video Compression: Principles-I, B, P frames - Motion estimation - Motion compensation - H.261 - MPEG standard.

ERROR CONTROL CODING: BLOCK CODES **9 Hours**

Definitions and Principles: Hamming weight - Hamming distance - Minimum distance decoding - Single parity codes - Hamming codes - Repetition codes - Linear block codes - Cyclic codes - Syndrome calculation - Encoder and decoder – Cyclic Redundancy check codes.

ERROR CONTROL CODING: CONVOLUTIONAL CODES **9 Hours**

Convolutional codes – code tree – trellis - state diagram - Encoding – Decoding: Sequential search and Viterbi algorithm – Principle of Turbo coding.

Theory: 45 hours **Tutorial: 0 hour** **Total hours:45**

REFERENCES

1. Simon Haykin, “Communication Systems”, fourth edition, John Wiley & Sons, 2014.
2. Bose.R, “Information Theory, Coding And Cryptography”, TMH 2011
3. Fred Halsall, “Multimedia Communications: Applications, Networks, Protocols And Standards”, Pearson Education Asia, 2011
4. Sayood. K, “Introduction To Data Compression”, Fourth edition, Elsevier, 2014.
5. Gravano. S, “Introduction To Error Control Codes”, Oxford University Press, 2010.

U15ITE013 SOFTWARE ARCHITECTURE

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Identify the key elements of software architecture	K2
CO2	Compare various architecture styles	K3
CO3	Explain the various documentation approaches and architectural description languages	K2
CO4	Explore the guidelines for architectural design	K2

Pre-requisite: Software Engineering

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	M	M										
CO3	M							W	W			W
CO4	M	M										

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. End Semester Exam 3. Assignment 4. Seminar	1. Course Exit Survey

INTRODUCTION 8 Hours

Introduction – Software design levels – Software engineering discipline – Architecture business cycle – Architectural patterns – Reference models – Architectural structures, views

BASICS OF ARCHITECTURAL STYLES 9 Hours

Architectural styles – Pipes and filters – Object-orientation – Invocation – Layered systems – Repositories – Interpreters – Process control – Heterogeneous architectures – Case studies

ARCHITECTURAL STYLES 10 Hours

Architecture and functionality – Architecture qualities – Architecture in the lifecycle - Architectural design - Shared information systems – Database integration – Integration in

software development environments – Architectural structures for shared information systems

GUIDANCE NA NOTATIONS 9 Hours

Architectural design guidance – Design space – Design rules – Applying design space – Quantified design space – Formal models and specification – Formalizing architectural style, design space - Z – notation

ADVANCED TOPICS 9 Hours

Linguistic issues – Requirements for architectural description languages – First class connectors – Adding implicit invocation to traditional programming languages – Tools for architectural design – Universal connector language - Software architecture. Documentation – Reconstruction**.**

Theory: 45 hours **Tutorial: 0 hour** **Total hours:45**

REFERENCES

1. Mary Shaw and David Garlan, "Software Architecture – Perspectives on an emerging discipline", Pearson education, 2008.
2. Len Bass, Paul Clements, Rick Kazman, "Software Architecture in Practice", Addison-Wesley, 2003.
3. Christine Hofmeister, Robert Nord, DilipSoni, "Applied Software Architecture: A Practical Guide for Software Designers", Addison-Wesley, 2000
4. David M. Dikel, David Kane, James R. Wilson, "Software Architecture: Organizational Principles and Patterns", Prentice Hall, 2001
5. Jan Bosch, Morven Gentleman, Christine Hofmeister, JuhaKuusela, "Software Architecture: System Design, Development and Maintenance", Springer, 2002

U15ITE201 **DIGITAL IMAGE PROCESSING**

L	T	P	C
3	0	0	3

Course Outcomes:
After successful completion of this course, the students should be able to

CO1	Explain the representation and manipulation of digital images in a computer	K2
CO2	Explore new techniques in the areas of image enhancement, restoration, segmentation and image morphology.	K2
CO3	Implement basic image processing algorithms using MATLAB tools	K3
CO4	Describe pattern recognition techniques.	K2
CO5	Outline the possibility of applying image processing concepts in various domains.	K3

Pre-requisite: Digital Signal Processing

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	M											
CO3	S				S					M		M
CO4	M											
CO5	S	M		M	S	M			M	M		M

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignment 3. Case Study 4. Mini Project	1. Course Exit Survey

FUNDAMENTALS OF IMAGE PROCESSING **9 Hours**

Introduction – Elements of visual perception, Steps in Image Processing Systems – Digital Imaging System - Image Acquisition – Sampling and Quantization – Pixel Relationships – File Formats – Colour images and models - Image Operations – Arithmetic, Logical, Statistical and Spatial operations.

IMAGE ENHANCEMENT AND RESTORATION 9 Hours

Image Transforms - Discrete and Fast Fourier Transform and Discrete Cosine Transform, Spatial Domain - Gray Level Transformations - Histogram Processing - Spatial Filtering – Smoothing and Sharpening. Frequency Domain: Filtering in Frequency Domain – Smoothing and Sharpening filters – Homomorphic Filtering., Noise models, Constrained and Unconstrained restoration models.

IMAGE SEGMENTATION AND MORPHOLOGY 9 Hours

Detection of Discontinuities – Edge Operators – Edge Linking and Boundary Detection – Thresholding – Region Based Segmentation – Motion Segmentation, Image Morphology: Binary and Gray level morphology operations - Erosion, Dilation, Opening and Closing Operations - Distance Transforms - Basic morphological Algorithms. Features – Textures - Boundary representations and Descriptions - Component Labelling – Regional descriptors and Feature Selection Techniques.

INTRODUCTION TO PATTERN RECOGNITION 9 Hours

Component Labelling - Image Features - Textures - Boundary representations and descriptions - Regional descriptors - Feature selection and Feature dimensionality reduction. Image Classification and Recognition- Statistical Classifiers - Clustering Algorithms - Hierarchical and Partitional clustering.

APPLICATIONS AND CASE STUDIES 9 Hours

Image Understanding – Case Studies in Biometrics, Video Processing, Image Fusion - Image Security - Steganography and Watermarking - Stereo vision - Visual Effects - Image compositing.

Theory: 45 hours **Tutorial: 0 hour** **Total hours:45**

REFERENCES

1. S.Sridhar, “Digital Image Processing”, Oxford University Press, 2011, New Delhi.
2. Rafael C.Gonzalez and Richard E.Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2008, New Delhi.
3. Alasdair McAndrew, “Introduction to Digital Image Processing with Matlab”, Cengage Learning 2011, India.
4. Anil J Jain, “Fundamentals of Digital Image Processing”, PHI, 2011.
5. Wilhelm Burger, Mark J Berge, “Digital Image Processing: An algorithmic Introduction using Java”, Springer International Edition, 2008.

U15MCE708 **MOBILE ROBOTICS**

L	T	P	C
3	0	0	3

Course Outcomes
After successful completion of this course, the students should be able to:

CO1	Explain robot locomotion	K2
CO2	Apply kinematics models and constraints	K2
CO3	Implement vision algorithms for robotics	K3
CO4	Implement robot localization techniques	K3
CO5	Implement robot mapping techniques	K3
CO6	Implement SLAM algorithms	K3
CO7	Explain planning and navigation in robotics	K2

Pre-requisite: Nil

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	M	M										
CO3	M	M	M		M					M		
CO4	M	M	M									
CO5	M	M	M									
CO6	M	M	M		M							
CO7	M	M							M	M		

LOCOMOTION AND KINEMATICS 9 Hours

Introduction to Robotics – key issues in robot locomotion – legged robots – wheeled mobile robots – aerial mobile robots – introduction to kinematics – kinematics models and constraints – robot maneuverability

ROBOT PERCEPTION 9 Hours

Sensors for mobile robots – vision for robotics – cameras – image formation – structure from stereo – structure from motion – optical flow – color tracking – place recognition – range data

MOBILE ROBOT LOCALIZATION **9 Hours**

Introduction to localization – challenges in localization – localization and navigation – belief representation – map representation – probabilistic map-based localization – Markov localization – EKF localization – UKF localization – Grid localization – Monte Carlo localization – localization in dynamic environments

MOBILE ROBOT MAPPING **9 Hours**

Autonomous map building – occupancy grip mapping – MAP occupancy mapping – SLAM – extended Kalman Filter SLAM – graph-based SLAM – particle filter SLAM – sparse extended information filter – fastSLAM algorithm

PLANNING AND NAVIGATION **9 Hours**

Introduction to planning and navigation – planning and reacting – path planning – obstacle avoidance techniques – navigation architectures – basic exploration algorithms

Theory: 45 hours **Tutorial: 0 hour** **Total hours:45**

REFERENCES

1. Roland Seigwart, Illah Reza Nourbakhsh, and DavideScaramuzza, "Introduction to autonomous mobile robots", Second Edition, MIT Press, 2011.
2. Sebastian Thrun, Wolfram Burgard, and Dieter Fox, "Probabilistic Robotics", MIT Press, 2005.
3. Howie Choset, Kevin M. Lynch , Seth Hutchinson , George A. Kantor , Wolfram Burgard , Lydia E. Kavraki , Sebastian Thrun , "Principles of Robot Motion: Theory, Algorithms, and Implementations", A Bradford Book, 2005.
4. Gregory Dudek and Michael Jenkin, "Computational Principles of Mobile Robotics", Second Edition, Cambridge University Press, 2010.
5. Maja J. Mataric, "The Robotics Primer", MIT Press, 2007.

U15GST002 TOTAL QUALITY MANAGEMENT

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Apply & analyze quality concepts and philosophies of TQM	K3
CO2	Apply concepts of continuous improvement	K3
CO3	Apply TQM concepts to enhance customer satisfaction and deal with customer related aspects	K3
CO4	Apply and analyze the quality tools, management tools and statistical fundamentals to improve quality	K3
CO5	Apply and analyze the TQM tools as a means to improve quality	K3
CO6	Understand quality systems, procedures for its implementation, documentation and auditing	K2

Pre-requisite: Nil

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M		M							M	
CO2		M		M							M	
CO3		M		M							M	
CO4					S						M	
CO5		M			S						M	
CO6					W						M	

Course Assessment methods:

Direct	Indirect
1. Assignment 2. Internal Tests 3. Group presentation 4. End Semester Examination	1. Course End Survey

INTRODUCTION **9 Hours**

Definition of Quality, Dimensions of Quality, Quality costs, Top Management Commitment, Quality Council, Quality Statements, Barriers to TQM Implementation, Contributions of

Deming, Juran and Crosby, Team Balancing

TQM PRINCIPLES **9 Hours**

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Continuous Process Improvement,5S, Kaizen, Just-In-Time and TPS

STATISTICAL PROCESS CONTROL **9 Hours**

The seven tools of quality, New seven Management tools, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Concept of six sigma.

TQM TOOLS **9 Hours**

Quality Policy Deployment (QPD), Quality Function Deployment (QFD), Benchmarking, Taguchi Quality Loss Function, Total Productive Maintenance (TPM), FMEA

QUALITY SYSTEMS **9 Hours**

Need for ISO 9000 and Other Quality Systems, ISO 9001:2008 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, ISO 14001:2004

Theory: 45 Hours **Total Hours: 45**

REFERENCES

1. Dale H.Besterfield, "Total Quality Management", Pearson Education
2. James R.Evans& William M.Lindsay, "The Management and Control of Quality", South-Western (Thomson Learning), 2008.
3. Feigenbaum.A.V."Total Quality Management", McGraw Hill
4. Oakland.J.S. "Total Quality Management", Butterworth – Hcinemann Ltd., Oxford
5. Bhaskar S. "Total Quality Management", (2007-revised edition) Anuradha Agencies, Chennai
6. Narayana V. and Sreenivasan, N.S. "Quality Management – Concepts and Tasks", New Age International 2007
7. Zeiri, "Total Quality Management for Engineers", Wood Head Publishers.

U15GST003 PRINCIPLES OF MANAGEMENT

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Apply the concepts of management and administration and analyze the evolution of management thoughts.	K3
CO2	Apply the concepts of planning, forecasting and decision making	K3
CO3	Analyze organizational structures and apply staffing concepts	K3
CO4	Analyze the motivational and leadership theories	K3
CO5	Apply & analyze the communication and controlling processes.	K3
CO6	Analyze the various international approaches to management	K3

Pre-requisite: Nil

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1											M	
CO2											M	
CO3											M	
CO4									M		M	
CO5										M	M	
CO6											M	

Course Assessment methods:

Direct	Indirect
1.Assignment 2. Internal Test 3 Group presentation 4.End semester exam	Course End Survey

MANAGEMENT CONTEXT **9 Hours**

Management – Definition – Importance – Functions – Skills required for managers - Roles and functions of managers – Science and Art of Management –Management and Administration. Evolution of Classical, Behavioural and Contemporary management thoughts.

PLANNING **9 Hours**

Nature & Purpose – Steps involved in Planning – Forms of Planning – Types of plans – Plans at Individual, Department and Organization level - Managing by Objectives. Forecasting – Purpose – Steps and techniques. Decision-making – Steps in decision making.

ORGANISING **9 Hours**

Nature and Purpose of Organizing - Types of Business Organization - Formal and informal organization – Organization Chart – Structure and Process – Strategies of Departmentation– Line and Staff authority – Benefits and Limitations. Centralization Vs De-Centralization and Delegation of Authority. Staffing – Manpower Planning – Recruitment – Selection – Placement – Induction.

DIRECTING & CONTROLLING **9 Hours**

Nature & Purpose – Manager Vs. Leader - Motivation - Theories and Techniques of Motivation. Leadership – Styles and theories of Leadership.
Communication – Process – Types – Barriers – Improving effectiveness in Communication.
Controlling – Nature – Significance – Tools and Techniques.

CONTEMPORARY ISSUES IN MANAGEMENT **9 Hours**

Corporate Governance Social responsibilities – Ethics in business – Recent issues.
American approach to Management, Japanese approach to Management, Chinese approach to Management and Indian approach to Management.

Theory: 45 Hours **Total Hours: 45**

REFERENCES

1. Tripathy PC and Reddy PN, "Principles of Management", Tata McGraw-Hill, 4th Edition, 2008.
2. Dinkar Pagare, "Principles of Management", Sultan Chand & Sons, 2000.
3. Kanagasapapathi. P (2008) Indian Models of Economy, Business and Management, Prentice Hall of India, New Delhi, ISBN: 978-81-203-3423-6.
4. G.K.Vijayaraghavan and M.Sivakumar, "Principles of Management", Lakshmi Publications, 5th Edition, 2009.
5. Bhaskar S. "Principles Of Management", (2011) Anuradha Agencies, Chennai
6. Harold Koontz & Heinz Weihrich, "Essentials of Management – An International perspective", 8th edition. Tata McGraw-Hill, 2009.
7. Charles W.L. Hill and Steven L McShane – Principles of Management, Tata Mc Graw-Hill, 2009.

U15GST004 **OPERATION RESEARCH**

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Apply linear programming model and assignment model to domain specific situations	K2
CO2	Analyze the various methods under transportation model and apply the model for testing the closeness of their results to optimal results	K2
CO3	Apply the concepts of PERT and CPM for decision making and optimally managing projects	K3
CO4	Analyze the various replacement and sequencing models and apply them for arriving at optimal decisions	K2
CO5	Analyze and apply appropriate inventory techniques in domain specific situations.	K3
CO6	Analyze and apply appropriate queuing theories in domain specific situations	K3

Pre-requisite: Nil

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S		S								
CO2	S	S		S								
CO3	S	S		S							S	
CO4	S	S		S								
CO5	S	S		S								
CO6	S	S		S								

Course Assessment methods:

Direct	Indirect
1. Assignment 2. Internal Test 3. Group presentation 4. End Semester Examination	1. Course End Survey

LINEAR MODEL **9 Hours**

The phases of OR study – formation of an L.P model – graphical solution – simplex algorithm – artificial variables technique (Big M method, two phase method), duality in simplex.

TRANSPORTATION AND ASSIGNMENT MODELS **9 Hours**

Transportation model – Initial solution by North West corner method – least cost method – VAM. Optimality test – MODI method and stepping stone method.

Assignment model – formulation – balanced and unbalanced assignment problems.

PROJECT MANAGEMENT BY PERT & CPM **9 Hours**

Basic terminologies – Constructing a project network – Scheduling computations – PERT - CPM – Resource smoothening, Resource leveling, PERT cost.

REPLACEMENT AND SEQUENCING MODELS **9 Hours**

Replacement policies - Replacement of items that deteriorate with time (value of money not changing with time) – Replacement of items that deteriorate with time (Value of money changing with time) – Replacement of items that fail suddenly (individual and group replacement policies).

Sequencing models- n job on 2 machines – n jobs on 3 machines – n jobs on m machines, Traveling salesman problem.

INVENTORY AND QUEUING THEORY **9 Hours**

Variables in inventory problems, EOQ, deterministic inventory models, order quantity with price break, techniques in inventory management.

Queuing system and its structure – Kendall's notation – Common queuing models - M/M/1: FCFS/∞/∞ - M/M/1: FCFS/n/∞ - M/M/C: FCFS/∞/∞ - M/M/1: FCFS/n/m

Theory: 45 Hrs **Total Hours: 45**

REFERENCES

1. Taha H.A., "Operation Research", Pearson Education
2. Hira and Gupta "Introduction to Operations Research", S.Chand and Co.2002
3. Hira and Gupta "Problems in Operations Research", S.Chand and Co.2008
4. Wagner, "Operations Research", Prentice Hall of India, 2000
5. S.Bhaskar, "Operations Research", Anuradha Agencies, Second Edition, 2004

L	T	P	C
3	0	0	3

U15ITE015 C# AND .NET PROGRAMMING

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1	Analyze the features of C# and write console applications using various features of C#	K3
CO2	Develop the web based applications using ADO.NET in C#	K3
CO3	Interpret the need of MVC architecture and web services in .NET Framework	K2
CO4	Summarize the basics of asynchronous programming and assemblies in C#	K2

Pre-requisite: Object Oriented Methodologies and Programming

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M						S	S		
CO2	S	S	M		M				S	S		
CO3	M	M										
CO4	M	W										

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Model Exam 3. Assignment 4. Seminar 5. Mini project	1. Course Exit Survey

C# LANGUAGE FUNDAMENTALS-I **7 Hours**

.NET Architecture: CLR-Intermediate Language-Assemblies-Framework Classes-Namespaces-C# basics-Objects and Types-Inheritance-Arrays and Tuples

C# LANGUAGE FUNDAMENTALS-II **10 Hours**

Delegates and Events-Strings-Regular Expressions- Asynchronous programming**:** Patterns-Foundation-Error Handling-Cancellation

ASP.NET AND ADO.NET **10 Hours**

Core ASP.NET- web forms-Web Controls-State Management Techniques- ADO.NET:

Database Connections-Commands-Data Reader class-Managing data and relationships-Populating a dataset

WEB SERVICES AND MVC 9 Hours

Introduction to Web Services: XML,SOAP,UDDI-Creating ,publishing and consuming simple web services-ASP.NET MVC: MVC Programming model- Advantages of an MVC-Based Web Application-Example

ADVANCED FETURES IN .NET 9 hours

Parallel class-Threads and Synchronization -Memory Management and pointers-Reflection—Assemblies

Theory: 45 hours **Tutorial: 0 hour** **Total hours:45**

REFERENCES

1. Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner," Professional C# 2012 and .NET 4.5",Wiley Publications,2012
2. Ian Griffiths," Programming C# 5.0"Oreilly publications, First edition,2012
3. Andrew Troelsen, "Pro C# 5.0 and the .NET 4.5 Framework," Apress, Sixth edition,2012
4. Karli Watson, Jacob Vibe Hammer..et .al, "Beginning Visual C# 2012 Programming", Wiley Publications,2012
5. http://www.microsoftvirtualacademy.com/training-courses/introduction-to-asp-net-mvc
6. http://www.c-sharpcorner.com/UploadFile/1d42da/web-service-basics/

U15ITE016 BUILDING ENTERPRISE APPLICATIONS

L	T	P	C
3	0	0	3

Course Outcomes (COs):
After successful completion of this course, the students should be able to

CO1	Interpret the role of various phases involved in ERP application	K3
CO2	Explain the functionality of requirements validation, planning and estimation associated with enterprise application	K2
CO3	Demonstrate a simple enterprise application design and explain the construction and development of different solution layers	K2
CO4	Demonstrate the need of various testing techniques involved in enterprise applications	K3

Pre-requisite: Internet and Java Programming

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M										
CO2	M	W							M	M		
CO3	M	M			W							
CO4	M	W			M							

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Model Exam 3. Assignment 4.Seminar 5.Case study	1. Course Exit Survey

INTRODUCTION TO ERP **7 Hours**

Overview of ERP and its Benefits- ERP and Related Technologies- Business Intelligence - Business Process Reengineering (BPR)-Case study
Introduction to enterprise applications and their types- Software engineering methodologies- Life cycle of raising an enterprise application- Introduction to skills required to build an enterprise application- Key determinants of successful enterprise applications- Measuring the success of enterprise applications

PHASES IN ENTERPRISE APPLICATIONS 7 Hours

Inception of enterprise applications- Enterprise analysis- Business modelling- Requirements elicitation- Use case modelling- Prototyping- Non functional requirements- Requirements validation- planning and estimation

LAYERS IN ERP ARCHITECTURE-1 12 hours

Concept of architecture, views and viewpoints- Enterprise architecture- Logical architecture, technical architecture- Design- Different technical layers- Best practices- Data architecture and design – Relational, XML, and other structured data representations- Infrastructure architecture and design elements - Networking, Internetworking, and Communication Protocols- IT Hardware and Software- Middleware- Policies for Infrastructure Management- Deployment Strategy- Documentation of application architecture and design

LAYERS IN ERP ARCHITECTURE-II 11 hours

Construction readiness of enterprise applications - Defining a construction plan- Defining a package structure- Setting up a configuration management plan- Setting up a development environment- Introduction to the concept of Software Construction Maps- Construction of technical solutions layers- Methodologies of code review- Static code analysis- Build and testing- Dynamic code analysis – Code profiling and code coverage

TESTING AND ROLLING OUT AN ENTERPRISE APPLICATION 8 hours

Types and methods of testing an enterprise application- Testing levels and approaches- Testing environments- Integration testing- Performance testing- Penetration testing- Usability testing- Globalization testing and interface testing- User acceptance testing- Rolling out an enterprise application

Theory: 45 hours **Tutorial: 0 hour** **Total hours:45**

REFERENCES

1. Anubhav Pradhan, Satheesha B. Nanjappa, Senthil K. Nallasamy, Veerakumar Esakimuthu “Raising Enterprise Applications”, John Wiley, April 2010.
2. Shankar Kambhampaty, Service-oriented Architecture For Enterprise And Cloud Applications , 2nd Edition, Wiley India Pvt. Ltd,2010
3. Brett McLaughlin, “Building Java Enterprise Applications”, O'Reilly Media, March 2002.
4. Alexis Leon, “ERP Demystified”, Second Edition, Tata McGraw Hill, New Delhi, 2008.
5. Soren Lauesen, “Software Requirements: Styles & Techniques”, Addison-Wesley Professional, 2002.
6. Inderjeet Singh, Mark Johnson, Beth Stearns, “Designing Enterprise Applications with the J2EE Platform”, second edition, Pearson Education, 2002.

U15ITE017 **BUSINESS INTELLIGENCE**

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Explain the Business Intelligence Environment	K2
CO2	Describe the Business Intelligence Architecture	K2
CO3	Outline the usage of ETL in Business Intelligence	K2
CO4	Explore the Emerging trends in Business Intelligence	K3

Pre-requisite: Data Warehousing and Data Mining

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

Cos	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	M											
CO3	M											
CO4	M	M	M		M			M		S	M	

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignment 3. Case Study	1. Course Exit Survey

INRODUCTION **9 Hours**

BI and Information Exploitation - BI Definitions & Concepts - Business Applications of BI- Organizational preparedness for BI and Analytics - Types of BI Users – Planning

BUSINESS INTELLIGENCE ENVIRONMENT **9 Hours**

BI Framework - Services and system Evolution - Business Processes and Information flow - Data Requirements Analysis

BUSINESS INTELLIGENCE ARCHITECTURE **9 Hours**

Data Modelling and Analytics - Analytical Platforms - Types of Metadata - Semantic Metadata Processes for Business Analytics - Data profiling - Business Rules

DATA QUALITY 9 Hours

Types of Data Flaws - Dimensions of Data Quality – Assessment – Rules - Data Cleansing - Data Integration – ETL - Data latency and Synchrony

BUSINESS INTELLIGENCE TRENDS 9 Hours

Knowledge Discovery and Data Mining for Predictive Analytics - Repurposing publicly available Data - Knowledge Delivery - Emerging BI Trends - Case study

Theory: 45 hours **Tutorial: 0 hour** **Total hours:45**

REFERENCES

1. David Loshin, "Business Intelligence", Second Edition, Morgan Kaufmann Series, 2013
2. Mike Bierre, "Business Intelligence for the Enterprise", IBM Press, 2003
3. Larissa T. Moss, ShakuAtre, "Business Intelligence Roadmap: The Complete Project Lifecycle for Decision-Support Applications", Addison-Wesley, 2003
4. CindiHowson, "Successful Business Intelligence: Secrets to Making BI a Killer App", McGraw-Hill, 2008
5. Brain, Larson, "Delivering business intelligence with Microsoft SQL server 2008", McGraw-Hill, 2009

U15ITE018 INFORMATION RETRIEVAL

L	T	P	C
3	0	0	3

Course Outcomes:
After successful completion of this course, the students should be able to

CO1	Explain the various components of an Information Retrieval System	K2
CO2	Explain the metrics for evaluating an Information Retrieval System	K2
CO3	Apply machine learning techniques for text classification and clustering.	K3
CO4	Analyze the Web content structure	K4

Pre-requisite: Data Warehousing and Data Mining

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

Cos	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M										
CO2	M	M										
CO3	S	M			M							
CO4	S	S			S	S	M			S		S

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignment 3. Case Study	1. Course Exit Survey

INTRODUCTION 9 Hours

Introduction – Goals and History of IR – The Impact of the Web on IR – The Role of Artificial Intelligence (AI) in IR – Basic IR Models – Boolean and Vector Space Retrieval Models – Ranked Retrieval – Text Similarity Metrics – TF-IDF (Term Frequency/Inverse Document Frequency) Weighting – Cosine Similarity.

PREPROCESSING 9 Hours

Basic Tokenizing Indexing and Implementation of Vector Space Retrieval – Simple Tokenizing – Stop Word Removal and Stemming – Inverted Indices – Efficient Processing with Sparse Vectors – Query Operations and Languages – Relevance Feedback – Query Expansion - Query

Languages.

METRICS 9 Hours

Experimental Evaluation of IR - Performance Metrics – Recall - Precision and F Measure - Evaluations on Benchmark Text Collections - Text Representation - Word Statistics - Zipf's Law - Porter Stemmer – Morphology - Index Term Selection - Using Thesauri - Metadata and Markup Languages - Web Search - Search Engines – Spidering – Metacrawlers - Directed Spidering - Link Analysis Shopping Agents.

CATEGORIZATION AND CLUSTERING 9 Hours

Text Categorization and Clustering - Categorization Algorithms - Naive Bayes - Decision Trees and Nearest Neighbor - Clustering Algorithms - Agglomerative Clustering - K-Means - Expectation Maximization (EM) - Applications to Information Filtering – Organization and Relevance Feedback.

EXTRACTION AND INTEGRATION 9 Hours

Recommender Systems - Collaborative Filtering and Content-Based Recommendation of Documents and Products Information Extraction and Integration - Extracting Data from Text – XML - Semantic Web - Collecting and Integrating Specialized Information on the Web.

Theory: 45 hours **Tutorial: 0 hour** **Total hours:45**

REFERENCES

1. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, “Introduction to Information Retrieval”, Cambridge University Press, 2008
2. Ricci, F, Rokach, L. Shapira, B.Kantor, “Recommender Systems Handbook”, First Edition, 2011.
3. Brusilovsky, Peter, “The Adaptive Web: Methods and Strategies of Web Personalization”, Springer, 2007
4. Ricardo Baeza-Yate, Berthier Ribeiro-Neto, “Modern Information Retrieval”, Pearson Education Asia, 2005.
5. G.G. Chowdhury, “Introduction to Modern Information Retrieval”, Neal-Schuman Publishers; 3rd edition, 2003.

U15ITE019 SOFTWARE QUALITY ASSURANCE AND TESTING

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Appreciate the importance of software quality assurance	K2
CO2	Apply software testing techniques for information systems development	K3
CO3	Know the inputs and deliverables of testing process	K3
CO4	Demonstrate activities in software project management.	K3
CO5	Interpret the importance of software quality assurance	K2

Pre-requisite: Software Engineering

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	M	M			M							
CO3	M	M										W
CO4	M	M	W						M	M		W
CO5	M											

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. End Semester Exam 3. Assignment 4. Seminar 5.Case study	1. Course Exit Survey

INTRODUCTION **9 Hours**

Introduction –Views on quality –Cost of quality -Quality models –Quality frameworks – Verification and Validation –Defect taxonomy –Defect management –Statistics and measurements -IEEE standards –Quality assurance and control processes

VERIFICATION **6 Hours**

Introduction –Verification techniques –Inspections, reviews, walkthroughs –Case studies

TEST GENERATION **12 Hours**

Software testing-Validation –Test plan –Test cases -Test Generation –Equivalence partitioning– Boundary value analysis –Category partition method –Combinatorial generation –Decision tables –Examples and Case studies

STRUCTURAL TESTING **12 Hours**

Introduction –Test adequacy criteria –Control flow graph –Coverage's: block, conditions, multiple conditions, MC/DC, path –Data flow graph –Definition and use coverage's –C-use, P-use, Defclear-Def-use –Finite state machines –Transition coverage –Fault based testing – Mutation analysis -Case studies.

SOFTWARE QUALITY ASSURANCE STANDARDIZATION **9 Hours**

Software Standards–ISO 9000 Quality System Standards - Capability Maturity Model and the Role of SQA in Software Development Maturity – SEI CMM Level 5 – Comparison of ISO 9000 Model with SEI's .

Theory: 45 hours **Tutorial: 0 hour** **Total hours:45**

REFERENCES

1. BorizBeizer, "Software Testing Techniques", 2nd Edition, DreamTech, 2009.
2. Stephen H. Khan, "Metrics And Models In Software Quality Engineering", Second edition, Pearson Education, 2004
3. P. Mathur, "Foundations of Software Testing", Pearson, 2008
4. Mauro Pezze and Michal Young, "Software Testing and Analysis. Process, Principles, and Techniques", John Wiley 2008
5. Mordechai Ben-Menachem / Garry S Marliss, "Software Quality", Vikas Publishing House, Pvt, Ltd., New Delhi,1997

U15ITE020 SOFTWARE PROJECT MANAGEMENT

L	T	P	C
3	0	0	3

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1	Understand software project planning and management.	K2
CO2	Identify and evaluate the cost estimation for a project	K3
CO3	Analyze the risk involved in a project and managing the allocation of its resources.	K3
CO4	Evaluate cost and contract management.	K2
CO5	Manage the software team and enhancing the Software Quality by external standards	K2

Pre-requisite: Software Engineering

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M										W	
CO2	S	S	M						S	S	M	
CO3	S	M	M						M	M		
CO4	M	M										
CO5	M	M							M			

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Model Exam 3. Assignment 4. Seminar 5. Project 6. Case study	1. Course Exit Survey

INTRODUCTION **5 Hours**

Software Project Management - An Overview of Project Planning - Programme Management and Project Evaluation.

COST ESTIMATION 6 Hours

Selection of an Appropriate Project Approach – Software Effort Estimation - Activity Planning

RISK MANAGEMENT AND RESOURCE ALLOCATION 14 Hours

Risk Management: Risk – Categories of Risk – A Framework for Dealing with Risk – Risk Identification – Risk Assessment – Risk Planning – Risk Management – Evaluating Risks to the Schedule –Monte Carlo Simulation – Critical Chain Concepts.

Resource Allocation: The Nature of Resources – Identifying Resource Requirements – Scheduling Resources – Creating Critical Paths - Publishing the Resource Schedule – Cost Schedules – The Scheduling Sequence.

MONITORING, MANAGING AND CONTROL 12Hours

Monitoring and Control: Creating the Framework – Collecting the Data – Visualizing Progress – Cost Monitoring – Earned Value Analysis – Prioritizing Monitoring – Change Control

Managing Contracts: The Supply Process – Types of Contract – Stages in Contract Placement – Typical Terms of a Contract – Contract Management – Acceptance

MANAGING PEOPLE AND ORGANIZING TEAMS 9 Hours

Managing People and Organizing Teams - Software Quality– Practical Software Quality Measures – Product versus Process Quality Management – External Standards – Techniques to Help Enhance Software Quality – Quality Plans.

Theory: 45 hours **Tutorial: 0 hour** **Total Hours:45**

REFERENCES

1. Bob Hughes, Mike Cotterell, “Software Project Management”, Fifth Edition, Tata McGraw Hill, 2010.
2. Walker Royce, “Software Project Management– A Unified Framework”, Pearson Education, 2004.
3. Humphrey and Watts, “Managing the software process”, Addison Wesley, 1989.

U15ITE021 MANAGEMENT INFORMATION SYSTEM

L	T	P	C
3	0	0	3

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1	Relate the value of information systems to various firms.	K2
CO2	Describe key information technologies used in today's businesses, such as databases and business intelligence tools	K2
CO3	Analyze issues related to information systems acquisition, development, operations, and management.	K3
CO4	Identify the ethical, social, and security issues of information systems.	K3
CO5	Apply the skills and techniques necessary to use a computer for information management in a business environment.	K3

Pre-requisite: Nil

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M										
CO2	M											
CO3	M	M										
CO4	S	S							M	M		
CO5	S	S			S				M	M		

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Model Exam 3. Assignment 4. Seminar 5. Case study	1. Course Exit Survey

INFORMATION SYSTEMS IN THE ENTERPRISE **9 Hours**

Overview of IS - Business Perspective - Contemporary Approaches - New Role of IS in

Organizations - E Commerce - E Business - New Opportunities - Types of Systems – Functional Perspective - Enterprise Applications – ES, SCM, CRM, KM.

INFORMATION SYSTEM, ORGANISATIONS, MANAGEMENT AND STRATEGY **9 Hours**

Organizations and IS - Changing Role of IS - Decision Making - Business Strategy – E Business and E Commerce - Ethical and Social Issues.

IT INFRASTRUCTURE **9 Hours**

Computer Hardware - Computer Categories - Software- Management. Data in Files - Database Environment - Database Management - Trends - New IT Infrastructure – Internet – WWW – Support Technology – Management Issues and Decisions.

MANAGEMENT AND ORGANIZATIONAL SUPPORT SYSTEMS **9 Hours**

KM in Organizations – KWS – AI - Intelligent Techniques - Decision Support Systems – GDSS - Executive Support Systems - Organizational Change – BPR - Systems Development – Approaches - Application Development – Case study

INFORMATION SYSTEM SECURITY AND CONTROL **9 Hours**

System Vulnerability and Abuse - Control Environment - System Quality. International IS - Growth – Organizing - Managing - Issues and Opportunities – Case study

Theory: 45 hours **Tutorial: 0 hour** **Total Hours:45**

REFERENCES

1. Kenneth C. Laudon and Jane Price Laudon, "Management Information Systems - Managing the Digital Firm", Thirteenth Edition, Pearson Education Asia, 2015.
2. Gordon B.Davis, "Management Information System: Conceptual Foundations, Structure And Development", McGraw Hill, 1989.
3. Steven Alter, "Information System – A Management Perspective" – Addison Wesley, 2008.
4. James O' Brein, "Management Information Systems", Tata McGraw Hill, New Delhi, 2009.
5. Ralph M.Stair and George W.Reynolds, "Principles Of Information Systems – A Managerial Approach", Thomson Asia Pvt. Ltd., 2014.

L	T	P	C
3	0	0	3

U15ITE022 INFORMATION SECURITY

Course Outcomes (COs):
After successful completion of this course, the students should be able to

CO1	Describe threats to information security and security SDLC.	K2
CO2	Identify the security threats and attacks.	K3
CO3	Analyze the mechanism to assess and control risk.	K4
CO4	Describe the types of security policies and standards.	K2
CO5	Identify security issues related to personnel decisions, and qualifications of security personnel.	K2

Pre-requisite: Nil

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M					M		M				
CO2	M					M		M	M	M		M
CO3						M		M	M	M		M
CO4						M		M				
CO5						M		M	M	M		M

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Model Exam 3. Case Study –CO1 – CO5	1. Course Exit Survey

INTRODUCTION 9 Hours

History - What is Information Security? - Critical characteristics of information - NSTISSC security model - Components of an information system - Securing the components - Balancing security and access - The SDLC - The security SDLC.

SECURITY INVESTIGATION 9 Hours

Need for security - Business needs - Threats – Attacks – Legal - Ethical and professional issues.

SECURITY ANALYSIS 9 Hours

Risk management: Identifying and assessing risk - Assessing and controlling risk.

LOGICAL DESIGN 9 Hours

Blueprint for security - Information security policy - Standards and practices - ISO 17799/BS 7799 – NIST models - VISA international security model - Design of security architecture - Planning for continuity.

PHYSICAL DESIGN 9 Hours

Security technology – IDS - Scanning and analysis tools –Access control devices - Physical security - Security and personnel.

Theory : 45 hours **Tutorial : 0 hour** **Total Hours:45**

REFERENCES

1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Fourth Edition, Thomson Publishing, India Edition, 2011.
2. Micki Krause, Harold F. Tipton, "Handbook of Information Security Management", Vol 1-3 CRC Press LLC, 2004.
3. Stuart McClure, et al., "Hacking Exposed", Tata McGraw- Hill, Sixth edition2009.
4. Matt Bishop, "Computer Security Art and Science", Pearson/PHI, 2002.

U15ITE023 OPEN SOURCE TECHNOLOGIES

L	T	P	C
3	0	0	3

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1	Summarize the need of open source software and the features of Linux OS.	K2
CO2	Demonstrate the features of non relational database over relational database	K3
CO3	Apply core concepts of Python to develop dynamic applications.	K3
CO4	Explain the basics of PERL.	K2

Pre-requisite: Nil

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M										
CO2	M	M	W		M				M	M		
CO3	M	M	W		M				M	M		
CO4	M	W										

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Model Exam 3. Assignment 4.Seminar 5. Group Projects	1. Course Exit Survey

OPEN SOURCE AND INTRODUCTION TO LINUX **9 Hours**

Introduction to Open Sources – Need of Open Sources – Advantages of Open Sources– Application of Open Sources - Open Source Operating Systems: LINUX: Introduction – General Overview – Kernel architecture-Kernel Mode and User Mode – Process Management – Process Scheduling –Signal handling

MONGODB **9 Hours**

Basics of JSON-NoSQL-Relational vs Non Relational Database-Mongo DB-Creating, Updating and deleting documents-Querying: Fundamentals-arrays-Embedded documents-Indexing: Basics

PYTHON -FUNDAMENTALS **9 Hours**

Syntax and Style –Data types-Collection Data types-Exception handling and Functions-Modules and Packages

PYTHON –ADVANCED FEATURES **9 hours**

File handling: Text files-XML files-Processes and Threading-Networking- DB Programming

PERL **9 Hours**

PERL Backgrounder – PERL Overview –Variables and Data – Statements and Control Structures – Subroutines - Packages and Modules - Working with Files – Data Manipulation-Perl Process Management.

Theory: 45 hours **Tutorial: 0 hour** **Total Hours:45**

REFERENCES

1. Robert Love, “Linux Kernel Development”, Third edition, Pearson Publications, 2011
2. Kristina Chodorow, "MongoDB: The Definitive Guide", 2nd Edition, O'ReillyMedia, May 2013
3. Mark Summerfield, “Programming in Python 3: A Complete Introduction to the Python Language” , 2nd Edition, Addison Wesley,2010
4. Martin C. Brown, “Perl: The Complete Reference”, Second edition, Tata McGraw-Hill, Indian Reprint, 2009.
5. http://www.tutorialspoint.com/mongodb/
6. http://www.w3resource.com/mongodb/introduction-mongodb.php

U15ITE024 **ARTIFICIAL INTELLIGENCE**

L	T	P	C
3	0	0	3

Course Outcomes (CO):

After Successful completion of this course, the students will be able to:

CO1	Demonstrate awareness of intelligent agents and problem solving using uninformed, informed and local search methods	K2
CO2	Describe about adversarial search and constraint satisfaction problem solving.	K2
CO3	Develop knowledge about usage of propositional logic and first order logic for making inferences.	K3
CO4	Describe the use of planning and different knowledge representation methods.	K2
CO5	Explore knowledge of machine learning methods and AI applications	K2

Pre-requisite: Discrete Mathematics

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	M									
CO2	M	M										
CO3	S	M	M							M		
CO4	M											
CO5	M	M										M

Course Assessment Methods:

Direct	Indirect
1. Internal Tests 2. Assignment 3. Seminar 4. Case Study	1. Course End Survey

INTRODUCTION AND PROBLEM SOLVING **10 Hours**

Definitions of AI - Intelligent Agents. Problem solving by searching: Problem-solving agents- Example problems – Search for solutions- - Uninformed search strategies – Informed search strategies – Heuristic functions – Local Search Algorithms and Optimization Problems- Local search in continuous spaces-Searching with non-deterministic actions.

PROBLEM SOLVING METHODS **8 Hours**

Adversarial search: Games-Optimal decisions in games – Alpha-beta pruning – Imperfect real time decisions. Constraint Satisfaction Problems(CSP): Defining CSP problems-Constraint

Propagation: Inference in CSPs - Backtracking search for CSPs

LOGIC 10 Hours

Logical agents: Knowledge-based agents – The Wumpus world. Logic – Propositional logic: A very simple logic-Propositional theorem proving.

First order logic: Representation – Syntax and semantics of first order logic – Using first order logic.

Inference in first order logic: Propositional versus first order inference– Unification and lifting – Forward chaining – Backward chaining – Resolution.

PLANNING AND KNOWLEDGE REPRESENTATION 8 Hours

Classical Planning: Definition – Algorithms for planning as state-space search-Planning graphs – Other classical planning approaches.

Knowledge Representation - Ontological engineering - Categories and objects –Events - Mental events and Mental objects - Reasoning systems for categories -Reasoning with default information

MACHINE LEARNING AND APPLICATIONS 9 Hours

Quantifying uncertainty: Acting under uncertainty - Probability basics – Bayes' Rule and its use. Probabilistic reasoning: Representing knowledge in uncertain domain- The semantics of Bayesian networks –Efficient representation of conditional distributions- Exact inference in Bayesian Networks. Learning from examples: Forms of learning- Supervised learning - Learning decision trees. Natural language processing: Language models –Text classification- Information retrieval - Foundation of Cognitive computing

Theory: 45 hours **Tutorial: 0 hour** **Total Hours:45**

REFERENCES:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", 3rd Edition, Pearson Education / Prentice Hall of India, 2015.
2. Judith Hurwitz, Marcia Kaufman, "Cognitive Computing and Big Data Analytics", Wiley Publication, April 2015
3. Elaine Rich, Kevin Knight, Shivashankar B.Nair, "Artificial Intelligence", Tata McGraw Hill Publishing Company Limited. Third Edition , 2009
4. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd.,2000.
5. George F. Luger, "Artificial Intelligence-Structures and Strategies For Complex Problem Solving", Pearson Education / PHI, 2002
6. David L. Poole, Alan K. Mackworth, Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.

Other References:

1.http://aima.cs.berkeley.edu
2. http://www-formal.stanford.edu/jmc/whatisai/
3.http://nptel.ac.in/courses/106106126/4

OPEN ELECTIVES (OE)

U15ITOE01 OBJECT ORIENTED PROGRAMMING USING C++ AND JAVA

L	T	P	C
3	0	0	3

Course Outcomes (COs):
After successful completion of this course, the students should be able to

CO1	Interpret the need of object oriented concepts and its fundamentals	K2
CO2	Develop solutions for the problems using basic oops concepts	K3
CO3	Analyze the salient features of Java over C++ and write programs using fundamental concepts.	K3

Pre-requisite: Nil

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	W										
CO2	M	M	M									
CO3	M	M	M									

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Model Exam 3. Assignment 4. Seminar 5.Quiz	1. Course Exit Survey

INTRODUCTION **9 Hours**

Principles of Object Oriented Programming –Fundamentals of C++- Functions in C++: Inline Functions-Default arguments –Function Overloading (Without class)-Classes and Objects.

CLASSES AND OBJECTS **9 Hours**

Constructors and its types-Destructors-Operator Overloading : Unary operator overloading – Binary operator overloading-Operator Overloading using friend functions

POLYMORPHISM & INHERITANCE 9 Hours

Inheritance –Types- Virtual Base classes –Abstract classes-Virtual Destructors-Virtual Functions-Polymorphism

JAVA FUNDAMENTALS-I 9 hours

Java Fundamentals – Control Structures – Classes – Methods - Garbage Collection – Inheritance

JAVA FUNDAMENTALS-II 9 hours

String Handling -Packages -Interfaces – Exception Handling in java

Theory: 45 hours **Tutorial: 0 hour** **Total Hours:45**

REFERENCES

1. E.Balagurusamy "Object Oriented Programming with C++", 6th Edition, TMH 2013
2. Herbert Schildt, "The Complete Reference– Java", Tata McGraw Hill, Ninth edition,2014
3. Deitel and Deitel, Java: How to Program, Ninth Edition, Prentice Hall, Tenth Edition,2014
4. K.R.Venugopal, Rajkumar Buyya, T.Ravishankar, "Mastering C++", Second Edition, TMH, 2013.
5. Cay S. Horstmann, Gary Cornell, "Core Java, Volume I—Fundamentals", Eighth Edition, Sun Microsystems,2011.
6. Ira Pohl, "Object oriented programming using C++", Pearson Education Asia, 2004
7. Bjarne Stroustrup, "The C++ programming language", Addison Wesley, fourth edition, 2014
8. John R.Hubbard, "Programming with C++", Schaums outline series, TMH, 2003

U15ITOE02 INTERNET OF THINGS

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Design a portable IoT using Arduino/equivalent boards	K3
CO2	Deploy an IoT application and connect to the cloud	K3
CO3	Design IoT based real time applications.	K3
CO4	Analyze real time data stored in a cloud server using Mongo DB	K3

Pre-requisite: Nil

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M				M\				M			M
CO2	M	M							M			M
CO3	M		M						M			M
CO4	M	M			M				M			M

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. End Semester Exam 3. Assignments /Case studies	1. Course Exit Survey

FUNDAMENTALS OF IOT **9**

Introduction-Characteristics-Physical design - Protocols – Logical design – Enabling technologies – IoT Levels – Domain Specific IoTs – IoT vs M2M.

IOT DESIGN METHODOLOGY **9**

IoT systems management – IoT Design Methodology – Specifications Integration and Application Development

BUILDING IOT WITH RASPBERRY PI/ GALILEO/ARDUINO **9**

Physical device – Raspberry Pi Interfaces – Programming - Intel Galileo Gen2 with Arduino- Interfaces - Arduino IDE – Programming - APIs.

DATA STORAGE USING MONGODB **9**

MongoDB – Overview- Advantages - Environment - Data Modeling - Create Database - Drop Database- Create Collection- Drop Collection- Data Types - Insert Document - Query Document - Update Document - Delete Document.

CASE STUDIES and ADVANCED TOPICS **9**

Various Real time applications of IoT- Connecting IoT to cloud – Cloud Storage for Iot – Data Analytics for IoT – Software & Management Tools for IoT

Theory: 45 hours **Tutorial: 0 hour** **Total Hours:45**

REFERENES

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

2. Manoel Carlos Ramon, “Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers”, Apress, 2014.

3. Marco Schwartz, “Internet of Things with the Arduino Yun”, Packt Publishing, 2014.

4. Kristina Chodorow , MongoDB: The Definitive Guide - Powerful and Scalable Data Storage,2nd Edition , O'Reilly Media,2013.

U15ITOE03 **MULTIMEDIA SYSTEMS**

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Explain the basic elements of design and its aesthetics.	K2
CO2	Summarize the theory behind visual elements.	K2
CO3	Design for better user experience.	K3
CO4	Make use of the design terminologies in their work.	K3
CO5	Plan for a job/ freelancing in multimedia.	K3

Pre-requisite: Nil

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	M											
CO3	S				S			S		S		S
CO4	S				S	S		S	S	S	S	S
CO5	M				S	S	S	S				S

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignment 3. Mini Project 4. Certification Course	1. Course Exit Survey

DESIGN ESSENTIALS **9 Hours**

Elements of Design: difference between Vector and Raster graphics – Applications and Possibilities of latest gen software : Specific for Raster graphics and Vector graphics – Design considerations and formats for Web – Thinking like a designer

COLOR THEORY AND DESIGN PRINCIPLES 9 Hours

Basic Color Theory – RGB v CMYK Space – Resolution for Print and Web – Using Adobe Color CC(free) to create Color Schemes – Learn about various color schemes – Explore Mobile App (Capture CC) free for both iPhone & Android – Advantages of SVG

FOUNDATIONS OF UX AND UI 9 Hours

Introduction and History of UX – Why UX is important in Web Design & Apps – What is Interaction Design – What is Information Architecture – What is Visual Design – A/B testing – Waterfall Model and its advantages – Search Engine Marketing (SEM) – Search Engine Optimization (SEO)

GRAPHIC DESIGN – CORE CONCEPTS 9 Hours

What is Graphic Design – Exploring Principles of Layout and Composition – Introduction to Typography – Brain Storming your ideas – Harnessing your creativity - Photoshop – Illustrator – In design Basic Workflow

GRAPHIC DESIGN LAB 9 Hours

Designing a Business Card and all Corporate stationary in Photoshop – Designing Basic Wireframes for Website and mobile App both Manually and in Photoshop – Optimizing images for Web in Photoshop or Illustrator – Making a Responsive Website in Muse – Making the Website live in your server.

Theory: 45 hours **Tutorial: 0 hour** **Total Hours:45**

REFERENCES

1. Adobe Creative Team, "Design with Adobe Creative Cloud Classroom in a Book: Basic Projects using Photoshop, InDesign, Muse, and More", Adobe, 2013.

2. Rex Hartson and PardhaPyla, "The UX Book: Process and Guidelines for Ensuring a Quality User Experience", Morgan Kaufmann, 2012.

3. Denise Bosler, "Mastering Type: The Essential Guide to Typography for Print and Web Design", How Books, 2012.

U15ITOE04 **FOUNDATIONS OF INFORMATION TECHNOLOGY**

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Outline various functional components of computer system	K2
CO2	Summarize the functions of operating systems, the different types of network topologies & protocols	K2
CO3	Explain the various internet tools and fundamentals of database	K2
CO4	Interpret the need of computer security	K2
CO5	Explain the basics of multimedia and the future trends in IT	K2

Pre-requisite: Nil

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	M	W										
CO3	M											
CO4	M	W										
CO5	M	W										

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignment 3. Mini Project 4. Certification Course	1. Course Exit Survey

COMPUTER BASICS AND ARCHITECTURE **9 Hours**

Information Technology Basics: Introduction - Role of IT - Information Technology and Internet

Computer Organization and Architecture: Introduction – CPU - Communication among various units - Instruction Format-Instruction Cycle - Instruction Set - Data Representation in Computers - Coding schemes

Computer Memory and Storage: Memory Hierarchy - Types of Memory - CPU interaction with memory - Secondary Storage devices and its types

BASICS OF OPERATING SYSTEMS AND NETWORKS **9 Hours**

Operating systems: Evolution-Types of Operating System –Functions of Operating System-Coordinating machine activities-Handling competition among processes

Data Communication and Computer Networks: Introduction - Data Communication - Transmission Media - Modulation-Multiplexing – Switching - Network Topologies - Communication Protocol - Network devices

BASICS OF INTERNET AND DATABASES **9 Hours**

Internet and Internet Tools: Internet Basics - Applications of Internet - Data over Internet - Web Browser - Email, Search Engines, Instant Messaging

Database Fundamentals: Logical and Physical Data Concepts - Database Management System – Architecture - Database Models - Types of databases - Data warehousing and Mining

COMPUTER SOFTWARE AND COMPUTER SECURITY **9 Hours**

Introduction to Software - Categories of Software - Software Piracy - Software Terminologies

Computer Security : Security Threats - Malicious Programs – Cryptography - Digital Signature – Firewall - User Identification and Authentication

BASICS OF MULTIMEDIA AND FUTURE TRENDS IN IT **9 Hours**

Multimedia Essentials: Building blocks - Multimedia system - Applications of multimedia

E-Commerce – EDI - Wireless Application Protocol - Smart Card - IPTV Blogging – RFID - Brain Computer Interface

Theory: 45 hours **Tutorial: 0 hour** **Total: 45 Hours**

REFERENCES

1. ITL Education solutions limited, Introduction to Information Technology, Pearson Education,2012
2. J. Glenn Brookshear , Computer Science: An Overview,11th edition, Pearson Education,2012
3. V.Rajaraman, Introduction to Information Technology,2nd Edition, PHI Learning Private Limited,2013

ONE CREDIT COURSES

U15ITIN01 INNOVATION AND ENTREPRENEURSHIP

L	T	P	C
1	0	0	1

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Develop skills for innovative thinking	K3
CO2	Analyze the plans for entrepreneurship	K3

Pre-requisite: Nil

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M										
CO2	M	M										

Course Assessment methods:

Direct	Indirect
Seminar / Assignment	Course Exit Survey

1. Introduction to Entrepreneurship& Business Plans
2. Understanding Failures in Entrepreneurship
3. Thinking Innovatively for Engineers
4. Preparing your Business Plan effectively
5. Branding & Company Description
6. Understanding your Target Market, industry analysis, trends and future markets
7. Risk Management, Sales Strategy, Marketing & Scenario Plans
8. Elevator Pitch
9. Operations, Technology, Management & Organization
10. Intellectual Property
11. Venture Capital Financing
12. Community Involvement, Social Responsibility, Milestones and Exit Plans
13. The Lean Startup
14. Types of Organizations to Consider while making a business plan

Total Hours: 15

U15ITIN02 ERP AND BUSINESS APPLICATIONS

L	T	P	C
1	0	0	1

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Explain the ERP usage in Business Applications	K2
CO2	Demonstrate the use of ERP Implementation Methodology in SAP	K2
CO3	Outline the importance of SAP software	K2

Pre-requisite: Nil

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	W										
CO2	M	W										
CO3	M	W										

Course Assessment methods:

Direct	Indirect
Seminar / Assignment	1. Course Exit Survey

FUNDAMENTALS **4 Hours**

An Overview – ERP, Enterprise, Benefits of ERP, Business Process Modeling, Business Process Reengineering (BPR), Supply Chain Management

THE BUSINESS MODULES AND ERP MARKET PLACE **4 Hours**

Business modules in an ERP Package, Materials Management ,Finance, Manufacturing, Plant Maintenance, , Quality Management, Sales and Distribution, Human Resources

ERP Market Place, SAP AG, PeopleSoft, Baan, JD Edwards, Oracle

ERP IMPLEMENTATION **4 Hours**

ERP Implementation Lifecycle, Implementation Methodology, Organizing the Implementation, Project Management and Monitoring

SAP R/3 AND BUSINESS APPLICATIONS **3 Hours**

SAP R/3 Basis Technology, Business Frame work Architecture, ASAP Methodology, SAP

Core Functional Modules, New Dimension Products

Theory: 15 Hrs **Tutorial: 0 hour** **Total Hours:15**

REFERENCES

1. Vinod Kumar Garg and Venkitakrishnan N K, “Enterprise Resource Planning Concepts and Practice”, Prentice Hall of India, 2003
2. Alexis Leon, “ERP Demystified”, Tata McGraw Hill, 2000
3. http://www.1172006.com/store/books/SAP_R3_Handbook_-_Third_Edition.pdf
4. http://www.saptechies.org/sap-pdf-books-download/basis/Sap-r3-Handbook.pdf

U15ITIN03 AGILE SOFTWARE DEVELOPMENT

L	T	P	C
1	0	0	1

Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Explain the agile concepts in software development	K2
CO2	Demonstrate the use of scrum methodology in mobile specific application	K3
CO3	Outline the importance of screen orientation and mobile browser	K2

Pre-requisite: Software Engineering

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	W										
CO2	M	W								M		
CO3	M	W										

Course Assessment methods:

Direct	Indirect
Project development using SCRUM	1. Course Exit Survey

OVERVIEW OF AGILE **4 Hours**

An Overview -Agile concepts- Terminology discussions-Ceremony discussions-Action plan-Pre-planning-Create backlog for Sprints-Release Planning-Discuss on the course structure, Team formation (SM, PO, Dev, Test roles to be rotated in every Sprint) -Setting up the environments-Backlog grooming for Sprint1(S1).

MOBILE-SPECIFIC ENHANCEMENTS & BROWSER-DETECTION **4 Hours**

Agile Development: Adapting to Scrum - Patterns for Adopting to Scrum - New Roles - Changed Roles - Sprints - Product Backlogs - Teamwork -Sprint Planning – Planning- Story Point Estimation- Task Break Down- detail-hrs estimation- Daily Stand Up (Dev & Test)-Demo- Retrospective

TOUCH INTERFACES & GGEOLOCATION **4 Hours**

SCRUM – process flow, scrum roles, scrum cycle description, product backlog, sprint planning meeting, sprint backlog, sprint execution, daily scrum meeting, maintaining sprint backlog and burn-down chart, sprint review and retrospectiveSprint Planning – Planning- Story Point Estimation- Task Break Down- detail-hrs estimation-Daily Stand Up (Dev & Test)-Demo-Retrospective

SCREEN ORIENTATION - MOBILE BROWSER "INTERPRETATIONS" 3 Hours

Agile Practices - test driven development, refactoring, pair programming, continuous integration, exploratory testing versus scripted testing-Sprint Planning – Planning- Story Point Estimation- Task Break Down- detail-hrs estimation-Daily Stand Up (Dev & Test)-Demo-Retrospective

Theory: 15 Hrs **Tutorial: 0 hour** **Total Hours:15**

REFERENCES

1. R.S. Pressman, "Software Engineering – A Practitioner's Approach", Eighth edition, McGraw Hill International Edition, 2014
2. Mike Cohn, "Succeeding with Agile: Software Development Using Scrum", 1st Edition, ISBN-10: 0321579364 | ISBN-13: 9780321579362, 2010.
3. Schwaber, K. and Beedle, M. (2001). Agile Software Development with SCRUM, 1st Ed. New Jersey: Pearson. [ISBN - 9780130676344]
4. www.inf.ed.ac.uk/publications/thesis/online/IM100767.pdf

U15ITIN04 UX/UI (User Experience/User Interface) Design

L	T	P	C
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Course Outcomes:

After successful completion of this course, the students should be able to

CO1	Design and develop responsive wireframe for Mobile Apps & website	K3
CO2	Learn and understand the use of Sprite sheets in 2D Gaming	K2
CO3	Develop Mobile apps for various platforms and test it	K4

Pre-requisite: Nil

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M		W							
CO2	M											
CO3			M	W	W							

Course Assessment methods:

Direct	Indirect
Project development using SCRUM	1. Course Exit Survey

1. Assigning a concept to every student - They choose required app to prototype
2. Brainstorming the user requirements and develop wireframe for the App/Website.
3. After approval of wireframe design starts with A/B testing with focus on Waterfall model
4. Information Architecture is planned and design process starts.
5. Design assets and responsive Wireframe in Illustrator. (Get Approval)
6. Intro to Adobe XD (Experience Design). Prototype with Mobile app style animation.
7. Get the graphics to Google Pixate and make a complete prototype.
8. Intro to Edge Animate - Creating a responsive Music Player App without coding
9. Intro to sprite sheets (used for 2D Gaming).
10. Intro to PhoneGap.
11. Advantages & Disadvantages between Native & Packaged App.
12. Packaging your first mobile app with Phonegap.
13. Deploying your first Mobile app for 4 platforms - Android, iOS, Windows and blackberry.
14. Testing your successful app.

Total Hours: 18