ANNA UNIVERSITY, CHENNAI
NON - AUTONOMOUS COLLEGES AFFILIATED ANNA UNIVERSITY
MASTER OF COMPUTER APPLICATIONS (2 YEARS)
REGULATIONS – 2021
CHOICE BASED CREDIT SYSTEM

1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

Graduates will be able to:

I. Apply their computing skills to analyse, design and develop innovative software products to meet the industry needs and excel as software professionals.
II. Pursue lifelong learning and do research in the computing field based on solid technical foundations.
III. Communicate and function effectively in teams in multidisciplinary fields within the global, societal and environmental context.
IV. Exhibit professional integrity, ethics and an understanding of responsibility to contribute technical solutions for the sustainable development of society.

2. PROGRAM OUTCOMES (POs)

1. An ability to independently carry out research/investigation and development work to solve practical problems
2. An ability to write and present a substantial technical report/document
3. Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program
4. Able to select suitable data models, appropriate architecture, and platform to implement a system with good performance.
5. Able to design and integrate various system based components to provide user interactive solutions for various challenges.
6. Able to develop applications for real time environments using existing and upcoming technologies.

PEO/PO Mapping:

PEO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
I.	3	1	3	3	3	3
II.	2	1	3	3	3	3
III.	3	3	2	3	2	2
IV.	2	1	2	1	1	2

(3-High, 2- Medium, 1- Low)

Principal
J.K.K.Munirajah College of Technology
(Autonomous)
T.N.Palayam, Gobi (Tk),
Erode (Dt) - 638 506.

MAPPING OF COURSE OUTCOMES AND PROGRAMME OUTCOMES

		COURSE NAME	PO1	PO2	PO3	PO4	PO5	PO6
YEAR I	SEMESTER I	Applied Probability and Statistics for Computer	2.5	0.2	2	2	1.2	2.4
		Research Methodology and IPR	3	2.4	0.4	1.4	-	0.6
		Advanced Data Structures and Algorithms	2.5	1	3	2	1.8	2
		Object Oriented Software Engineering	1.83	1	3	2.66	2	2
		Python Programming	2.2	1	3	3	2.2	2.6
		Fundamentals of Accounting	1.2	1	1.4	1	1	1.2
		Advanced Data Structures and Algorithms Laboratory	2.6	1	3	3	2.8	2.8
		Python Programming Laboratory	1.8	1	3	2.6	2	2.2
		Communication Skills Enhancement – I	1	2.6	2.2	1	1	1
	SEMESTER II	Full Stack Web Development	1.8	1	2.6	2	2.6	2.4
		Advanced Database Technology	2	1	2.8	2	2.2	2.4
		Cloud Computing Technologies	2.2	1	2.2	2	2	2
		Mobile Application Development	2.4	1	2.4	2.4	2	2.4
		Cyber Security	2	1	2	2	2	2
		Advanced Database Technology Laboratory	2	1	2	2	2	2
		Full Stack Web Development Laboratory	2.2	1	2.4	2	2.6	2.6
		Communication Skills Enhancement– II	1	2	1	1	1	1
YEAR II	SEMESTER III	Machine Learning	1.6	1	2	2	2	2
		Internet of Things	2	1	2.4	2	2	2.4
		Machine Learning Laboratory	2	1	2	2	2	2
		Internet of Things Laboratory	2	1	2	2	2	2
	SEMESTER IV	Project Work	3	3	3	3	3	3

PROFESSIONAL ELECTIVE COURSES [PEC]

S. NO.	COURSE TITLE	PO1	PO2	PO3	PO4	PO5	PO6
1.	Software Project Management	2	1	2	2	2	2
2.	Professional Ethics in IT	1	1	1	1	1	1
3.	E – Learning	2	1	2	2	2	2
4.	Advances in Operating System	2	1	2	2	2	2
5.	Information Retrieval Techniques	2	1	2	2	2	2
6.	Soft Computing Techniques	2	1	2	2	2	2
7.	Operations Research	2	1	2	2	2	2
8.	Business Data Analytics	2	1	2	2	2	2
9	DevOps and Microservices	1.8	1.2	2	2	2	2
10.	Advances in Networking	2	1	2	2	2	2
11.	Digital Image Processing	2	1	2	2	2	2
12.	Social Network Analytics	2	1	2	2	2	2
13.	Cryptocurrency and Blockchain Technologies	2	1	2	2	2	2
14.	Bio Inspired learning	2	1	2	2	2	2
15.	Digital Marketing	2	1	2	2	2	2
16.	Software Architecture	2	1.4	2	2	2	2
17.	Digital Forensics	2	1	2	2	2	2
18.	Wireless Networking	2	1	2	2	2	2
19.	Data Visualization Techniques	2	1	2	2	2	2
20.	Data Mining and Data Warehousing Techniques	2	2	2	2	2	2
21.	Agile Methodologies	2	1	2	2	2	2
22	Organizational Behavior	1	1	1	1	1	1
23	Web Design	2	1	2	2	2	2
24	C# and .NET	2	1	2	2	2	2
25	Big Data Analytics	2	1	2	2	2	2
26	Software Quality and Testing	2	1	2	2	2	2
27	Advanced Java Programming	2	1	2	2	2	2
28	Network Programming and Security	2	1	2	2	2	2

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I TO IV SEMESTERS CURRICULA AND SYLLABI
SEMESTER I

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA4151	Applied Probability and Statistics for Computer Science Engineers	FC	3	1	0	4	4
2.	RM4151	Research Methodology and IPR	RMC	2	0	0	2	2
3.	MC4101	Advanced Data Structures and Algorithms	PCC	3	0	0	3	3
4.	MC4102	Object Oriented Software Engineering	PCC	3	0	0	3	3
5.	MC4103	Python Programming	PCC	3	0	0	3	3
6.	MC4104	Fundamentals of Accounting	PCC	3	0	2	5	4
7.		Audit Course – I*	AC	2	0	0	2	0
PRACTICALS								
8.	MC4111	Advanced Data Structures and Algorithms Laboratory	PCC	0	0	4	4	2
9.	MC4112	Python Programming Laboratory	PCC	0	0	4	4	2
10.	MC4113	Communication Skills Enhancement – I	EEC	0	0	2	2	1
			TOTAL	**19**	**1**	**12**	**32**	**24**

*Audit course is optional

SEMESTER II

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MC4201	Full Stack Web Development	PCC	3	0	0	3	3
2.	MC4202	Advanced Database Technology	PCC	3	0	0	3	3
3.	MC4203	Cloud Computing Technologies	PCC	3	0	0	3	3
4.	MC4204	Mobile Application Development	PCC	3	0	2	5	4
5.	MC4205	Cyber Security	PCC	3	0	0	3	3
6.		Professional Elective I	PEC	3	0	0	3	3
7.		Audit Course – II*	AC	2	0	0	2	0
PRACTICALS								
8.	MC4211	Advanced Database Technology Laboratory	PCC	0	0	4	4	2
9.	MC4212	Full Stack Web Development Laboratory	PCC	0	0	4	4	2
10.	MC4213	Communication Skills Enhancement– II	EEC	0	0	2	2	1
			TOTAL	**20**	**0**	**12**	**32**	**24**

*Audit course is optional

SEMESTER III

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MC4301	Machine Learning	PCC	3	0	0	3	3
2.	MC4302	Internet of Things	PCC	3	0	0	3	3
3.		Professional Elective II	PEC	3	0	0	3	3
4.		Professional Elective III	PEC	3	0	0	3	3
5.		Professional Elective IV	PEC	3	0	2	5	4
6.		Open Elective	OEC	3	0	0	3	3
PRACTICALS								
7.	MC4311	Machine Learning Laboratory	PCC	0	0	4	4	2
8.	MC4312	Internet of Things Laboratory	PCC	0	0	4	4	2
			TOTAL	**18**	**0**	**10**	**28**	**23**

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1.	MC4411	Project Work	EEC	0	0	24	24	12
			TOTAL	0	0	24	24	**12**

TOTAL NO. OF CREDITS: 83

PROFESSIONAL ELECTIVES
SEMESTER II, ELECTIVE I

S.No.	COURSE CODE	COURSE TITLE	CATE - GORY	CONTACT PERIODS	L	T	P	C
1.	MC4001	Software Project Management	PEC	3	3	0	0	3
2.	MC4002	Professional Ethics in IT	PEC	3	3	0	0	3
3.	MC4003	E - Learning	PEC	3	3	0	0	3
4.	MC4004	Advances in Operating System	PEC	3	3	0	0	3
5.	MC4005	Information Retrieval Techniques	PEC	3	3	0	0	3
6.	MC4006	Soft Computing Techniques	PEC	3	3	0	0	3
7.	MC4007	Operations Research	PEC	3	3	0	0	3
8.	MC4008	Business Data Analytics	PEC	3	3	0	0	3

SEMESTER III, ELECTIVE II

S.No.	COURSE CODE	COURSE TITLE	CATE-GORY	CONTACT PERIODS	L	T	P	C
1.	MC4009	DevOps and Microservices	PEC	3	3	0	0	3
2.	MC4010	Advances in Networking	PEC	3	3	0	0	3
3.	MC4011	Digital Image Processing	PEC	3	3	0	0	3
4.	MC4012	Social Network Analytics	PEC	3	3	0	0	3
5.	MC4013	Cryptocurrency and Blockchain Technologies	PEC	3	3	0	0	3
6.	MC4014	Bio Inspired learning	PEC	3	3	0	0	3
7.	MC4015	Digital Marketing	PEC	3	3	0	0	3

SEMESTER III, ELECTIVE III

S.No.	COURSE CODE	COURSE TITLE	CATE-GORY	CONTACT PERIODS	L	T	P	C
1.	MC4016	Software Architecture	PEC	3	3	0	0	3
2.	MC4017	Digital Forensics	PEC	3	3	0	0	3
3.	MC4018	Wireless Networking	PEC	3	3	0	0	3
4.	MC4019	Data Visualization Techniques	PEC	3	3	0	0	3
5.	MC4020	Data Mining and Data Warehousing Techniques	PEC	3	3	0	0	3
6.	MC4021	Agile Methodologies	PEC	3	3	0	0	3
7.	MC4022	Organizational Behavior	PEC	3	3	0	0	3

SEMESTER III, ELECTIVE IV

S.No.	COURSE CODE	COURSE TITLE	CATE-GORY	CONTACT PERIODS	L	T	P	C
1.	MC4023	Web Design	PEC	5	3	0	2	4
2.	MC4024	C# and .NET	PEC	5	3	0	2	4
3.	MC4025	Big Data Analytics	PEC	5	3	0	2	4
4.	MC4026	Software Quality and Testing	PEC	5	3	0	2	4
5.	MC4027	Advanced Java Programming	PEC	5	3	0	2	4
6.	MC4028	Network Programming and Security	PEC	5	3	0	2	4

AUDIT COURSES (AC)

Registration for any of these courses is optional to students

SL. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS
			L	T	P	
1.	AX4091	English for Research Paper Writing	2	0	0	0
2.	AX4092	Disaster Management	2	0	0	0
3.	AX4093	Constitution of India	2	0	0	0
4.	AX4094	நற்றமிழ் இலக்கியம்	2	0	0	0

BRIDGE COURSES

(For the M.C.A students admitted under non-computer-science background category)

SL. NO.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C
Classes are to be conducted and completed before the start of the class of first semester, Examinations will be conducted along with first semester							
1.	BX4001	Data Structures and Algorithms	5	3	0	2	4
2.	BX4002	Problem Solving and Programming in C	5	3	0	2	4
Classes are to be conducted and completed before the start of the class of second semester, Examinations will be conducted along with second semester							
3.	BX4003	Introduction to Computer Organization and Operating Systems	3	3	0	0	3
4.	BX4004	Database Management Systems	5	3	0	2	4
Classes are to be conducted and completed before the start of the class of third semester, Examinations will be conducted along with third semester							
5.	BX4005	Mathematical Foundations of Computer Science	3	3	0	0	3
6.	BX4006	Basics of Computer Networks	3	3	0	0	3

LIST OF OPEN ELECTIVES FOR PG PROGRAMMES

SL. NO.	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS
			L	T	P	
1.	OCE431	Integrated Water Resources Management	3	0	0	3
2.	OCE432	Water, Sanitation and Health	3	0	0	3
3.	OCE433	Principles of Sustainable Development	3	0	0	3
4.	OCE434	Environmental Impact Assessment	3	0	0	3
5.	OME431	Vibration and Noise Control Strategies	3	0	0	3
6.	OME432	Energy Conservation and Management in Domestic Sectors	3	0	0	3
7.	OME433	Additive Manufacturing	3	0	0	3
8.	OME434	Electric Vehicle Technology	3	0	0	3
9.	OME435	New Product Development	3	0	0	3
10.	OBA431	Sustainable Management	3	0	0	3
11.	OBA432	Micro and Small Business Management	3	0	0	3
12.	OBA433	Intellectual Property Rights	3	0	0	3
13.	OBA434	Ethical Management	3	0	0	3
14.	ET4251	IoT for Smart Systems	3	0	0	3
15.	ET4072	Machine Learning and Deep Learning	3	0	0	3
16.	PX4012	Renewable Energy Technology	3	0	0	3
17.	PS4093	Smart Grid	3	0	0	3
18.	DS4015	Big Data Analytics	3	0	0	3

19.	NC4201	Internet of Things and Cloud	3	0	0	3
20.	MX4073	Medical Robotics	3	0	0	3
21.	VE4202	Embedded Automation	3	0	0	3
22.	CX4016	Environmental Sustainability	3	0	0	3
23.	TX4092	Textile Reinforced Composites	3	0	0	3
24.	NT4002	Nanocomposite Materials	3	0	0	3
25.	BY4016	IPR, Biosafety and Entrepreneurship	3	0	0	3

FOUNDATION COURSES (FC)

S. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			Lecture	Tutorial	Practical		
1.	MA4151	Applied Probability and Statistics for Computer Science Engineers	3	1	0	4	I

PROFESSIONAL CORE COURSES (PCC)

S. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			Lecture	Tutorial	Practical		
1.	MC4101	Advanced Data Structures and Algorithms	3	0	0	3	I
2.	MC4102	Object Oriented Software Engineering	3	0	0	3	I
3.	MC4103	Python Programming	3	0	0	3	I
4.	MC4104	Fundamentals of Accounting	3	0	2	4	I
5.	MC4111	Advanced Data Structures and Algorithms Laboratory	0	0	4	2	I
6.	MC4112	Python Programming Laboratory	0	0	4	2	I
7.	MC4201	Full Stack Web Development	3	0	0	3	II
8.	MC4202	Advanced Database Technology	3	0	0	3	II
9.	MC4203	Cloud Computing Technologies	3	0	0	3	II
10.	MC4204	Mobile Application Development	3	0	2	4	II
11.	MC4205	Cyber Security	3	0	0	3	II
12.	MC4211	Advanced Database	0	0	4	2	II
13.	MC4212	Full Stack Web Development Laboratory	0	0	4	2	II
14.	MC4301	Machine Learning	3	0	0	3	III

15.	MC4302	Internet of Things	3	0	0	3	III
16.	MC4311	Machine Learning Laboratory	0	0	4	2	III
17.	MC4312	Internet of Things Laboratory	0	0	4	2	III

RESEARCH METHODOLOGY AND IPR COURSES (RMC)

S. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			Lecture	Tutorial	Practical		
1.	RM4151	Research Methodology and IPR	2	0	0	2	1

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			Lecture	Tutorial	Practical		
1.	MC 4411	Project Work II	0	0	24	12	IV

SUMMARY

Sl. No.	NAME OF THE PROGRAMME: M.CA					
	SUBJECT AREA	CREDITS PER SEMESTER				CREDITS TOTAL
		I	II	III	IV	
1.	FC	04	00	00	00	04
2.	PCC	17	20	10	00	49
3.	PEC	00	03	10	00	13
4.	RMC	02	00	00	00	02
5.	OEC	00	00	03	00	03
6.	EEC	01	01	00	12	12
7.	Non Credit/Audit Course	✓	✓	00	00	
8.	**TOTAL CREDIT**	**24**	**24**	**23**	**12**	**83**

MA4151	APPLIED PROBABILITY AND STATISTICS FOR COMPUTER SCIENCE ENGINEERS	L T P C 3 1 0 4

COURSE OBJECTIVES:

- To encourage students to develop a working knowledge of the central ideas of Linear Algebra.
- To enable students to understand the concepts of Probability and Random Variables.
- To understand the basic probability concepts with respect to two dimensional random variables along with the relationship between the random variables and the significance of the central limit theorem.
- To apply the small / large sample tests through Tests of hypothesis.
- To enable the students to use the concepts of multivariate normal distribution and principal components analysis.

UNIT I LINEAR ALGEBRA 12

Vector spaces – norms – Inner Products – Eigenvalues using QR transformations – QR factorization – generalized eigenvectors – Canonical forms – singular value decomposition and applications – pseudo inverse – least square approximations.

UNIT II PROBABILITY AND RANDOM VARIABLES 12

Probability – Axioms of probability – Conditional probability – Bayes theorem – Random variables – Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson , Geometric, Uniform, Exponential, Gamma and Normal distributions – Function of a random variable.

UNIT III TWO DIMENSIONAL RANDOM VARIABLES 12

Joint distributions – Marginal and conditional distributions – Functions of two dimensional random variables – Regression curve – Correlation.

UNIT IV TESTING OF HYPOTHESIS 12

Sampling distributions – Type I and Type II errors – Small and Large samples – Tests based on Normal, t, Chi square and F distributions for testing of mean , variance and proportions – Tests for independence of attributes and goodness of fit.

UNIT V MULTIVARIATE ANALYSIS 12

Random vectors and matrices – Mean vectors and covariance matrices – Multivariate normal density and its properties – Principal components – Population principal components – Principal components from standardized variables.

TOTAL : 60 PERIODS

COURSE OUTCOMES:

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

- apply the concepts of Linear Algebra to solve practical problems.
- use the ideas of probability and random variables in solving engineering problems.
- be familiar with some of the commonly encountered two dimension random variables and be equipped for a possible extension to multivariate analysis.
- use statistical tests in testing hypothesis on data.
- develop critical thinking based on empirical evidence and the scientific approach to knowledge development.

REFERENCES:

1. Dallas E Johnson, “Applied multivariate methods for data Analysis”, Thomson and Duxbury press, Singapore, 1998.
2. Richard A. Johnson and Dean W. Wichern, “Applied multivariate statistical Analysis”, Pearson Education, Fifth Edition, 6th Edition, New Delhi, 2013.
3. Bronson, R.,”Matrix Operation” Schaum’s outline series, Tata McGraw Hill, New York, 2011.
4. Oliver C. Ibe, “Fundamentals of Applied probability and Random Processes”, Academic Press, Boston, 2014.
5. Johnson R. A. and Gupta C.B., “Miller and Freund’s Probability and Statistics for Engineers”, Pearson India Education, Asia, 9th Edition, New Delhi, 2017.

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	-	2	2	1	2
2	2	-	2	2	1	1
3	2	-	2	1	1	2
4	3	1	2	2	1	2
5	3	-	2	3	2	3
Avg	2.5	0.2	2	2	1.2	2.4

RM4151 RESEARCH METHODOLOGY AND IPR L T P C
2 0 0 2

UNIT I RESEARCH DESIGN 6

Overview of research process and design, Use of Secondary and exploratory data to answer the research question, Qualitative research, Observation studies, Experiments and Surveys.

UNIT II DATA COLLECTION AND SOURCES 6

Measurements, Measurement Scales, Questionnaires and Instruments, Sampling and methods. Data - Preparing, Exploring, examining and displaying.

UNIT III DATA ANALYSIS AND REPORTING 6

Overview of Multivariate analysis, Hypotheses testing and Measures of Association. Presenting Insights and findings using written reports and oral presentation.

UNIT IV INTELLECTUAL PROPERTY RIGHTS 6

Intellectual Property – The concept of IPR, Evolution and development of concept of IPR, IPR development process, Trade secrets, utility Models, IPR & Biodiversity, Role of WIPO and WTO in IPR establishments, Right of Property, Common rules of IPR practices, Types and Features of IPR Agreement, Trademark, Functions of UNESCO in IPR maintenance.

UNIT V PATENTS 6

Patents – objectives and benefits of patent, Concept, features of patent, Inventive step, Specification, Types of patent application, process E-filling, Examination of patent, Grant of patent, Revocation, Equitable Assignments, Licences, Licensing of related patents, patent agents, Registration of patent agents.

TOTAL: 30 PERIODS

REFERENCES:

1. Cooper Donald R, Schindler Pamela S and Sharma JK, "Business Research Methods", Tata McGraw Hill Education, 11e (2012).
2. Catherine J. Holland, "Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets", Entrepreneur Press, 2007.
3. David Hunt, Long Nguyen, Matthew Rodgers, "Patent searching: tools & techniques", Wiley, 2007.
4. The Institute of Company Secretaries of India, Statutory body under an Act of parliament, "Professional Programme Intellectual Property Rights, Law and practice", September 2013.

Course Outcomes:

At the end of this course, the students will have the ability to

1. Formulate and Design research problem
2. Understand and Comprehend the Data Collection Methods
3. Perform Data analysis and acquire Insights
4. Understand IPR and follow research ethics
5. Understand and Practice Drafting and filing a Patent in research and development

O-PO Mapping:

CO	PO					
	1	**2**	**3**	**4**	**5**	**6**
1	3	3	-	1	-	1
2	3	2	-	2	-	1
3	3	2	2	2	-	1
4	3	2	-	1	-	-
5	3	3	-	1	-	-
Avg.	3	2.4	0.4	1.4	-	0.6

MC4101 ADVANCED DATA STRUCTURES AND ALGORITHMS L T P C

3 0 0 3

COURSE OBJECTIVES:

- To understand the usage of algorithms in computing
- To learn and use hierarchical data structures and its operations
- To learn the usage of graphs and its applications
- To select and design data structures and algorithms that is appropriate for problems
- To study about NP Completeness of problems.

UNIT I ROLE OF ALGORITHMS IN COMPUTING & COMPLEXITY ANALYSIS 9

Algorithms – Algorithms as a Technology -Time and Space complexity of algorithms- Asymptotic analysis-Average and worst-case analysis-Asymptotic notation-Importance of efficient algorithms-Program performance measurement - Recurrences: The Substitution Method – The Recursion-

Tree Method- Data structures and algorithms.

UNIT II HIERARCHICAL DATA STRUCTURES 9

Binary Search Trees: Basics – Querying a Binary search tree – Insertion and Deletion- Red Black trees: Properties of Red-Black Trees – Rotations – Insertion – Deletion -B-Trees: Definition of B - trees – Basic operations on B-Trees – Deleting a key from a B-Tree- Heap – Heap Implementation – Disjoint Sets - Fibonacci Heaps: structure – Mergeable-heap operations- Decreasing a key and deleting a node-Bounding the maximum degree.

UNIT III GRAPHS 9

Elementary Graph Algorithms: Representations of Graphs – Breadth-First Search – Depth-First Search – Topological Sort – Strongly Connected Components- Minimum Spanning Trees: Growing a Minimum Spanning Tree – Kruskal and Prim- Single-Source Shortest Paths: The Bellman-Ford algorithm – Single-Source Shortest paths in Directed Acyclic Graphs – Dijkstra‘s Algorithm; Dynamic Programming - All-Pairs Shortest Paths: Shortest Paths and Matrix Multiplication – The Floyd-Warshall Algorithm

UNIT IV ALGORITHM DESIGN TECHNIQUES 9

Dynamic Programming: Matrix-Chain Multiplication – Elements of Dynamic Programming – Longest Common Subsequence- Greedy Algorithms: – Elements of the Greedy Strategy- An Activity-Selection Problem - Huffman Coding.

UNIT V NP COMPLETE AND NP HARD 9

NP-Completeness: Polynomial Time – Polynomial-Time Verification – NP- Completeness and Reducibility – NP-Completeness Proofs – NP-Complete Problems.

TOTAL : 45 PERIODS

SUGGESTED ACTIVITIES:

1. Write an algorithm for Towers of Hanoi problem using recursion and analyze the complexity (No of disc-4)
2. Write any one real time application of hierarchical data structure
3. Write a program to implement Make_Set, Find_Set and Union functions for Disjoint Set Data Structure for a given undirected graph G(V,E) using the linked list representation with simple implementation of Union operation
4. Find the minimum cost to reach last cell of the matrix from its first cell
5. Discuss about any NP completeness problem

COURSE OUTCOMES:

CO1:Design data structures and algorithms to solve computing problems.
CO2: Choose and implement efficient data structures and apply them to solve problems.
CO3: Design algorithms using graph structure and various string-matching algorithms to solve real-life problems.
CO4: Design one’s own algorithm for an unknown problem.
CO5: Apply suitable design strategy for problem solving.

REFERENCES

1. S.Sridhar,” Design and Analysis of Algorithms”, Oxford University Press, 1st Edition, 2014.
2. Adam Drozdex, “Data Structures and Algorithms in C++”, Cengage Learning, 4th Edition, 2013.

3. T.H. Cormen, C.E.Leiserson, R.L. Rivest and C.Stein, "Introduction to Algorithms", Prentice Hall of India, 3rd Edition, 2012.
4. Mark Allen Weiss, “Data Structures and Algorithms in C++”, Pearson Education, 3rd Edition, 2009.
5. E. Horowitz, S. Sahni and S. Rajasekaran, “Fundamentals of Computer Algorithms”, University Press, 2nd Edition, 2008.
6. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, Reprint 2006.

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	3	2	1	2
2	2	1	3	2	2	2
3	2	1	3	2	2	2
4	3	1	3	2	2	2
5	3	1	3	2	2	2
Avg	2.5	1	3	2	1.8	2

MC4102 OBJECT ORIENTED SOFTWARE ENGINEERING L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand the phases in object oriented software development
- To gain fundamental concepts of requirements engineering and analysis.
- To know about the different approach for object oriented design and its methods
- To learn about how to perform object oriented testing and how to maintain software
- To provide various quality metrics and to ensure risk management.

UNIT I SOFTWARE DEVELOPMENT AND PROCESS MODELS 9

Introduction to Software Development – Challenges – An Engineering Perspective – Object Orientation – Software Development Process – Iterative Development Process – Process Models – Life Cycle Models – Unified Process – Iterative and Incremental – Agile Processes.

UNIT II MODELING OO SYSTEMS 9

Object Oriented Analysis (OOA / Coad-Yourdon), Object Oriented Design (OOD/Booch), Hierarchical Object Oriented Design (HOOD), Object Modeling Technique (OMT) – Requirement Elicitation – Use Cases – SRS Document – OOA - Identification of Classes and Relationships, Identifying State and Behavior – OOD - Interaction Diagrams – Sequence Diagram – Collaboration Diagrams - Unified Modeling Language and Tools.

UNIT III DESIGN PATTERNS 9

Design Principles – Design Patterns – GRASP – GoF – Dynamic Object Modeling – Static Object

Modeling.

UNIT IV SYSTEM TESTING 9

Software testing: Software Verification Techniques – Object Oriented Checklist :- Functional Testing – Structural Testing – Class Testing – Mutation Testing – Levels of Testing – Static and Dynamic Testing Tools - Software Maintenance – Categories – Challenges of Software Maintenance – Maintenance of Object Oriented Software – Regression Testing

UNIT V SOFTWARE QUALITY AND METRICS 9

Need of Object Oriented Software Estimation – Lorenz and Kidd Estimation – Use Case Points Method – Class Point Method – Object Oriented Function Point – Risk Management – Software Quality Models – Analyzing the Metric Data – Metrics for Measuring Size and Structure – Measuring Software Quality - Object Oriented Metrics

SUGGESTED ACTIVITIES:

1. Discuss the different phases in any domain like Health Monitoring System using extreme programming
2. Describe Business Requirement Specification (BRS) and SRS (Software Requirement Specification) for any Project like Automatic Intelligent Plant Watering System .using any one of requirement analysis tool
3. Identify the classes , relationship between classes and draw standard UML diagrams using any one UML modeling tool (eg: ArgoUML that supports UML 1.4 and higher)
4. for a system (eg: Conference Management System, student management system)
5. Test the above UML for all the scenarios identified using Selenium /JUnit / Apache JMeter
6. Perform COCOMO estimation for Book Management System to find effort and development time considering all necessary cost estimation factors. (Use GanttPRO Software for estimation)

COURSE OUTCOMES:

On completion of the course the student would be able to :

CO1: Design object oriented software using appropriate process models.
CO2: Differentiate software processes under waterfall and agile methodology.
CO3: Design and Develop UML diagrams for software projects.
CO4: Apply Design Patterns for a software process.
CO5: Categorize testing methods and compare different testing tools for software processes.
CO6: Analyze object oriented metrics and quality for software engineering processes.

TOTAL: 45 PERIODS

REFERENCES:

1. Yogesh Singh, RuchikaMalhotra, " Object – Oriented Software Engineering", PHI Learning Private Limited ,First edition,2012
2. Ivar Jacobson. Magnus Christerson, PatrikJonsson, Gunnar Overgaard, "Object Oriented Software Engineering, A Use Case Driven Approach", Pearson Education, Seventh Impression, 2009
3. Craig Larman, "Applying UML and Patterns, an Introduction to Object-Oriented Analysis and Design and Iterative Development", Pearson Education, Third Edition, 2008.
4. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen,

Kelli A. Houston, "Object Oriented Analysis & Design with Applications, Third Edition, Pearson Education,2010

5. Roger S. Pressman, "Software Engineering: A Practitioner's Approach, Tata McGraw-Hill Education, 8th Edition, 2015

CO-PO Mapping

CO	POs					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
1	2	1	3	3	2	2
2	2	1	3	2	2	2
3	2	1	3	3	2	2
4	2	1	3	3	1	2
5	2	1	3	3	3	2
6	1	1	3	2	2	2
Avg	1.83	1	3	2.66	2	2

MC4103 PYTHON PROGRAMMING L T P C
3 0 0 3

COURSE OBJECTIVES:

- To develop Python programs with conditionals, loops and functions.
- To use Python data structures – lists, tuples, dictionaries.
- To do input/output with files in Python
- To use modules, packages and frameworks in python
- To define a class with attributes and methods in python

UNIT I BASICS OF PYTHON 9

Introduction to Python Programming – Python Interpreter and Interactive Mode– Variables and Identifiers – Arithmetic Operators – Values and Types – Statements. Operators – Boolean Values – Operator Precedence – Expression – Conditionals: If-Else Constructs – Loop Structures/Iterative Statements – While Loop – For Loop – Break Statement-Continue statement – Function Call and Returning Values – Parameter Passing – Local and Global Scope – Recursive Functions

UNIT II DATA TYPES IN PYTHON 9

Lists, Tuples, Sets, Strings, Dictionary, Modules: Module Loading and Execution – Packages – Making Your Own Module – The Python Standard Libraries.

UNIT III FILE HANDLING AND EXCEPTION HANDLING 8

Files: Introduction – File Path – Opening and Closing Files – Reading and Writing Files –File Position –Exception: Errors and Exceptions, Exception Handling, Multiple Exceptions

UNIT IV MODULES, PACKAGES AND FRAMEWORKS 10

Modules: Introduction – Module Loading and Execution – Packages – Making Your Own Module – The Python Libraries for data processing, data mining and visualization- NUMPY, Pandas, Matplotlib, Plotly-Frameworks- -Django, Flask, Web2Py

UNIT V OBJECT ORIENTED PROGRAMMING IN PYTHON 9

Creating a Class, Class methods, Class Inheritance, Encapsulation, Polymorphism, class method vs. static methods, Python object persistence.

SUGGESTED ACTIVITIES:

1. Display a multiplication Table Both players are given the same string, S ; Both players have to make substrings using the letters of the string S.
2. Player A has to make words starting with consonants. Player B has to make words starting with vowels. The game ends when both players have made all possible substrings. Do Scoring
3. Write a function definition for JTOI() in Python that would display the corrected version of entire content of the file .TXT (has wrongly alphabet J in place of alphabet I) with all the alphabets "J" to be displayed as an alphabet "I" on screen.
4. Consider a CSV file of profit of 10 items in monthly sales of a year . Read this file using Pandas or NumPy or using the in-built matplotlib function. Perform the following task.

5. Read Total profit of all months and show it using a line plot
   Read all product sales data and show it using a multi-line plot
   Read each item sales data of each month and show it using a scatter plot
   Read each item product sales data and show it using the bar chart
   Read sales data of bathing soap of all months and show it using a bar chart.
   Calculate total sale data an year for each product and show it using a Pie chart
6. Create a Python class called Bank Account which represents a bank account, having as attributes: account Number (numeric type), name (name of the account owner as string type), balance. Create a constructor with parameters: account Number, name, balance. Create a Deposit() method which manages the deposit actions. Create a Withdrawal() method which manages withdrawals actions

COURSE OUTCOMES:

On completion of the course the student would be able to :

CO1: Develop algorithmic solutions to simple computational problems
CO2: Represent compound data using Python lists, tuples and dictionaries.
CO3: Read and write data from/to files in Python Programs
CO4: Structure simple Python programs using libraries, modules etc.
CO5: Structure a program by bundling related properties and behaviors into individual objects.

TOTAL : 45 PERIODS

REFERENCES

1. Reema Thareja, “Python Programming using Problem Solving Approach”, Oxford University Press, First edition, 2017
2. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, Second Edition, Shroff, O‘Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/
3. Guido van Rossum, Fred L. Drake Jr., “An Introduction to Python – Revised and Updated for Python 3.2, Network Theory Ltd., First edition, 2011
4. John V Guttag, “Introduction to Computation and Programming Using Python”, Revised and Expanded Edition, MIT Press, 2013
5. Charles Dierbach, “Introduction to Computer Science using Python”, Wiley India Edition, First Edition, 2016

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	3	1	3	3	2	3
2	1	1	3	3	1	2
3	2	1	3	3	2	2
4	3	1	3	3	3	3
5	2	1	3	3	3	3
Avg	2.2	1	3	3	2.2	2.6

MC4104 **FUNDAMENTALS OF ACCOUNTING** **L T P C**
3 0 2 4

COURSE OBJECTIVES:

- To understand the basic principles of Accounting
- To understand the Double entry system and the preparation of ledger.
- To understand the process and importance of the electronic accounting system.
- To Prepare the estimate for various business activities such as purchase, sale, production and cash budgets
- To ensure the decision making process of an organization.

UNIT I **INTRODUCTION TO ACCOUNTING** **15**

Introduction to Financial, Cost and Management Accounting - Objectives of Financial Accounting – Accounting Principles, Concepts and Conventions – Bookkeeping and Accounting

Practical exercise session using Tally:

1. Company Creation, Creating Groups
2. Creation of Ledgers and Vouchers

UNIT II **MANAGEMENT ACCOUNTING AND BOOKKEEPING** **15**

Meaning-Objectives of Management Accounting-Accounting System – Preparation of Journal, Ledger, Cash Book and Trial Balance – Errors disclosed and not disclosed by Trial Balance –Final Accounts - Ratio Analysis

Practical exercise session using Tally.:

1. Creating Contra, Journals, Credit and Debit Notes
2. Preparing Trial Balance and Final Accounts

UNIT III **BUDGETS AND BUDGETARY CONTROL** **15**

Budgets and Budgetary Control-Meaning-Types-Sales Budget-Production Budget-Cost of Production Budget-Flexible Budgeting-Cash Budget-Master Budget-Zero Base Budgeting-Computerized Accounting – with adjustments

Practical sessions using Advanced tools in MS-Excel:

1. Preparing Revenue Management and Portfolio Selection

2. Preparing Final Accounts with Adjustments

UNIT IV FINANCIAL MANAGEMENT 15

Objectives of Financial Management- preparation of Suspense Account – Depreciation – Meaning and Types – Methods of Charging and Providing depreciation – Inventory

Practical exercise session using Tally.:

1. Preparing Inventory Creation, Purchase order, Sales Order
2. Preparing Sales Journal, Rejections, Delivery Note.

UNIT V BANK RECONCILIATION STATEMENT AND REPORTING 15

Preparing Bank Reconciliation Statement (simple problems) – Insurance Claim – Average Clause - Export and Import of Data, Data Security,

Practical exercise session using Tally.:

1. Preparing the Bank Reconciliation Statement
2. Preparing the Trading, Profit And Loss Account and Trial Balance

TOTAL : 75 PERIODS

COURSE OUTCOMES:

On completion of the course the student would be able to :

CO1. Able to understand the basic concepts of Accounting standards.
CO2. Able to understand the process of maintaining Accounts in an organization
CO3. Helps to understand and calculating the financial position of an organization
CO4. Helps to understand Financial Management concepts and its components
CO5. It helps to understand the importance of BRS and generation of various financial reports

REFERENCES:

1. S.N.Maheswari, “Financial and Management Accounting”, Sultan Chand & Sons, 5 edition,2010
2. I.M.Pandey, ”Financial Management”, Vikas Publishing House Pvt. Ltd., 9th Edition, 2009.
3. M.Y.Khan and P.K.Jain, “Financial Management , Text, Problems and Cases”, Tata McGraw Hill, 5th Edition, 2008.
4. Reddy and Murthy, Financial Accounting by Margham Publications, 2015,Chennai
5. I.M.Pandey, “Management Accounting”, Vikas Publishing House Pvt. Ltd., 3rd Edition, 2009
6. Advanced Accounting, R.L.Gupta and P.K.Gupta, Advanced Accounting, Sultan Chand, New Delhi.

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	3	1	1	2
2	1	1	1	1	1	1
3	1	1	1	1	1	1
4	1	1	1	1	1	1
5	1	1	1	1	1	1

Avg	**1.2**	**1**	**1.4**	**1**	**1**	**1.2**

MC4111 ADVANCED DATA STRUCTURES AND ALGORITHMS LABORATORY **L T P C 0 0 4 2**

COURSE OBJECTIVES:

- To acquire the knowledge of using advanced tree structures
- To learn the usage of heap structures
- To understand the usage of graph structures and spanning trees
- To understand the problems such as matrix chain multiplication, activity selection and Huffman coding
- To understand the necessary mathematical abstraction to solve problems.

LIST OF EXPERIMENTS:

1: Implementation of recursive function for tree traversal and Fibonacci
2: Implementation of iteration function for tree traversal and Fibonacci
3: Implementation of Merge Sort and Quick Sort
4: Implementation of a Binary Search Tree
5: Red-Black Tree Implementation
6: Heap Implementation
7: Fibonacci Heap Implementation
8: Graph Traversals
9: Spanning Tree Implementation
10: Shortest Path Algorithms (Dijkstra's algorithm, Bellman Ford Algorithm)
11: Implementation of Matrix Chain Multiplication
12: Activity Selection and Huffman Coding Implementation

HARDWARE/SOFTWARE REQUIREMENTS

1: 64-bit Open source Linux or its derivative
2: Open Source C++ Programming tool like G++/GCC

TOTAL : 60 PERIODS

COURSE OUTCOMES:

CO1: Design and implement basic and advanced data structures extensively
CO2: Design algorithms using graph structures
CO3: Design and develop efficient algorithms with minimum complexity using design techniques
CO4: Develop programs using various algorithms.
CO5: Choose appropriate data structures and algorithms, understand the ADT/libraries, and use it to design algorithms for a specific problem.

REFERENCES:

1. Lipschutz Seymour, “Data Structures Schaum's Outlines Series”, Tata McGraw Hill, 3rd Edition, 2014.
2. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, Reprint 2006.
3. http://www.coursera.org/specializations/data-structures-algorithms
4. http://www.tutorialspoint.com/data_structures_algorithms
5. http://www.geeksforgeeks.org/data-structures/

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	3	3	2	2
2	2	1	3	3	3	3
3	3	1	3	3	3	3
4	3	1	3	3	3	3
5	3	1	3	3	3	3
Avg	2.6	1	3	3	2.8	2.8

MC4112 PYTHON PROGRAMMING LABORATORY

L T P C
0 0 4 2

COURSE OBJECTIVES:

- Develop Python programs with conditionals, loops and functions
- Represent compound data using Python lists, tuples, dictionaries
- Read and write data from/to files in Python
- Implement NumPy, Pandas, Matplotlib libraries
- Implement object oriented concepts

LIST OF EXPERIMENTS:

Note: The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines.

1. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
2. Scientific problems using Conditionals and Iterative loops.
3. Linear search and Binary search
4. Selection sort, Insertion sort
5. Merge sort, Quick Sort
6. Implementing applications using Lists, Tuples.
7. Implementing applications using Sets, Dictionaries.
8. Implementing programs using Functions.
9. Implementing programs using Strings.
10. Implementing programs using written modules and Python Standard Libraries (pandas, numpy, Matplotlib, scipy)
11. Implementing real-time/technical applications using File handling.
12. Implementing real-time/technical applications using Exception handling.
13. Creating and Instantiating classes

HARDWARE/SOFTWARE REQUIREMENTS

1: Processors: Intel Atom® processor Intel®Core™i3 processor
2: Disk space: 1GB.
3: Operating systems: Windows 7,macOS and Linux
4: Python versions:2.7, 3.6, 3.8

TOTAL : 60 PERIODS

COURSE OUTCOMES:

On completion of the laboratory course, the student should be able to

CO1: Apply the Python language syntax including control statements, loops and functions to solve a wide variety of problems in mathematics and science.

CO2: Use the core data structures like lists, dictionaries, tuples and sets in Python to store, process and sort the data

CO3: Create files and perform read and write operations

CO4: Illustrate the application of python libraries.

CO5: Handle exceptions and create classes and objects for any real time applications

REFERENCES:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second Edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016.
2. Shroff "Learning Python: Powerful Object-Oriented Programming; Fifth edition, 2013.
3. David M.Beazley "Python Essential Reference". Addison-Wesley Professional; Fourth edition, 2009.
4. David M. Baezly "Python Cookbook" O'Reilly Media; Third edition (June 1, 2013).
5. http://www.edx.org/

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	3	3	2	2
2	2	1	3	3	2	2
3	1	1	3	2	2	2
4	2	1	3	2	2	2
5	2	1	3	3	2	3
Avg	1.8	1	3	2.6	2	2.2

MC4113 COMMUNICATION SKILLS ENHANCEMENT – I

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

- To provide opportunities to learners to practice English and thereby make them proficient users of the language.
- To enable learners to fine-tune their linguistic skills (LSRW) with the help of technology.
- To improve the performance of students' listening, speaking, reading and writing skills and thereby enhance their career opportunities.

LIST OF ACTIVITIES:

1. Listening:
   - Listening and practicing neutral accents

- Listening to short talks and lectures and completing listening comprehension exercises
- Listening to TED Talks

2. Speaking:
   - Giving one minute talks
   - Participating in small Group Discussions
   - Making Presentations

3. Reading:
   - Reading Comprehension
   - Reading subject specific material
   - Technical Vocabulary

4. Writing:
   - Formal vs Informal Writing
   - Paragraph Writing
   - Essay Writing
   - Email Writing

REFERENCES / MANUALS / SOFTWARE: Open Sources / websites

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

- Listen and comprehend lectures in English
- Articulate well and give presentations clearly
- Participate in Group Discussions successfully
- Communicate effectively in formal and informal writing
- Write proficient essays and emails

CO-PO Mapping

CO	POs					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
1	1	2	2	1	1	1
2	1	3	2	1	1	1
3	1	2	3	1	1	1
4	1	3	2	1	1	1
5	1	3	2	1	1	1
Avg	1	2.6	2.2	1	1	1

MC4201 **FULL STACK WEB DEVELOPMENT** **L T P C**

3 0 0 3

COURSE OBJECTIVES:

- To understand the fundamentals of web programming and client side scripting.
- To learn server side development using NodeJS.

- To understand API development with Express Framework.
- To understand and architect databases using NoSQL and SQL databases.
- To learn the advanced client side scripting and ReactJS framework

UNIT I INTRODUCTION TO CSS and JAVASCRIPT 9

Introduction to Web: Server - Client - Communication Protocol (HTTP) – Structure of HTML Documents – Basic Markup tags – Working with Text and Images with CSS– CSS Selectors – CSS Flexbox - JavaScript: Data Types and Variables - Functions - Events – AJAX: GET and POST

UNIT II SERVER SIDE PROGRAMMING WITH NODE JS 9

Introduction to Web Servers – Javascript in the Desktop with NodeJS – NPM – Serving files with the http module – Introduction to the Express framework – Server-side rendering with Templating Engines – Static Files - async/await - Fetching JSON from Express

UNIT III ADVANCED NODE JS AND DATABASE 9

Introduction to NoSQL databases – MongoDB system overview - Basic querying with MongoDB shell – Request body parsing in Express – NodeJS MongoDB connection – Adding and retrieving data to MongoDB from NodeJS – Handling SQL databases from NodeJS – Handling Cookies in NodeJS – Handling User Authentication with NodeJS

UNIT IV ADVANCED CLIENT SIDE PROGRAMMING 9

React JS: ReactDOM - JSX - Components - Properties – Fetch API - State and Lifecycle - -JS Localstorage - Events - Lifting State Up - Composition and Inheritance

UNIT V APP IMPLEMENTATION IN CLOUD 9

Cloud providers Overview – Virtual Private Cloud – Scaling (Horizontal and Vertical) – Virtual Machines, Ethernet and Switches – Docker Container – Kubernetes

TOTAL: 45 PERIODS

SUGGESTED ACTIVITIES:

1. Build an online MCQ quiz app. The questions and options should be fetched based on the chosen topic from a NodeJS server. The questions can be stored in a JSON file in the backend. Once the user has answered the questions, the frontend must send the chosen options to the backend and the backend must identify the right answers and send the score back to the front end. The frontend must display the score in a separate neatly designed page.
2. Build a blog website where you can add blog posts through a simple admin panel and the users can view the blog posts. The contents of the blog posts can be stored in either MongoDB or MySQL database. The home page should contain the titles of the blog post and the full post can be viewed by clicking the title. Frontend can be built either using React or through template engines served by the NodeJS server.
3. Take any ecommerce or social media website/app. Analyze what the API endpoints would have been used for and how the frontend interacts with the backend. The networks tab in the browser's developer tools can be used if required.
4. Architect an entire database structure for an E-Commerce application for MongoDB. Discuss how the database would have been structured if you were using a SQL database.
5. Build a simple calculator app with React. The user should be able to add numbers and operations to the app by clicking on buttons, just like you would do in a mobile phone. The moment the operation and the two operations are defined, the answer should be displayed

COURSE OUTCOMES:

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

CO1: Write client side scripting HTML, CSS and JS.

CO2: Implement and architect the server side of the web application.

CO3: Implement Web Application using NodeJS.

CO4: Architect NoSQL databases with MongoDB.

CO5: Implement a full-stack Single Page Application using React, NodeJS and MongoDB and deploy on Cloud.

REFERENCES

1. David Flanagan, “Java Script: The Definitive Guide”, O’Reilly Media, Inc, 7th Edition, 2020
2. Matt Frisbie, "Professional JavaScript for Web Developers", Wiley Publishing, Inc, 4th Edition, ISBN: 978-1-119-36656-0, 2019
3. Alex Banks, Eve Porcello, "Learning React", O’Reilly Media, Inc, 2nd Edition, 2020
4. Marc Wandschneider, “Learning Node”, Addison-Wesley Professional, 2nd Edition, 2016
5. Joe Beda, Kelsey Hightower, Brendan Burns, “Kubernetes: Up and Running”, O’Reilly Media, 1st edition, 2017
6. Paul Zikopoulos, Christopher Bienko, Chris Backer, Chris Konarski, Sai Vennam, “Cloud Without Compromise”, O’Reilly Media, 1st edition, 2021

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	1	1	2	2	2	2
2	2	1	2	2	2	2
3	2	1	3	2	3	2
4	2	1	3	2	3	3
5	2	1	3	2	3	3
Avg	1.8	1	2.6	2	2.6	2.4

MC4202 ADVANCED DATABASE TECHNOLOGY L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand the working principles and query processing of distributed databases.
- To understand the basics of spatial, temporal and mobile databases and their applications.
- To distinguish the different types of NoSQL databases.
- To understand the basics of XML and create well-formed and valid XML documents.
- To gain knowledge about information retrieval and web search.

UNIT I DISTRIBUTED DATABASES 9

Distributed Systems – Introduction – Architecture – Distributed Database Concepts – Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing

UNIT II SPATIAL AND TEMPORAL DATABASES 9

Active Databases Model – Design and Implementation Issues - Temporal Databases - Temporal Querying - Spatial Databases: Spatial Data Types, Spatial Operators and Queries – Spatial Indexing and Mining – Applications -– Mobile Databases: Location and Handoff Management, Mobile Transaction Models – Deductive Databases - Multimedia Databases.

UNIT III NOSQL DATABASES 9

NoSQL – CAP Theorem – Sharding - Document based – MongoDB Operation: Insert, Update, Delete, Query, Indexing, Application, Replication, Sharding–Cassandra: Data Model, Key Space, Table Operations, CRUD Operations, CQL Types – HIVE: Data types, Database Operations, Partitioning – HiveQL – OrientDB Graph database – OrientDB Features

UNIT IV XML DATABASES 9

Structured, Semi structured, and Unstructured Data – XML Hierarchical Data Model – XML Documents – Document Type Definition – XML Schema – XML Documents and Databases – XML Querying – XPath – XQuery

UNIT V INFORMATION RETRIEVAL AND WEB SEARCH 9

IR concepts – Retrieval Models – Queries in IR system – Text Preprocessing – Inverted Indexing – Evaluation Measures – Web Search and Analytics – Current trends.

TOTAL: 45 PERIODS

Suggested Activities:

1. Create a distributed database for any application (ex. book store) and access it using PHP and Python
2. Create spatial database of any place and perform query operations
3. Creating Databases and writing simple queries using MongoDB, DynamoDB, Voldemort Key-Value Distributed Data Store Hbase and Neo4j.
4. Creating XML Documents, Document Type Definition and XML Schema for any e-commerce website and perform XML Querying
5. Perform sentiment analysis for any web document using text preprocessing techniques

COURSE OUTCOMES:

On completion of the course, the student will be able to:

CO1: Design a distributed database system and execute distributed queries.

CO2: Manage Spatial and Temporal Database systems and implement it in corresponding applications.

CO3: Use NoSQL database systems and manipulate the data associated with it.

CO4: Design XML database systems and validate with XML schema.

CO5: Apply knowledge of information retrieval concepts on web databases.

REFERENCES:

1. Abraham Silberschatz, Henry F Korth, S. Sudharshan, “Database System Concepts”, Seventh Edition, McGraw Hill, 2019.
2. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Seventh Edition, Pearson Education/Addison Wesley, 2017.
3. Guy Harrison, “Next Generation Databases, NoSQL, NewSQL and Big Data”, First Edition, Apress publishers, 2015

4. Jiawei Han, Micheline Kamber, Jian Pei, “Data Mining: Concepts and Techniques”, Third Edition, Morgan Kaufmann, 2012.
5. Brad Dayley, “Teach Yourself NoSQL with MongoDB in 24 Hours”, Sams Publishing, First Edition, 2014.
6. C. J. Date, A. Kannan, S. Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2
2	2	1	3	2	2	2
3	2	1	3	2	2	3
4	2	1	3	2	3	3
5	2	1	3	2	2	2
Avg	2	1	2.8	2	2.2	2.4

MC4203 CLOUD COMPUTING TECHNOLOGIES L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand the basic concepts of Distributed systems.
- To learn about the current trend and basics of Cloud computing.
- To be familiar with various Cloud concepts.
- To expose with the Server, Network and storage virtualization.
- To be aware of Microservices and DevOps.

UNIT I DISTRIBUTED SYSTEMS 9

Introduction to Distributed Systems – Characterization of Distributed Systems – Distributed Architectural Models –Remote Invocation – Request-Reply Protocols – Remote Procedure Call – Remote Method Invocation – Group Communication – Coordination in Group Communication – Ordered Multicast – Time Ordering – Physical Clock Synchronization – Logical Time and Logical Clocks.

UNIT II BASICS OF CLOUD COMPUTING 9

Cloud Computing Basics – Desired features of Cloud Computing – Elasticity in Cloud – On demand provisioning - Applications – Benefits – Cloud Components: Clients, Datacenters & Distributed Servers – Characterization of Distributed Systems – Distributed Architectural Models - Principles of Parallel and Distributed computing - Applications of Cloud computing – Benefits – Cloud services – Open source Cloud Software: Eucalyptus, Open Nebula, Open stack, Aneka, Cloudsim.

UNIT III CLOUD INFRASTRUCTURE 9

Cloud Architecture and Design – Architectural design challenges – Technologies for Network based system - NIST Cloud computing Reference Architecture – Public, Private and Hybrid

clouds – Cloud Models : IaaS, PaaS and SaaS – Cloud storage providers - Enabling Technologies for the Internet of Things – Innovative Applications of the Internet of Things.

UNIT IV CLOUD ENABLING TECHNOLOGIES 9

Service Oriented Architecture – Web Services – Basics of Virtualization – Emulation – Types of Virtualization – Implementation levels of Virtualization – Virtualization structures – Tools & Mechanisms – Virtualization of CPU, Memory & I/O Devices – Desktop Virtualization – Server Virtualization – Google App Engine – Amazon AWS - Federation in the Cloud.

UNIT V MICROSERVICES AND DEVOPS 9

Defining Microservices - Emergence of Microservice Architecture – Design patterns of Microservices – The Mini web service architecture – Microservice dependency tree – Challenges with Microservices - SOA vs Microservice – Microservice and API – Deploying and maintaining Microservices – Reason for having DevOps – Overview of DevOps – Core elements of DevOps – Life cycle of DevOps –Adoption of DevOps - DevOps Tools – Build, Promotion and Deployment in DevOps.

SUGGESTED ACTIVITIES:

1. Write a client and server program to calculate the value of PI, in which server calls the remote procedure of the client side (C programming)
2. Create an word document of your class time table and store locally and also on cloud and share it (use www.zoho.com , docs.google.com)
3. Create your resume in a neat format using google and zoho cloud Programs on PaaS
4. Discuss processor virtualization, memory virtualization, I/O virtualization in VMWare
5. Set up Azure DevOps, Import Code and Create the Azure DevOps Build Pipeline

COURSE OUTCOMES:

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

CO1: Use Distributed systems in Cloud Environment.

CO2: Articulate the main concepts, key technologies, strengths and limitations of Cloud computing.

CO3: Identify the Architecture, Infrastructure and delivery models of Cloud computing.

CO4: Install, choose and use the appropriate current technology for the implementation of Cloud.

CO5: Adopt Microservices and DevOps in Cloud environments.

TOTAL:45 PERIODS

REFERENCES

1. Kai Hwang, Geoffrey C. Fox & Jack J.Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, First Edition, 2012
2. Andrew S. Tanenbaum & Maarten Van Steen,“Distributed Systems - Principles and Paradigms”, Third Edition, Pearson, 2017.
3. Thomas Erl, Zaigham Mahood & Ricardo Puttini, “Cloud Computing, Concept, Technology & Architecture”, Prentice Hall, SecondEdition, 2013.
4. Richard Rodger, “The Tao of Microservices”, ISBN 9781617293146, Manning Publications, First Edition, December 2017.
5. Magnus Larsson, “Hands-On Microservices with Spring Boot and Spring Cloud: Build and deploy microservices using spring cloud, Istio and kubernetes”, Packt Publishing Ltd, First Edition, September 2019.

6. Jim Lewis, “DEVOPS: A complete beginner’s guide to DevOps best practices”, ISBN-13:978-1673259148, ISBN-10: 1673259146, First Edition,2019

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2
2	2	1	2	2	2	2
3	3	1	3	2	2	2
4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2.2	1	2.2	2	2	2

MC4204 MOBILE APPLICATION DEVELOPMENT L T P C
3 0 2 4

COURSE OBJECTIVES:

- To understand the need and characteristics of mobile applications.
- To design the right user interface for mobile applications.
- To understand the design issues in the development of mobile applications.
- To understand the development procedure for mobile applications.
- To develop mobile applications using various tools and platforms.

UNIT I INTRODUCTION 15

Mobile Application Model – Infrastructure and Managing Resources – Mobile Device Profiles – Frameworks and Tools

- Installation of necessary components and software

UNIT II USER INTERFACE 15

Generic UI Development - Multimodal and Multichannel UI –Gesture Based UI – Screen Elements and Layouts – Voice XML.

Lab Component:

i. Implement mobile applications using UI toolkits and frameworks.
ii. Design an application that uses Layout Managers and event listeners.

UNIT III APPLICATION DESIGN 15

Memory Management – Design Patterns for Limited Memory – Workflow for Application development – Java API – Dynamic Linking – Plugins and rule of thumb for using DLLs – Multithreading in Java - Concurrency and Resource Management.

Lab Component:

i. Design a mobile application that is aware of the resource constraints of mobile devices.
ii. Design an application that uses Dynamic Linking

UNIT IV MOBILE OS **15**

Mobile OS: Android, iOS – Android Application Architecture – Understanding the anatomy of a mobile application - Android basic components –Intents and Services – Storing and Retrieving data – Packaging and Deployment – Security and Hacking.

Lab Component:

i. Develop an application that makes use of mobile database
ii. Implement an android application that writes data into the SD card.

UNIT V APPLICATION DEVELOPMENT **15**

Communication via the Web – Notification and Alarms – Graphics and Multimedia: Layer Animation, Event handling and Graphics services – Telephony – Location based services

Lab Component:

i. Develop a web based mobile application that accesses internet and location data.
ii. Develop an android application using telephony to send SMS.

TOTAL:75 PERIODS

COURSE OUTCOMES:

On completion of the course, the student will be able to

CO1: Understand the basics of mobile application development frameworks and tools.
CO2: Develop a UI for mobile applications.
CO3: Design mobile applications that manage memory dynamically.
CO4: Build applications based on mobile OS like Android, iOs.
CO5: Build location based services.

SOFTWARE REQUIREMENTS

1. JDK, ECLIPSE IDE / equivalent, ANDROID STUDIO

REFERENCES

1. Reto Meier, Ian Lake, “Professional Android”, 4th Edition, Wrox, 2018.
2. Zigurd Mednieks, Laird Dornin, G. Blake Meike, Masumi Nakamura, “Programming Android”, O’Reilly, 2nd Edition, 2012.
3. Alasdair Allan, “Learning iOS Programming”, O’Reilly, Third Edition, 2013.
4. Bill Phillips, Chris Stewart, Brian Hardy, and Kristin Marsicano, Android Programming: The Big Nerd Ranch Guide, 4th edition, 2019.
5. Christian Keur, Aaron Hillegass, iOS Programming: The Big Nerd Ranch Guide, 6th Edition, O’Reilly, 2016.
6. Barry Burd, “Android Application Development All-In-One for Dummies”, 3rd Edition, 2021.

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2

2	2	1	2	2	2	2
3	2	1	2	2	2	2
4	3	1	3	3	2	3
5	3	1	3	3	2	3
Avg	2.4	1	2.4	2.4	2	2.4

MC4205 **CYBER SECURITY** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To learn the principles of cyber security and to identify threats and risks.
- To learn how to secure physical assets and develop system security controls.
- To understand how to apply security for Business applications and Network Communications.
- To learn the technical means to achieve security.
- To learn to monitor and audit security measures.

UNIT I PLANNING FOR CYBER SECURITY **9**

Best Practices-Standards and a plan of Action-Security Governance Principles, components and Approach-Information Risk Management-Asset Identification-Threat Identification-Vulnerability Identification-Risk Assessment Approaches-Likelihood and Impact Assessment-Risk Determination, Evaluation and Treatment-Security Management Function-Security Policy-Acceptable Use Policy-Security Management Best Practices - Security Models: Bell La Padula model, Biba Integrity Model - Chinese Wall model

UNIT II SECURITY CONTROLS **9**

People Management-Human Resource Security-Security Awareness and Education-Information Management- Information Classification and handling-Privacy-Documents and Record Management-Physical Asset Management-Office Equipment-Industrial Control Systems-Mobile Device Security-System Development-Incorporating Security into SDLC - Disaster management and Incident response planning.

UNIT III CYBER SECURITY FOR BUSINESS APPLICATIONS AND NETWORKS **9**

Business Application Management-Corporate Business Application Security-End user Developed Applications-System Access- Authentication Mechanisms-Access Control-System Management-Virtual Servers-Network Storage Systems-Network Management Concepts-Firewall-IP Security-Electronic Communications - Case study on OWASP vulnerabilities using OWASP ZAP tool.

UNIT IV TECHNICAL SECURITY **9**

Supply Chain Management-Cloud Security-Security Architecture-Malware Protection-Intrusion Detection-Digital Rights Management-Cryptographic Techniques-Threat and Incident Management-Vulnerability Management-Security Event Management-Forensic Investigations-Local Environment Management-Business Continuity.

UNIT V SECURITY ASSESSMENT **9**

Security Monitoring and Improvement-Security Audit-Security Performance-Information Risk Reporting-Information Security Compliance Monitoring-Security Monitoring and Improvement Best

Practices.

SUGGESTED ACTIVITIES:

1. Discuss and debate information security policies that a privacy focused social media company should comply with.
2. Discuss data privacy policies implemented in various countries.
3. Demonstrate how ADB (Android debug bridge) is being used for malicious purposes.
4. Demonstrate how to troubleshoot networks and analyze packets using tools like WireShark.
5. Discuss the control challenges in virtual networks over cloud environments.

Discuss the common security flaws present in web applications and demonstrate how they can identified using tools like ACUNETIX (or similar tools)

- OWASP ZAP : https://owasp.org/www-project-zap/
- ACUNETIX: https://www.acunetix.com/
- WireShark: https://www.wireshark.org/
- ADB: https://developer.android.com/studio/command-line/adb

COURSE OUTCOMES:

On completion of the course, the student will be able to

CO1: Develop a set of risk and security requirements to ensure that there are no gaps in an organization's security practices.

CO2: Achieve management, operational and technical means for effective cyber security.

CO3: Audit and monitor the performance of cyber security controls.

CO4: Spot gaps in the system and devise improvements.

CO5: Identify and report vulnerabilities in the system

TOTAL: 45 PERIODS

REFERENCES

1. William Stallings, "Effective Cyber Security - A guide to using Best Practices and Standards", Addison-Wesley Professional, First Edition, 2019.
2. Adam Shostack, "Threat Modelling - Designing for Security", Wiley Publications, First Edition, 2014.
3. Gregory J. Touhill and C. Joseph Touhill, "Cyber Security for Executives - A Practical Guide", Wiley Publications, First Edition, 2014.
4. Raef Meeuwisse, "Cyber Security for Beginners", Second Edition, Cyber Simplicity Ltd, 2017.
5. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy", 2nd Edition, Syngress, 2013.
6. Charles P. Pfleeger, Shari Lawrence Pfleeger, Jonathan Margulies, "Security in Computing", Fifth Edition, Prentice Hall, 2015.

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2
2	2	1	2	2	2	2
3	2	1	2	2	2	2

4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

MC4211 ADVANCED DATABASE TECHNOLOGY LABORATORY L T P C
0 0 4 2

COURSE OBJECTIVES:

- To understand the process of distributing tables across multiple systems
- To understand the process of storing, retrieving spatial and temporal data
- To understand the process of storing, retrieving objects in a database
- To understand the process of storing and retrieving data from a XML Database
- To use the open source database for building a mobile application

LIST OF EXPERIMENTS:

1. NOSQL Exercises
   a. MongoDB – CRUD operations, Indexing, Sharding
   b. Cassandra: Table Operations, CRUD Operations, CQL Types
   c. HIVE: Data types, Database Operations, Partitioning – HiveQL
   d. OrientDB Graph database – OrientDB Features
2. MySQL Database Creation, Table Creation, Query
3. MySQL Replication – Distributed Databases
4. Spatial data storage and retrieval in MySQL
5. Temporal data storage and retrieval in MySQL
6. Object storage and retrieval in MySQL
7. XML Databases , XML table creation, XQuery FLWOR expression
8. Mobile Database Query Processing using open source DB (MongoDB/MySQL etc)

TOTAL: 60 PERIODS

SOFTWARE REQUIREMENTS

1. Java / Python / R / Scala
2. Oracle, MySQL, MongoDB, Casandra, Hive

COURSE OUTCOMES:

On completion of the course, the student will be able to:

CO1: Design and implement advanced databases.
CO2: Use big data frameworks and tools.
CO3: Formulate complex queries using SQL.
CO4: Create an XML document and perform Xquery.
CO5: Query processing in Mobile databases using open source tools.

CO-PO Mapping

CO	**POs**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
1	2	1	2	2	2	2

2	2	1	2	2	2	2
3	2	1	2	2	2	2
4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

MC4212 FULL STACK WEB DEVELOPMENT LABORATORY L T P C
0 0 4 2

COURSE OBJECTIVES:

- To implement the client side of the web application using javascript.
- To understand Javascript on the desktop using NodeJS.
- To develop a web application using NodeJS and Express.
- To implement a SPA using React.
- To develop a full stack single page application using React, NodeJS, and a Database (MongoDB or SQL).

LIST OF EXPERIMENTS:

1. Create a form and validate the contents of the form using JavaScript.
2. Get data using Fetch API from an open-source endpoint and display the contents in the form of a card.
3. Create a NodeJS server that serves static HTML and CSS files to the user without using Express.
4. Create a NodeJS server using Express that stores data from a form as a JSON file and displays it in another page. The redirect page should be prepared using Handlebars.
5. Create a NodeJS server using Express that creates, reads, updates and deletes students' details and stores them in MongoDB database. The information about the user should be obtained from a HTML form.
6. Create a NodeJS server that creates, reads, updates and deletes event details and stores them in a MySQL database. The information about the user should be obtained from a HTML form.
7. Create a counter using ReactJS
8. Create a Todo application using ReactJS. Store the data to a JSON file using a simple NodeJS server and retrieve the information from the same during page reloads.
9. Create a simple Sign up and Login mechanism and authenticate the user using cookies. The user information can be stored in either MongoDB or MySQL and the server should be built using NodeJS and Express Framework.
10. Create and deploy a virtual machine using a virtual box that can be accessed from the host computer using SSH.
11. Create a docker container that will deploy a NodeJS ping server using the NodeJS image.

TOTAL: 60 PERIODS

SOFTWARE REQUIREMENTS

1. NodeJS/Express JS, ReactJS, Docker, any IDE like NOTEPAD++/visual studio code/sublime text etc.,
2. MySQL, MongoDB

COURSE OUTCOMES:

CO1: To implement and deploy the client side of the web application.

CO2: To develop and deploy server side applications using NodeJS.

CO3: To use Express framework in web development.

CO4: To implement and architect database systems in both NoSQL and SQL environments.

CO5: To develop a full stack single page application using React, NodeJS, and a Database and deploy using containers.

CO-PO Mapping

CO	POs					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
1	3	1	3	2	3	3
2	2	1	2	2	3	3
3	2	1	2	2	3	2
4	2	1	3	2	2	3
5	2	1	2	2	2	2
Avg	2.2	1	2.4	2	2.6	2.6

MC4213 COMMUNICATION SKILLS ENHANCEMENT - II L T P C
0 0 2 1

COURSE OBJECTIVES:

- To provide opportunities to learners to practice their communication skills to make them become proficient users of English.
- To enable learners to fine-tune their linguistic skills (LSRW) with the help of Technology to communicate globally.
- To enhance the performance of learners at placement interviews and group discussions and other recruitment procedures

1. **SOFT SKILLS**
   - People skills
   - Interpersonal skills
   - Team building skills
   - Leadership skills
   - Problem solving skills

2. **PRESENTATION SKILLS**
   - Preparing slides with animation related to the topic
   - Introducing oneself to the audience
   - Introducing the topic
   - Presenting the visuals effectively – 5 minute presentation

3. **GROUP DISCUSSION SKILLS**
   - Participating in group discussions
   - Brainstorming the topic
   - Activities to improve GD skills.

PROGRESS THROUGH KNOWLEDGE

4. **INTERVIEW SKILLS**

- Interview etiquette – dress code – body language
- Attending job interviews
- Answering questions confidently
- Technical interview – telephone/Skype interview
- Emotional and cultural intelligence
- Stress Interview

TOTAL: 30 PERIODS

REFERENCES / MANUALS / SOFTWARE: Open Sources / websites

COURSE OUTCOMES:

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

CO1: Students will be able to make presentations and participate in Group discussions with confidence.

CO2:Students will be able to perform well in the interviews.

CO3: Students will make effective presentations.

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	1	2	1	1	1	1
2	1	2	1	1	1	1
3	1	2	1	1	1	1
Avg	1	2	1	1	1	1

MC4301 **MACHINE LEARNING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To gain knowledge on foundations of machine learning and apply suitable dimensionality reduction techniques for an application
- To select the appropriate model and use feature engineering techniques
- To gain knowledge on Probability and Bayesian Learning to solve the given problem
- To design and implement the machine learning techniques for real world problems
- To analyze, learn and classify complex data without predefined models also

UNIT I INTRODUCTION **9**

Human Learning - Types – Machine Learning - Types - Problems not to be solved - Applications - Languages/Tools– Issues. Preparing to Model: Introduction - Machine Learning Activities - Types of data - Exploring structure of data - Data quality and remediation - Data Pre-processing

UNIT II MODEL EVALUATION AND FEATURE ENGINEERING **9**

Model Selection - Training Model - Model Representation and Interpretability - Evaluating Performance of a Model - Improving Performance of a Model - Feature Engineering: Feature Transformation - Feature Subset Selection

UNIT III BAYESIAN LEARNING 9

Basic Probability Notation- Inference – Independence - Bayes' Rule. Bayesian Learning: Maximum Likelihood and Least Squared error hypothesis-Maximum Likelihood hypotheses for predicting probabilities- Minimum description Length principle -Bayes optimal classifier - Naïve Bayes classifier - Bayesian Belief networks -EM algorithm.

UNIT VI PARAMETRIC MACHINE LEARNING 9

Logistic Regression: Classification and representation – Cost function – Gradient descent – Advanced optimization – Regularization - Solving the problems on overfitting. Perceptron – Neural Networks – Multi – class Classification - Backpropagation – Non-linearity with activation functions (Tanh, Sigmoid, Relu, PRelu) - Dropout as regularization

UNIT V NON PARAMETRIC MACHINE LEARNING 9

k- Nearest Neighbors- Decision Trees – Branching – Greedy Algorithm - Multiple Branches – Continuous attributes – Pruning. Random Forests: ensemble learning. Boosting – Adaboost algorithm. Support Vector Machines – Large Margin Intuition – Loss Function - Hinge Loss – SVM Kernels

SUGGESTED ACTIVITIES:

1. Explore the significant steps involved in data preprocessing in Machine Learning
2. Choose a model and train a model in machine learning.
3. Explain the application of Bayes Theorem and how it's useful to predict the future
4. Make the difference between supervised Learning and unsupervised Learning Techniques
5. Differentiate Perceptron, Neural Network, Convolutional Neural Network and Deep Learning

TOTAL:45 PERIODS

COURSE OUTCOMES:

CO1: Understand about Data Preprocessing, Dimensionality reduction
CO2: Apply proper model for the given problem and use feature engineering techniques
CO3:Make use of Probability Technique to solve the given problem.
CO4: Analyze the working model and features of Decision tree
CO5:choose and apply appropriate algorithm to learn and classify the data

REFERENCES

1. Ethem Alpaydin, "Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)", Third Edition, MIT Press, 2014
2. Tom M. Mitchell, "Machine Learning", India Edition, 1st Edition, McGraw-Hill Education Private Limited, 2013
3. Saikat Dutt, Subramanian Chandramouli and Amit Kumar Das, "Machine Learning", 1st Edition, Pearson Education, 2019
4. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Revised Edition, Springer, 2016.
5. Aurelien Geron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", 2nd Edition, O"Reilly, 2019
6. Stephen Marsland, "Machine Learning – An Algorithmic Perspectivell, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	1	1	2	2	2	2
2	1	1	2	2	2	2
3	2	1	2	2	2	2
4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	1.6	1	2	2	2	2

MC4302 **INTERNET OF THINGS** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To understand the concepts of IoT and its working models
- To know the various IoT protocols
- To understand about various IoT Physical devices and Endpoints
- To know the security and privacy issues connected with IoT
- To apply the concept of Internet of Things in a real world scenario.

UNIT I FUNDAMENTALS OF IOT **9**

Definition and Characteristics of IoT, Sensors, Actuators, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.

UNIT II IOT PROTOCOLS **9**

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFIDProtocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4–BACNet Protocol– Modbus – KNX – Zigbee– Network layer – APS layer – Security

UNIT III IOT PHYSICAL DEVICES AND ENDPOINTS **9**

Introduction to Arduino and Raspberry Pi- Installation, Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, and reading input from pins.

UNIT IV INTERNET OF THINGS PRIVACY, SECURITY AND GOVERNANCE **9**

Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security

UNIT V APPLICATIONS **9**

IOT APPLICATIONS - IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT- A, Hydra etc.

SUGGESTED ACTIVITIES:

1: Study of 5 different types of sensors and actuators available in Market
2: Study of commercial IoT available in any one domain
3: Study the recent developments in IoT Protocol
4: Implement simple Python programs for IoT
5: Study on the latest government policies on IoT security and Privacy
6: A study on how to use IoT to solve some problems in your neighborhood.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Able to

CO1: Define the infrastructure for supporting IoT deployment**s**
CO2: Understand the usage of IoT protocols for communication between various IoT devices
CO3: Design portable IoT using Arduino/Raspberry Pi /equivalent boards.
CO4: Understand the basic concepts of security and governance as applied to IoT
CO5: Analyze and illustrate applications of IoT in real time scenarios

REFERENCES

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012. .
3. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton, Jerome Henry, “IoT Fundamentals, Networking Technologies, Protocols, and Use cases for the Internet of Things”, Cisco Press, First Edition,2017.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet ofThings”, Springer, 2011
5. Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895
6. Peter Friess,'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014

PROGRESS THROUGH KNOWLEDGE

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2
2	2	1	2	2	2	2
3	2	1	3	2	2	3
4	2	1	2	2	2	2
5	2	1	3	2	2	3
Avg	2	1	2.4	2	2	2.4

MC4311 **MACHINE LEARNING LABORATORY** **L T P C**
0 0 4 2

COURSE OBJECTIVES:

- To understand about data cleaning and data preprocessing
- To familiarize with the Supervised Learning algorithms and implement them in practical situations.
- To familiarize with unsupervised Learning algorithms and carry on the implementation part.
- To involve the students to practice ML algorithms and techniques.
- Learn to use algorithms for real time data sets.

LIST OF EXPERIMENTS :

1. Demonstrate how do you structure data in Machine Learning
2. Implement data preprocessing techniques on real time dataset
3. Implement Feature subset selection techniques
4. Demonstrate how will you measure the performance of a machine learning model
5. Write a program to implement the naïve Bayesian classifier for a sample training data set. Compute the accuracy of the classifier, considering few test data sets.
6. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using the standard Heart Disease Data Set.
7. Apply EM algorithm to cluster a set of data stored in a .CSV file.
8. Write a program to implement k-Nearest Neighbor algorithm to classify the data set.
9. Apply the technique of pruning for a noisy data monk2 data, and derive the decision tree from this data. Analyze the results by comparing the structure of pruned and unpruned tree.
10. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets
11. Implement Support Vector Classification for linear kernels.
12. Implement Logistic Regression to classify problems such as spam detection. Diabetes predictions and so on.

TOTAL: 60 PERIODS

LAB REQUIREMENTS:

Python or any ML tools like R

PROGRESS THROUGH KNOWLEDGE

COURSE OUTCOMES:

On completion of the laboratory course, the student should be able to

CO1: apply data preprocessing technique and explore the structure of data to prepare for predictive modeling

CO2: understand how to select and train a model and measure the performance.

CO3: apply feature selection techniques in Machine Learning

CO4: construct Bayesian Network for appropriate problem

CO5: learn about parametric and non-parametric machine Learning algorithms and implement to practical situations

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2
2	2	1	2	2	2	2
3	2	1	2	2	2	2
4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

MC4312 INTERNET OF THINGS LABORATORY L T P C
0 0 4 2

COURSE OBJECTIVES:

- To design applications to interact with sensors
- To design and develop IoT application Arduino/Raspberry pi for real world scenario.
- To enable communication between IoT and cloud platforms
- To develop applications using Django Framework

EXPERIMENTS:

PART I:

1. To study various IoT protocols – 6LowPAN, IPv4/IPv6, Wifi, Bluetooth, MQTT.
2. IoT Application Development Using sensors and actuators (temperature sensor, light sensor, infrared sensor)
3. To study Raspberry Pi development board and to implement LED blinking applications.
4. To develop an application to send and receive data with Arduino using HTTP request
5. To develop an application that measures the room temperature and posts the temperature value on the cloud platform.
6. To develop an application that measures the moisture of soil and post the sensed data over Google Firebase cloud platform.
7. To develop an application for measuring the distance using ultrasonic sensor and post distance value on Google Cloud IoT platform
8. Develop a simple application based on sensors.
9. Develop IoT applications using Django Framework and Firebase/ Bluemix platform.
10. Develop a commercial IoT application.

TOTAL: 60 PERIODS

HARDWARE/SOFTWARE REQUIREMENTS:

1. The universal microcontroller development board
2. 8051 Daughter Board
3. Raspberry Pi 3B+ Original
4. Arduino Daughter Board
5. Humidity + IR Sensor Interface
6. Ultrasonic Sensors
7. Open source softwares Django Framework

8. Open cloud architectures like Bluemix, Development platforms like Firebase

COURSE OUTCOMES:

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

CO1: To understand the various IoT protocols
CO2: Test and experiment different sensors for application development
CO3: To develop applications using Arduino/Raspberry Pi/ Equivalent boards.
CO4: To develop applications that would read the sensor data and post it in Cloud
CO5: Develop IOT applications with different platforms and frameworks.

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2
2	2	1	2	2	2	2
3	2	1	2	2	2	2
4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

MC4001 SOFTWARE PROJECT MANAGEMENT L T P C
3 0 0 3

COURSE OBJECTIVES:

- To know how to do project planning for the software process.
- To learn the cost estimation techniques during the analysis of the project.
- To understand the quality concepts for ensuring the functionality of the software

UNIT SOFTWARE PROJECT MANAGEMENT CONCEPTS 9

Introduction to Software Project Management: An Overview of Project Planning: Select Project, Identifying Project scope and objectives, infrastructure, project products and Characteristics. Estimate efforts, Identify activity risks, and allocate resources- Six Sigma, Software Quality: defining software quality, ISO9126, External Standards.

UNIT II SOFTWARE EVALUATION AND COSTING 9

Project Evaluation: Strategic Assessment, Technical Assessment, cost-benefit analysis, Cash flow forecasting, cost-benefit evaluation techniques, Risk Evaluation. Selection of Appropriate Project approach: Choosing technologies, choice of process models, structured methods.

UNIT III SOFTWARE ESTIMATION TECHNIQUES 9

Software Effort Estimation: Problems with over and under estimations, Basis of software Estimation, Software estimation techniques, expert Judgment, Estimating by analogy. Activity Planning: Project schedules, projects and activities, sequencing and scheduling Activities, networks planning models, formulating a network model.

UNIT IV RISK MANAGEMENT 9

Risk Management: Nature of Risk, Managing Risk, Risk Identification and Analysis, Reducing the Risk. Resource Allocation: Scheduling resources, Critical Paths, Cost scheduling, Monitoring and Control: Creating Framework, cost monitoring, prioritizing monitoring.

UNIT V GLOBALIZATION ISSUES IN PROJECT MANAGEMENT 9

Globalization issues in project management: Evolution of globalization- challenges in building global teams-models for the execution of some effective management techniques for managing global teams. Impact of the internet on project management: Introduction – the effect of the internet on project management – managing projects for the internet – effect on project management activities. Comparison of project management software: dot Project, Launch pad, openProj. Case study: PRINCE2

SUGGESTED ACTIVITIES:

1. Reducing process variability using six-sigma model DMAIC on software company applications with respect to factors like quality aspects , production bugs classified and measured, the causes of the large number of production bugs leading to different improvement suggestions
2. Do cost benefit analysis using Ms-Excel for Selecting the project (from available data in the web like https://img.chandoo.org/a/24-cost-benefit-analysis.xlsx)
3. Frequencying and Scheduling the Project activities using open source Ms-Project
4. Risk analysis of any project with special reference to performance time cost trilogy
5. Set up a project and its tasks ; Communicate with everyone on the project team from within dotProject software.

TOTAL:45 PERIODS

COURSE OUTCOMES:

CO1: Understand the activities during the project scheduling of any software application.

CO2: Learn the risk management activities and the resource allocation for the projects.

CO3: Apply the software estimation and recent quality standards for evaluation of the software projects

CO4: Acquire knowledge and skills needed for the construction of highly reliable software project

CO5: Create reliable, replicable cost estimation that links to the requirements of project planning and managing

PROGRESS THROUGH KNOWLEDGE

REFERENCES

1. Bob Hughes, Mike Cotterell & Rajib Mall “Software Project Management”, McGraw- Hill Publications, 6th Edition 2017.
2. Ian Somerville, “Software Engineering”, 10th Edition, Pearson Education, 2017.
3. Robert T. Futrell , “Quality Software Project Management”, Pearson Education India, 2008.
4. Gopalaswamy Ramesh, “Managing Global Software Projects: How to Lead Geographically Distributed Teams, Manage Processes and Use Quality Models”, McGraw Hill Education, 2017.
5. Richard H.Thayer “Software Engineering Project Management”, 2nd Edition, Wiley, 2006.
6. S. A. Kelkar,” Software Project Management” PHI, New Delhi, Third Edition ,2013

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2
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Avg	2	1	2	2	2	2

MC4002 PROFESSIONAL ETHICS IN IT L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand the concepts of computer ethics in the work environment.
- To understand the threats in computing environment
- To Understand the intricacies of accessibility issues
- To ensure safe exits when designing the software projects

UNIT I INTRODUCTION TO ETHICS 9

Definition of Ethics- Right, Good, Just- The Rational Basis of Ethics -Theories of Right: Intuitionist vs. End-Based vs. Duty-Based -Rights, Duties, Obligations -Theory of Value - Conflicting Principles and Priorities -The Importance of Integrity -The Difference Between Morals, Ethics, and Laws -Ethics in the Business World - Corporate Social Responsibility - Creating an Ethical Work Environment -Including Ethical Considerations in Decision Making

UNIT II ETHICS IN INFORMATION TECHNOLOGY, INTERNET CRIME 9

IT Professionals - Are IT Workers Professionals- Professional Relationships That Must Be Managed -Professional Codes of Ethics - Professional Organizations - Certification - IT Professional Ethics, Three Codes of Ethics, Management Conflicts. The Reveton Ransomware Attacks -IT Security Incidents: A Major Concern - Why Computer Incidents Are So Prevalent - Types of Exploits -Types of Perpetrators-Federal Laws for Prosecuting Computer Attacks- Implementing Trustworthy Computing -Risk Assessment -Establishing a Security Policy - Educating Employees and Contract Workers

UNIT III FREEDOM OF EXPRESSION, PRIVACY 9

First Amendment Rights -Obscene Speech-Defamation -Freedom of Expression: Key Issues - Controlling Access to Information on the Internet -Strategic Lawsuit Against Public Participation (SLAPP)-Anonymity on the Internet-Hate Speech- Privacy Protection and the Law- Information Privacy- Privacy Laws, Applications, and Court Rulings-Key Privacy and Anonymity Issues- Data Breaches -Electronic Discovery-Consumer Profiling- Workplace Monitoring -Advanced Surveillance Technology

UNIT IV FREEDOM OF EXPRESSION, INTELLECTUAL PROPERTY RIGHTS **9**

Intellectual Property Rights-Copyrights-Copyright Term - Eligible Works -Fair Use Doctrine - Software Copyright Protection –Copyright Laws and the internet-Copyright and Piracy–Patents--Software Patents -Cross-Licensing Agreements -Trade Secrets-Trade Secret Laws -Employees and Trade Secrets-Key Intellectual Property Issues-Plagiarism -Reverse Engineering-Open Source Code- Competitive Intelligence -Trademark Infringement -Cyber squatting

UNIT V SOCIAL NETWORKING ETHICS AND ETIQUETTES **9**

Social Networking Web Site- Business Applications of Online Social Networking-Social Network Advertising-The Use of Social Networks in the Hiring Process-Social Networking Ethical Issues –Cyber bullying- Online Virtual Worlds-Crime in Virtual Worlds-Educational and Business Uses of Virtual Worlds

SUGGESTED ACTIVITIES:

1. Prepare a report of CSR activities of any three organizations.
2. Study of the government rules and regulations for prosecuting Computer Attacks
3. Do case study of two incidents that lead to IT Security breach in any of the organizations
4. Recent cases (within last 5 years duration) of infringement of intellectual property rights
5. A study on Creative commons and its effect on Open Educational Resources
6. A study on the role of social networking advertising in the development of Business and Educational Sectors

TOTAL:45 PERIODS

COURSE OUTCOMES:

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

CO1: Examine situations and to internalize the need for applying ethical principles, values to tackle various situations.

CO2: Develop a responsible attitude towards the use of computers as well as the technology.

CO3: Envision the societal impact on the products/ projects they develop in their career

CO4: Understand the code of ethics and standards of computer professionals.

CO5: Analyze professional responsibility and empower access to information in the workplace.

REFERENCES

1. Caroline Whitback, "Ethics in Engineering Practice and Research", Cambridge University Press, 2nd Edition 2011.
2. George Reynolds, "Ethics in Information Technology", Cengage Learning, 6thEdition 2018.
3. Barger, Robert. (2008). Computer ethics: A case-based approach.Cambridge University Press 1stEdition.
4. John Weckert and Douglas Adeney, Computer and Information Ethics, Greenwood Press,FirstEdition1997.
5. Penny Duquenoy, Simon Jones and Barry G Blundell, "Ethical, legal and professional issues in computing", Middlesex University Press, First Edition2008.
6. Sara Baase, "A Gift of Fire: Social, Legal, and Ethical Issues for Computing Technology", 4th Edition, Pearson India, 2018.
7. http://www.infosectoday.com/Articles/Intro_Computer_Ethics.html

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	1	1	1	1	1	1
2	1	1	1	1	1	1
3	1	1	1	1	1	1
4	1	1	1	1	1	1
5	1	1	1	1	1	1
Avg	1	1	1	1	1	1

MC4003 **E - LEARNING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To learn the various E-learning approaches andComponents.
- To explore DesignThinking.
- To understand the types of design models ofE-learning.
- To learn about E-learning Authoring tools.
- To know about evaluation and management of E-learning solutions

UNIT I INTRODUCTION **9**

Need for E-Learning – Approaches of E-Learning – Components of E-Learning –synchronous and Asynchronous Modes of Learning – Quality of E-Learning – Blended Learning: Activities, Team and Technology – WorkFlow to Produce and Deliver E-Learning Content – Design Thinking: Introduction – Actionable Strategy – Act to Learn – Leading Teams to Win

UNIT II DESIGNING E-LEARNING COURSE CONTENT **9**

Design Models of E-Learning – Identifying and Organizing E-Learning Course Content: Needs Analysis – Analyzing the Target Audience – Identifying Course Content – Defining Learning Objectives – Defining the Course Sequence – Defining Instructional Methods – Defining Evaluation and Delivery Strategies – Case Study

UNIT III CREATING INTERACTIVE CONTENT **9**

Preparing Content: Tips for Content Development and Language Style – Creating Storyboards: Structure of an Interactive E-Lesson – Techniques for Presenting Content – Adding Examples – Integrating Multimedia Elements – Adding Examples – Developing Practice and Assessment Tests–Adding Additional Resources – Courseware Development Authoring Tools – Types of Authoring Tools – Selecting an Authoring Tool.

UNIT V LEARNING PLATFORMS **9**

Types of Learning Platforms – Proprietary Vs. Open – Source LMS – LMS Vs LCMS – Internally Handled and Hosted LMS – LMS Solutions – Functional Areas of LMS.

UNIT V COURSE DELIVERY AND EVALUATION 9

Components of an Instructor-Led or Facilitated Course – Planning and Documenting Activities – Facilitating Learners Activities – E-Learning Methods and Delivery Formats – Using Communication Tools for E-Learning – Course Evaluation

TOTAL:45 PERIODS

SUGGESTED ACTIVITIES:

1. Prepare the E-Learning Components and how will you measure the quality of the contents. Also, analyze synchronous and Asynchronous Modes of Learning, and discuss the advantages and disadvantages of both.
2. Explain how the course instructor design and create effective E-Learning content
3. List the types of authoring tools and discuss which tool is best according to you.
4. Explain about different types of Learning Platforms
5. Discuss about the Evaluation process of E-Learning courses in detail.

COURSE OUTCOMES:

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

CO1: Distinguish the phases of activities in models of E-learning.
CO2: Identify appropriate instructional methods and delivery strategies.
CO3: Choose appropriate E-learning Authoring tools.
CO4: Create interactive E-learning courseware.
CO5: Evaluate the E-learning courseware

REFERENCES

1. Clark, R. C., Mayer, R. E., “E-Learning and the Science of Instruction”. Third Edition, Wiley Publisher, 2016.
2. Crews, T. B., Sheth, S. N., Horne, T. M., “Understanding the Learning Personalities of Successful Online Students”, 1st Edition, Educause Review, 2014.
3. Johnny Schneider, “Understanding Design Thinking, Lean and Agile”, 1st Edition, O'Reilly Media, 2017.
4. Madhuri Dubey, “Effective E–learning Design, Development and Delivery”, 1st Edition, University Press, 2011.
5. Vladimir L. Uskov, Robert J. Howlett, Lakhmi C. Jain, Smart Education and E-Learning, 1st Edition, Springer Singapore, 2019.
6. William Horton,”E-Learning by design”, 2nd Edition, John Wiley & Sons, 2011.

CO-PO Mapping

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5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

MC4004 ADVANCES IN OPERATING SYSTEMS L T P C
3 0 0 3

COURSE OBJECTIVES:

- To review the fundamentals of Operating Systems
- To gain knowledge on Distributed Operating System concepts that includes issues, Mutual exclusion algorithms, Deadlock detection algorithms
- To gain insight on the distributed resource management components viz. the algorithms for implementation of distributed shared memory, and distributed scheduling.
- To know the components and management aspects of Real time, Mobile operating systems
- To acquire knowledge on the basics of Linux and Mobile OS like iOS, Android

UNIT I FUNDAMENTALS OF OPERATING SYSTEMS 9

Overview – Synchronization Mechanisms – Processes and Threads - Process Scheduling – Models of Resources - Deadlocks: Detection, Prevention and Recovery

UNIT II DISTRIBUTED OPERATING SYSTEMS 9

Issues in Distributed Operating System – Communication Primitives – Lamport's Logical clocks – Causal Ordering of Messages – Distributed Mutual Exclusion Algorithms – Centralized and Distributed Deadlock Detection Algorithms

UNIT III DISTRIBUTED RESOURCE MANAGEMENT 9

Distributed File Systems – Design Issues – Distributed Shared Memory – Algorithms for Implementing Distributed Shared Memory – Distributed Scheduling – Issues in Load Distributing – Load Distributing Algorithms

UNIT IV REAL TIME AND MOBILE OPERATING SYSTEMS 9

Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems – Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems – Microkernel Design - Client Server Resource Access – Processes and Threads - Memory Management - File system.

UNIT V CASE STUDIES 9

Linux System: Design Principles - Kernel Modules - Process Management - Scheduling - Memory Management – Input Output Management - File System – Interprocess Communication. iOS and Android: Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer - File System.

TOTAL: 45 PERIODS

SUGGESTED ACTIVITIES:

1. Consider the following preemption method to prevent deadlocks: All processes are assigned unique priorities that can be totally ordered. A requesting process is allowed to preempt another process that holds the needed resource only if the requesting process has higher priority, otherwise, it is blocked. Demonstrate that this method prevents deadlock.
2. Consider a distributed system where each node has its own clock. Assume that all the clocks in the system are perfectly synchronized. Also, assume that the communication network is reliable. Give an algorithm for recording the global state. Note that your algorithm should be simpler than the Chandy- Lamport algorithm.
3. Predict the performance of the receiver-initiated load sharing algorithm when the entire

system workload is generated at only a few nodes in the system instead of equally at all the nodes in the system. (Hint : performance depends on how successful receivers will be in locating senders)

4. Consider two processes, P1 and P2, where p1 = 50, t1 = 25, p2 = 75, and t2 = 30.
    a. Can these two processes be scheduled using Rate-Monotonic Scheduling? Illustrate your answer by displaying a Gantt chart
    b. Implement the scheduling of these two processes using Earliest Deadline-First (EDF) scheduling.
5. Developers David and Peter of R & D belong to group A. Administrative staff Jack and Mike belong to group B.
    a. Create a shared directory "/ project_a". The files in this directory can only be read, added, deleted, modified, and executed by developers in the R & D department. Other users cannot perform any access operation in this directory.
    b. Create a directory "/ project_b". The files in this directory can only be read, added, deleted, modified and executed by the staff of the Administration Department, other users cannot do anything to this directory Access operation.
    c. Create a directory "/ project". The files in this directory can be read, added, deleted, modified, and executed by personnel in the R & D department and administrative department. Users in other departments can only use this directory and perform read-only access operations.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Discuss various synchronization, scheduling and deadlock issues
CO2: Demonstrate mutual exclusion and deadlock detection of Distributed Operating system
CO3: Discuss various resource management techniques for distributed systems
CO4: Identify the different features of real time and mobile operating systems
CO5: Perform administrative tasks on Linux Servers, iOS and Android

REFERENCES

1. Mukesh Singhal, Niranjan G. Shivaratri, “Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems”, Tata McGraw-Hill,First Edition, 1994.
2. Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, “Operating System Concepts-Essentials”, Ninth Edition, John Wiley & Sons, 2013.
3. Love Robert,” Linux Kernel Development”, Pearson Education India, Third Edition, 2018.
4. Neil Smyth, “iOS 12 App Development Essentials”, Payload media, 2018.
5. Rajib Mall, “Real-Time Systems: Theory and Practice”, Pearson Education India, First Edition 2006.

CO-PO Mapping

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2	2	1	2	2	2	2

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5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

MC4005 INFORMATION RETRIEVAL TECHNIQUES L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand the basics of information retrieval with pertinence to modeling, query operations and indexing
- To get an understanding of machine learning techniques for text classification and clustering.
- To understand the various applications of information retrieval giving emphasis to multimedia IR, web search
- To understand the concepts of digital libraries

UNIT I MOTIVATION 9

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

UNIT II MODELING 9

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

UNIT III INDEXING 9

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

UNIT IV CLASSIFICATION AND CLUSTERING 9

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

UNIT V SEARCHING THE WEB AND RETRIEVAL 9

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

TOTAL: 45 PERIODS

SUGGESTED ACTIVITIES:

1. Compare the features of any three search engines
2. Compare and contrast the IR models

3. List out features of the various IR Query languages
4. List out the applications of classification and clustering in Machine Learning
5. A Study on web crawler used by any Search Engine for indexing the sites

(For eg., Google, Mozilla, Internet Explorer,....)

COURSE OUTCOMES:

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

CO1: Build an Information Retrieval system using the available tools.

CO2: Identify and design the various components of an Information Retrieval system.

CO3: Model an information retrieval system

CO4: Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval.

CO5: Design an efficient search engine and analyze the Web content structure.

REFERENCES

1. Implementing and Evaluating Search Engines, The MIT Press, Cambridge, Massachusetts London, England, First Edition2010.
2. Manning D. Christopher, Raghavan Prabhakar & Schutz Hinrich, " Introduction to Information Retrieval", Cambridge University Press, Online Edition,2009.
3. David A. Grossman, Ophir Frieder, "Information Retrieval: Algorithms and Heuristics", Springer, 2nd Edition, 2004.
4. Bruce Croft, Donald Metzler,Trevor Strohman, "Search Engines: Information Retrieval in Practice", Pearson, 2009.
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6. Stefan Buttcher, Charles L. A. Clarke, Gordon V. Cormack, —Information Retrieval: Implementing and Evaluating Search Engines (The MIT Press), Illustrated Edition, 2016.

CO-PO Mapping

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Avg	2	1	2	2	2	2

MC4006 SOFT COMPUTING TECHNIQUES L T P C

3 0 0 3

COURSE OBJECTIVES:

- To gain knowledge of soft computing theories and its fundamentals.
- To design a soft computing system required to address a computational task.

- To learn and apply artificial neural networks, fuzzy sets and fuzzy logic and genetic algorithms in problem solving and use of heuristics based on human experience.
- To introduce the ideas of fuzzy sets, fuzzy logic and to become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems.
- To familiarize with genetic algorithms and other random search procedures while seeking global optimum in self – learning situations

UNIT I FUZZY COMPUTING 9

Basic Concepts of Fuzzy Logic, Fuzzy Sets and Crisp Sets, Fuzzy Set Theory and Operations, Properties of Fuzzy Sets, Fuzzy and Crisp Relations, Fuzzy to Crisp Conversion Membership Functions, Interference in Fuzzy Logic, Fuzzy If – Then Rules, Fuzzy Implications and Fuzzy Algorithms, Fuzzification and Defuzzification, Fuzzy Controller, Industrial Applications.

UNIT II FUNDAMENTALS OF NEURAL NETWORKS 9

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

UNIT III BACKPROPAGATION NETWORKS 9

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

UNIT IV COMPETITIVE NEURAL NETWORKS 9

Kohenen's Self Organizing Map – SOM Architecture, learning procedure – Application; Learning Vector Quantization – learning by LVQ; Adaptive Resonance Theory – Learning procedure – Applications.

UNIT V GENETIC ALGORITHM 9

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

TOTAL: 45 PERIODS

SUGGESTED ACTIVITIES:

- Prepare a weekly timetable for classes in a college for different groups of students so that there are no clashes between classes. The task is to search for the optimum using GA
- Species identification of a plant using Back propagation Algorithm
- Bandwidth allocation for wireless system using Neural network
- Apply Fuzzy logic for washing machines to determine the correct amount of water and detergent, speed of agitation, and length of the wash cycles.
- Apply Fuzzy logic for breast cancer diagnosis
- Do a Case Study Effect of Road Traffic Noise Pollution on Human Work Efficiency in Offices/ Organizations/ Commercial Business Centers in cities Using Fuzzy Expert System:

COURSE OUTCOMES:

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

CO1: Identify and describe soft computing techniques and their roles in building intelligent

machines.

CO2: Recognize the feasibility of applying a soft computing methodology for a particular problem.

CO3: Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.

CO4: Apply genetic algorithms to optimization problems.

CO5: Design neural networks to pattern classification and regression problems using a soft computing approach.

REFERENCES

1. J.S.R. Jang, C.T. Sun and E. Mizutani, "Neuro – Fuzzy and Soft Computing", Pearson Education, 2004.
2. S. Rajasekaran and G.A. VijayalakshmiPai, "Neural Networks, Fuzzy Systems and Evolutionary Algorithms: Synthesis and Applications", PHI Learning, 2nd Edition, 2017.
3. S. N. Sivanandam, S. N. Deepa, "Principles of Soft Computing", Third Edition, Wiley, 2018.
4. Simon Haykin, "Neural Networks and Learning Machines", Pearson, 3rd Edition, 2009.
5. Timothy Ross, "Fuzzy Logic with Engineering Applications", Wiley Publications, 4th Edition 2016.

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5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

MC4007 OPERATIONS RESEARCH L T P C
3 0 0 3

COURSE OBJECTIVES:

- To provide the concept and an understanding of basic concepts in Operations Research techniques for Analysis and Modeling in Applications.
- To understand , develop and solve mathematical model of linear programming problems
- To understand , develop and solve mathematical model of Transport and assignment problems
- To Understand network modeling for planning and scheduling the project activities

UNIT I LINEAR PROGRAMMING MODELS 9

Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables: big-M method, degeneracy and unbound solutions.

UNIT II TRANSPORTATION AND ASSIGNMENT MODELS 9

Formulation - Methods for finding basic Feasible Solution - Optimality Test - MODI method - Degeneracy in Transportation Problem -Unbalanced Transportation Problem. Assignment Method: Mathematical formulation of assignment models – Hungarian Algorithm – Variants of the Assignment problem

UNIT III SCHEDULING BY PERT AND CPM 9

Introduction - Rules to frame a Network - Fulkerson's Rule to numbering of events - Activity, Times - Critical Path Computation - Slack and Float - PERT- Steps and computing variance, Merits and demerits of PERT, CPM- Time estimating & Limitations, Comparison between PERT & CPM.

UNIT VI QUEUEING MODELS 9

Characteristics of Queueing Models–Poisson Queues-(M /M/1):(FIFO/∞/∞), (M / M / 1) : (FIFO / N / ∞), (M / M / C) : (FIFO / ∞ / ∞), (M / M / C) : (FIFO / N / ∞)models.

UNIT V GAME THEORY 9

Competitive game, rectangular game, saddle point, minimax (maximin) method of optimal strategies- value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.

SUGGESTED ACTIVITIES:

1. Do some research on nutrients that are essential for a balanced diet. Select three or four nutrients and constraints on it. Explore the framework of LPP. Formulate an LPP with suitable objective function and constraints.
2. Identify some electricity distribution centers and areas which have requirements. Think of the objective and try to provide the solution framework.
3. Break down the stages of completing a construction of a house (like Start, Framing, Plumbing etc…) and find the minimum days to complete the construction.
4. Try to observe the customer arrival rate in a departmental store near your residence for a week. Also the service rate rendered. Make your inference on appointing an extra salesgirl.
5. Decision making is very crucial. Consider the situation where two companies share a market, in which they currently make Rs 50, 00,000 each. Both need to determine whether they should advertise. For each company advertising costs Rs 20, 00,000 and captures Rs 30, 00, 000 from the competitor provided the competitor doesn't advertise. What should the companies do?

COURSE OUTCOMES:

CO1:Understand and apply linear programming to solve operational problem with constraints
CO2:Apply transportation and assignment models to find optimal solution
CO3:Prepare project scheduling using PERT andCPM
CO4:Identify and analyze appropriate queuing models to reduce the waiting time in queue.
CO5:Choose the best strategy using decision making methods under game theory.

TOTAL: 45 PERIODS

REFERENCES

1. Taha H.A., "Operations Research: An Introduction", 10th Edition, Prentice Hall of India, New Delhi, 2017
2. KantiSwarup, P.K. Gupta, Man Mohan, "Operations Research", 15th Revised Edition,

S. Chand& Sons Education Publications, New Delhi, 2017
3. Ronald L Rardin, Optimization In Operations Research, 2nd Edition, Pearson Education, India, 2018
4. Jatinder Kumar, Optimization Techniques in Operations Research, LAP LAMBERT Academic Publishing, 2015
5. D.S.Hira and P.K.Gupta, Operations Research, 5th Edition, S.Chand& Sons, 2015.

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2
2	2	1	2	2	2	2
3	2	1	2	2	2	2
4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

MC4008 BUSINESS DATA ANALYTICS L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand the basics of business analytics and its life cycle.
- To gain knowledge about fundamental business analytics.
- To learn modeling for uncertainty and statistical inference.
- To understand analytics using Hadoop and Map Reduce frameworks.
- To acquire insight on other analytical frameworks.

UNIT I OVERVIEW OF BUSINESS ANALYTICS 9

Introduction – Drivers for Business Analytics – Applications of Business Analytics: Marketing and Sales, Human Resource, Healthcare, Product Design, Service Design, Customer Service and Support – Skills Required for a Business Analyst – Framework for Business Analytics Life Cycle for Business Analytics Process.

UNIT II ESSENTIALS OF BUSINESS ANALYTICS 9

Descriptive Statistics – Using Data – Types of Data – Data Distribution Metrics: Frequency, Mean, Median, Mode, Range, Variance, Standard Deviation, Percentile, Quartile, z-Score, Covariance, Correlation – Data Visualization: Tables, Charts, Line Charts, Bar and Column Chart, Bubble Chart, Heat Map – Data Dashboards.

UNIT III MODELING UNCERTAINTY AND STATISTICAL INFERENCE 9

Modeling Uncertainty: Events and Probabilities – Conditional Probability – RandomVariables – Discrete Probability Distributions – Continuous Probability Distribution –Statistical Inference: Data Sampling – Selecting a Sample – Point Estimation – Sampling Distributions – Interval Estimation – Hypothesis Testing.

UNIT IV ANALYTICS USING HADOOP AND MAPREDUCE FRAMEWORK **9**

Introducing Hadoop – RDBMS versus Hadoop – Hadoop Overview – HDFS (HadoopDistributed File System) – Processing Data with Hadoop – Introduction to MapReduce –Features of MapReduce – Algorithms Using Map-Reduce: Matrix-Vector Multiplication, Relational Algebra Operations, Grouping and Aggregation – Extensions to MapReduce

UNIT V OTHER DATA ANALYTICAL FRAMEWORKS **9**

Overview of Application development Languages for Hadoop – PigLatin – Hive – Hive QueryLanguage (HQL) – Introduction to Pentaho, JAQL – Introduction to Apache: Sqoop, Drill and Spark, Cloudera Impala – Introduction to NoSQL Databases – Hbase and MongoDB.

TOTAL: 45 PERIODS

SUGGESTED ACTIVITIES:

1. Study on some application of Business analytics in organizations of any domain
2. Study the statistics and data visualization charts of sales data like Amazon using R
3. Study on new strategies derived using data analytic tools on some business data set available and its impact on company progress
4. Prepare a report on the use of Hadoop framework in any two companies
5. Compare and contrast the various Data Analytical Frameworks

COURSE OUTCOMES:

On completion of the course, the student will be able to:

CO1: Identify the real world business problems and model with analytical solutions.

CO2: Solve analytical problems with relevant mathematics background knowledge.

CO3: Convert any real world decision making problem to hypothesis and apply suitable statistical testing.

CO4: Write and Demonstrate simple applications involving analytics using Hadoop and MapReduce

CO5: Use open source frameworks for modeling and storing data

REFERENCES

1. U. Dinesh Kumar, “Business Analytics: The Science of Data-Driven Decision Making”, Wiley, First Edition, 2017.
2. Umesh R Hodeghatta, Umesha Nayak, “Business Analytics Using R – A Practical Approach”, Apress, First Edition2017.
3. Jeffrey D. Camm, James J. Cochran, Michael J. Fry, Jeffrey W. Ohlmann, David R. Anderson, “Essentials of Business Analytics”, Cengage Learning, second Edition, 2016.
4. Rui Miguel Forte, “Mastering Predictive Analytics with R”, Packt Publication, First Edition2015.
5. VigneshPrajapati, “Big Data Analytics with R and Hadoop”, Packt Publishing, First Edition2013.
6. AnandRajaraman, Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press,FirstEdition 2012.
7. A. Ohri, “R for Business Analytics”, Springer,First Edition, 2012

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2

2	2	1	2	2	2	2
3	2	1	2	2	2	2
4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

MC4009 **DEVOPS AND MICROSERVICES** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To introduce Microservices and Containers. .
- To understand the key concepts and principles of DevOps
- To be familiar with most common DevOps tools
- To explain the business benefits of DevOps and continuous delivery.
- To recall specific DevOps methodologies and frameworks

UNIT I INTRODUCTION TO MICROSERVICES **9**

Definition of Microservices – Characteristics - Microservices and Containers – Interacting with Other Services – Monitoring and Securing the Services – Containerized Services – Deploying on Cloud

UNIT II MICROSERVICES ARCHITECTURE **9**

Monolithic architecture- Microservices architectural style- Benefits - Drawbacks of Microservices architectural style - decomposing monolithic applications into Microservices

UNIT III DevOps Tools **9**

History of DevOps- DevOps and Software Development Life Cycle – Waterfall Model _Agile Model – DevOps LifeCycle – DevOps Tools: distributed version of control tool **Git-** Automation testing tools- **Selenium** – report generation –**TestNG –** User Acceptance Testing – **Jenkins**

UNITI V MICROSERVICES IN DEVOPS ENVIRONMENT **9**

Evolution of Microservices and DevOps – Benefits of combining DevOps and Microservices- working of DevOps and Microservices in Cloud environment - DevOps Pipeline representation for a NodeJS based Microservices

UNIT V VELOCITY AND CONTINUOUS DELIVERY **9**

Velocity - Delivery Pipeline- test stack - Small/Unit Test – medium /integration testing – system testing- Job of Development and DevOps - Job of Test and DevOps – Job of Op and Devops- Infrastructure and the job of Ops

TOTAL:45 PERIODS

SUGGESTED ACTIVITIES:

- Write your understanding about Microservices and how it works. How you deploy Microservices on cloud.
- Discuss about Microservices Architecture.
- Write a report on about DevOps tools

- Explaining the benefits of combining DevOps.and Microservices with case study
- Describe continuous integration and continuous delivery by taking a case study

COURSE OUTCOMES:

At the end of this course, the students will be able to:

CO1: Select the Microservices design and apply the principles..

CO2: Apply Microservices in DevOps

CO3: Understand about DevOps and the common tools used in DevOps.

CO4: Develop and integrate projects using DevOps

CO5: Deploy and monitor projects using DevOps

REFERENCES

1. Namit Tanasseri, RahulRai, Microservices with Azure, 1st Edition, Packt Publishing, UK, 2017
2. Eberhard Wolff, Microservices: Flexible Software Architecture, 1st Edition, Pearson Education, 2017
3. James A Scott, A Practical Guide to Microservices and Containers, MapR Data Technologies e – book. https://mapr.com/ebook/microservices-and-containers/assets/microservices-and-containers.pdf
4. Joyner Joseph, Devops for Beginners, First Edition, MihailsKonoplovs publisher, 2015.
5. Gene Kim, Kevin Behr, George Spafford, The Phoenix Project, A Novel about IT, DevOps, 5th Edition, IT Revolution Press, 2018 .
6. Michael Hüttermann, DevOps for Developers, 1st Edition, APress, e-book, 2012.

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	1	2	2	2	2	2
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4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	1.8	1.2	2	2	2	2

MC4010 ADVANCES IN NETWORKING L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand the theme underlying IPv6 Structure and addressing methods
- To understand and analyze the protocols for IPv6 Implementation
- To identify and provide solutions for QoS and Security Issues with IPv6
- To learn about Software Defined concepts, architectures, protocols and applications
- To explore the significance of Network Function Virtualization

UNIT I IPv6 STRUCTURE AND ADDRESSING 9

IPv4 Address Depletion- IPv6 Transition Issues-IPv6 Structure: IPv6 Header, Extension Headers:

Hop-by-Hop Options Header, Destination Options Header, Routing Header, Fragment Header, AH, ESP- IPv6 Addresses: Unicast, Anycast, Multicast – Address Autoconfiguration

UNIT II IPv6 NETWORKING 9

IPv6 Internet Control Message Protocol (ICMPv6): ICMPv6 Messages, Fragmentation and Path MTU- IPv6 Neighbor Discovery- IPv6 Routing : RIPng , EIGRP for IPv6, OSPFv3 - Mobile IPv6

UNIT III QoS, PROVISIONING AND SECURITY WITH IPv6 9

QoS in IPv6 Protocols: Differentiated Services and IPv6, IPv6 Flows, Explicit Congestion Notification in IPv6 – Provisioning: Stateless DHCPv6, Stateful DHCPv6, DNS Extensions for IPv6- Security with IPv6: IP Security Protocol (IPsec) Basics, IPv6 Security Elements, Interaction of IPsec with IPv6 Elements

UNIT IV SOFTWARE DEFINED NETWORKING 9

Genesis of SDN – Separation of Control Plane and Data Plane – Distributed Control Plane –IP and MPLS – Characteristics of SDN – Operation – Devices – Controller – OpenFlow Specification

UNIT V NETWORK FUNCTION VIRTUALIZATION 9

Building SDN Framework – Network Functions Virtualization – Introduction –Virtualization and Data Plane I/O – Service Locations and Chaining – Applications – Use Cases of SDNs:Data Centers, Overlays, Big Data and Network Function Virtualization

SUGGESTED ACTIVITIES:

1. IPv6 Packet Analysis Using Wireshark
2. Verifying the Router's Link-Local Address on Ethernet and Serial Interfaces using Cisco Packet Tracer
3. Configuring a Windows Host to Use EUI-64 using Cisco Packet Tracer
4. Analysis of Router Advertisement Using Wireshark
5. Simulating the basic network topology with SDN based Open Flow Switch using NS3

TOTAL: 45 PERIODS

COURSE OUTCOMES:

CO1: Describe how IPv6 interacts with data link layer with IPv6 Structure and addressing methods
CO2: To develop the strategies for deploying IPv6 in the place of IPv4
CO3:Analyze the security issues for IPv6 in emerging applications
CO4:Analyze the need for separation of data and control plane in Networking
CO5:To use SDN to enable and enhance NFV

REFERENCES

1. Rick Graziani,"IPv6 Fundamentals: A Straightforward Approach to Understanding IPv6" Second Edition, Cisco Press, 2017
2. Peter Loshin, "IPv6:Theory,Protocol,and Practice" Second Edition, Morgan Kaufmann Publishers, 2004
3. William Stallings, "Foundations of Modern Networking – SDN, NFC, QoE, IoT and Cloud" Third Edition, Pearson Publications, 2019.
4. Oswald Coker, Siamak Azodolmolky, "Software-Defined Networking with OpenFlow", Second Edition, Packt Publishing, 2017.

5. Paul Goransson, Chuck Black, “Software Defined Networks: A Comprehensive Approach”, Morgan Kaufmann Publisher, First Edition 2014.
6. Thomas D. Nadeau, Ken Gray, “SDN: Software Defined Networks, An Authoritative Review of Network Programmability Technologies”, O'Reilly Media, First Edition August 2013.

CO-PO Mapping

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1	2	1	2	2	2	2
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4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

MC4011 DIGITAL IMAGE PROCESSING L T P C
3 0 0 3

COURSE OBJECTIVES:

- Learn digital image fundamentals.
- Be exposed to simple image processing techniques.
- Learn to represent image enhancement in the spatial and frequency domain.
- Be familiar with image segmentation and compression techniques

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Elements of visual perception, Image Acquisition Systems, Sampling and Quantization, Image Formation, Image Geometry, Different types of digital images. Relationship between pixels, Basic concepts of distance transform, Color Image fundamentals-RGB-HIS Models, Different color models-conversion.

PROGRESS THROUGH KNOWLEDGE

UNIT II IMAGE TRANSFORMS 9

1D Discrete Fourier Transform (DFT), 2D transforms – DFT, Discrete Cosine Transform, Walsh and PCA

UNIT III IMAGE ENHANCEMENT 9

Gray Level transformations, Histogram Equalization, Spatial Domain: Basics of Spatial Filtering: smoothing and sharpening spatial filters.
Frequency domain: smoothing and sharpening frequency domain filters, Ideal, Gaussian filters.

UNIT IV IMAGE SEGMENTATION AND FEATURE EXTRACTION 9

Segmentation: Point detection, line detection, edge detection, Region based segmentation, Region Splitting and Merging Technique. Thresholding Techniques: multilevel thresholding, optimal thresholding using Bayesian classification. Feature Extraction: GLCM, Hough Transform,

Morphological operation

UNIT V IMAGE COMPRESSION 9

Lossy and lossless compression schemes, prediction based compression schemes, sub-band encoding schemes, JPEG compression standard, Fractal compression scheme, Wavelet compression scheme

TOTAL:45 PERIODS

SUGGESTED ACTIVITIES:

1. Compute the GLCM Gray Level Co-occurrence Matrix matrix at (d=1, θ=0°)for the image of size nxn and derive the possible features from the GLCM matrix.
2. For the given 3*3 input matrix, perform histogram equalization (Assume the image is 5 bit)
3. Classify an image 8x8 into 3 classes using K- means clustering.
4. Tools – OpenCV/ Python / Matlab Trial Version
5. To read, view any image and convert a color image (peppers.png) into greyscale image, binary Image.
6. To obtain Discrete Cosine transform of any grey scale image (eg: cameraman.tiff).
7. Apply Principal Component Analysis (PCA) transform of any color image (eg: peppers.png) and prove that it reduces the dimensionality of the data.
8. By using (GLCM), extract the different features of any image (cameraman.tiff) like energy feature
9. Segment any image (peppers.png) by using thresholding, and compute Euclidean distance for classifying using k-NN classifier.

COURSE OUTCOMES:

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

CO1:digitize the input image using appropriate sampling and quantizing techniques

CO2: Transform the input images to various domains and classify the images

CO3:enhance the images using spatial domain and frequency domain for better visual representation

CO4: To extract the features of a image by applying Morphological Image Processing techniques.

CO5: Analyze the different image compression techniques and its significance

PROGRESS THROUGH KNOWLEDGE

REFERENCES

1. Rafael C.Gonzalez and Richard E.Woods, “Digital Image Processing”, 4th Edition, Pearson Education, New Delhi, 2018
2. Jain Anil K.,”Fundamentals of Digital Image Processing”, 1st Edition, Prentice Hall of India, New Delhi, 2002.
3. Kenneth R.Castleman, “Digital Image Processing”, 1st Edition, Prentice Hall of India, New Delhi, 2006.
4. John C.Russ, “The Image Processing Handbook”, 5thEdition, Prentice Hall, New Jersey, 2002.
5. Willliam K Pratt, “Digital Image Processing”, 3rd Edition, John Willey,2002.
6. Dr.S.Sridhar, Digital Image Processing, Second Edition, Oxford University Press, 2016.

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2
2	2	1	2	2	2	2
3	2	1	2	2	2	2
4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

MC4012 SOCIAL NETWORK ANALYTICS L T P C
3 0 0 3

COURSE OBJECTIVES:

- To gain knowledge about social networks, its structure and their data sources.
- To study about the knowledge representation technologies for social network analysis.
- To analyze the data left behind in social networks.
- To gain knowledge about the community-maintained social media resources.
- To learn about the visualization of social networks.

UNIT I INTRODUCTION TO SEMANTIC WEB 9

The development of Semantic Web – Emergence of the Social Web – The Development of Social Network Analysis – Basic Graph Theoretical Concepts of Social Network Analysis – Electronic Sources for Network Analysis – Electronic Discussion Networks, Blogs and Online Communities

UNIT II KNOWLEDGE REPRESENTATION ON THE SEMANTIC WEB 9

Ontology-based knowledge Representation – Ontology languages for the Semantic Web: RDF and OWL

UNIT III SOCIAL NETWORK MINING 9

Detecting Communities in Social Network – Evaluating Communities –Methods for Community Detection – Applications of Community Mining Algorithms – Tools for detecting communities – Application: Mining Facebook

UNIT IV COMMUNITY MAINTAINED SOCIAL MEDIA RESOURCES 9

Community Maintained Resources – Supporting technologies for community maintained resources– User motivations-Location based social interaction – location technology– mobile location sharing – Automated recommender system

UNIT V VISUALIZATION OF SOCIAL NETWORKS 9

Visualization of Social Networks - Node-Edge Diagrams – Random Layout – Force-Directed Layout – Tree Layout – Matrix Representations –Matrix and Node-Link Diagrams– Visualizing Online Social Networks

TOTAL: 45 PERIODS

SUGGESTED ACTIVITIES:

1. Create complex topologies for a social network (Eg: Society of Friends (Quakers) https://programminghistorian.org/assets/exploring-and-analyzing-network-data-with-python/quakers_nodelist.csv) using an open source library (NetworkX) and analyse multiple metrics (Node degree, Node strength, Average path length, Clustering coefficient, Node centralities and Ego-betweenness centrality).
2. Describe the steps in Ontology development using Uniform Modeling Language. Also discuss how to interact with the ontology by extending UML.
3. Collect different types of data from Twitter by using an open source library (Tweepy) and build your own Twitter data crawler.
4. Discuss about community welfare application in social network analysis using an open source tool (Gephi).
5. Consider a data set (eg: Flavor Network https://github.com/lingcheng99/Flavor-Network/tree/master/data).Transform mathematical representations of the given network (adjacency matrix) with features (eg: flavour compounds) into a graphical representation (Node-Edge Diagrams).

COURSE OUTCOMES:

Up on completion of the course, the students will be able to:

CO1:create entities and relationships of data as network and do analysis

CO2:Model and represent knowledge for social semantic Web.

CO3: Use extraction and mining tools for analyzing Social networks.

CO4: Collect data from various social media resources and analyse.

CO5: Develop personalized visualization for Social networks.

REFERENCES

1. Matthew A. Russell,“Mining the Social Web: Data Mining Facebook, Twitter, LinkedIn, Google+, Githuband more”, O’REILLY, Third Edition, 2018.
2. CharuAggarwal, "Social Network Data Analytics," Springer, First Edition, 2014
3. Jennifer Golbeck, "Analyzing the social web", Waltham, MA: Morgan Kaufmann (Elsevier), First Edition, 2013.
4. BorkoFurht, “Handbook of Social Network Technologies and Applications”, Springer, First Edition, 2010
5. Peter Mika, “Social Networks and the Semantic Web”, Springer, First Edition, 2007

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2
2	2	1	2	2	2	2
3	2	1	2	2	2	2
4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

MC4013 CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGIES L T P C
3 0 0 3

COURSE OBJECTIVES:

To understand the basics of Blockchain

- To understand the basics of Cryptocurrency
- To understand the working of digital tokens and wallets
- To understand the working of contracts
- To understand the working of block chain platforms

UNIT I OVERVIEW OF BLOCKCHAIN: **9**

Why Blockchain - The Structure of Blockchain - Data Structure of Blockchain - Data Distribution in Blockchain - Block Validation. **Block Validators:** Consensus - Proof of Work – Proof of Stake - Proof of Activity - Proof of Elapsed Time - Proof of Burn

UNIT II CRYPTOCURRENCY 9

Bitcoin: Bitcoin Working - Bitcoin Transactions - Bitcoin Mining - Value of Bitcoin - Community, Politics and Regulations – Advantages – Disadvantages. **Ethereum:** Overview – Decentralized Application. **Components of Ethereum:** Smart contracts – Ether - Ethereum Clients - Ethereum Virtual Machine – Etherscripter

UNIT III DEVELOPMENT FRAMEWORKS 9

Digital Tokens: Overview **-** Initial Coin Offering – OmiseGO – EOS – Tether. **Meta Mask:** Wallet Seed – Meta Mask Transactions. **Mist:** Overview **-** Mist wallet. **Truffle**: Features of Truffle – Development Truffle boxes - Community truffle box.

UNITI V HYPERLEDGER 9

Hyperledger Fabric: Introduction - Fabric v/s Ethereum – Hyperledger Iroha - Features of Iroha. **Hyperledger Sawtooth:** Components of sawtooth - Proof of Elapsed time.

UNIT V BLOCKCHAIN PLATFORMS 9

Multichain - HydraChain**. Future Blockchain:** IOTA **–** Corda - Chain Core.**Blockchain Framework:** CoCo Framework – Tierion – BigchainDB.

PROGRESS THROUGH KNOWLEDGE

SUGGESTED ACTIVITIES:

- Discuss that Blockchain is itself a data structure**.** Mention the type of data structure in Blockchain. How data distribution happens in Blockchain?
- Write your understanding about Bitcoin and how to create our own Cryptocurrency.
- Compare OmiseGO, EOS and Tether.
- Write the features and applications of Hyperledger Fabric in Blockchain Technology.
- Explore Blockchain platforms.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Identify Block Chain as Data structure and Distribution Data

CO2: Implement the transactions of Crypto currency

CO3:identify the different ways to achieve Block chain Technology

CO4: Design and build smart contracts
CO5: Use smart contract for real world application in a Blockchain Platform

REFERENCES

1. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guide to BlockchainTechnology and Blockchain Programming', Create Space Independent Publishing Platform, 1st Edition, 2017.
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. 1st Edition, Princeton University Press, 2016.
3. Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 1st Edition, 2015.
4. Antony Lewis, The Basics of Bitcoins and Blockchains: An Introduction to Cryptocurrencies and the Technology that Powers Them, Mango Publishing group, 2018
5. Tiana Laurence, Introduction to Blockchain Technology, 1st Edition, Van Haren Publishing, 2019.

CO-PO Mapping

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4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

MC4014 BIO INSPIRED COMPUTING L T P C
3 0 0 3

COURSE OBJECTIVES:

- To Learn bio-inspired theorem and algorithms
- To Understand random walk and simulated annealing
- To Learn genetic algorithm and differential evolution
- To Learn swarm optimization and ant colony for feature selection
- To understand bio-inspired application in various fields

UNIT I INTRODUCTION 9

Introduction to algorithm - Newton ' s method - optimization algorithm - No-Free-Lunch Theorems - Nature-Inspired Metaheuristics -Analysis of Algorithms -Nature Inspired Algorithms -Parameter tuning and parameter control

UNIT II RANDOM WALK AND ANNEALING 9

Random variables - Isotropic random walks - Levy distribution and flights - Markov chains - step sizes and search efficiency - Modality and intermittent search strategy - importance of

randomization- Eagle strategy-Annealing and Boltzmann Distribution - parameters -SA algorithm - Stochastic Tunneling

UNIT III GENETIC ALGORITHMS AND DIFFERENTIAL EVOLUTION 9

Introduction to genetic algorithms and - role of genetic operators - choice of parameters - GA variants - schema theorem - convergence analysis - introduction to differential evolution - variants - choice of parameters - convergence analysis - implementation.

UNIT IV SWARM OPTIMIZATION AND FIREFLY ALGORITHM 9

Swarm intelligence - PSO algorithm - accelerated PSO - implementation - convergence analysis - binary PSO - The Firefly algorithm - algorithm analysis - implementation - variants- Ant colony optimization toward feature selection

UNIT V APPLICATIONS OF BIO INSPIRED COMPUTING 9

Improved Weighted Threshold Histogram Equalization Algorithm for Digital Image Contrast Enhancement Using Bat Algorithm - Ground Glass Opacity Nodules Detection and Segmentation using Snake Model - Mobile Object Tracking Using Cuckoo Search- Bio inspired algorithms in cloud computing- Wireless Sensor Networks using Bio inspired Algorithms

TOTAL: 45 PERIODS

SUGGESTED ACTIVITIES:

1. Identify problems with domains where Bio inspired computing will be most suitable to find a solution
2. Identify the applications of Random walk
3. List out the applications of Genetic algorithms in AI and machine learning
4. Apply swarm intelligence and Firefly algorithm to find an optimal solution for a problem Compare their efficiency and accuracy
5. Ty to implement a Bio inspired computing in Networks/Biomedical/Cloud computing applications to obtain an optimal solution

COURSE OUTCOMES:

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

CO1: Implement and apply bio-inspired algorithms

CO2: Explain random walk and simulated annealing

CO3: Implement and apply genetic algorithms

CO4: Explain swarm intelligence and ant colony for feature selection

CO5:Apply bio-inspired techniques in various fields

REFERENCES

1. Eiben,A.E.Smith,James E, "Introduction to Evolutionary Computing", Springer 2nd Edition2015.
2. Helio J.C. Barbosa, "Ant Colony Optimization - Techniques and Applications", IntechFirstEdition,2013
3. Xin-She Yang , Joao Paulo papa, "Bio-Inspired Computing and Applications in Image Processing",ElsevierFirst Edition, 2016
4. Xin-She Yang, "Nature Inspired Optimization Algorithm",Elsevier First Edition 2014
5. Yang ,Cui,XIao,Gandomi,Karamanoglu,"Swarm Intelligence and Bio-Inspired Computing", Elsevier First Edition 2013

CO-PO Mapping

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4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

MC4015 **DIGITAL MARKETING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To understand the difference between Traditional Marketing and digital Marketing
- To understand and analyze the search engine functions
- To develop a deep knowledge about the Digital marketing platforms and the theoretical aspects of creating a website
- To analyze inbuilt tools for digital Marketing

UNIT I INTRODUCTION TO DIGITAL MARKETING **9**

What is Digital Marketing- Need of Digital Marketing-Digital Marketing Platforms – Understanding digital marketing process- Difference between Traditional Marketing and digital Marketing- tools of Digital marketing - Advantage of Digital Marketing-Digital Marketing Manager Role and functions - How we use both Digital & Traditional Marketing

UNIT II WEBSITE & SEARCH ENGINE **9**

Website –Hosting and Domain– Different platforms for website creation- Introduction to SERP- What are search engines- How search engines work- Major functions of a search engine- What are keywords -Different types of keywords- Google keyword planner tool.

UNIT III MISC TOOLS- GOOGLE WEBMASTER TOOLS **9**

Site Map Creators- Browser-based analysis tools-Page Rank tools-pinging & indexing tools-Dead links identification tools- Open site explorer Domain information/ whois tools- Quick sprout

UNIT IV LEAD MANAGEMENT & DIGITAL MARKETING **9**

Web to lead forms- Web to case forms- Lead generation techniques- Leads are everywhere-Social media and lead gen Inbuilt tools for Digital Marketing-Ip Tracker- CPC reduction (in case of paid ads) Group posting on Social Media platforms

UNIT V TRENDING DIGITAL MARKETING SKILLS **9**

Search Engine Optimization(SEO)-Search Engine Marketing(SEM).-Social Media Marketing/Optimization- Email Marketing. Website :Product Marketing- Content Writing. Marketing

the created content online Copywriting- Blogging- Local Marketing. Google Ad Words - Campaign Management- PPC Advertising- Affiliate Marketing. Mobile and SMS Marketing- Marketing Automation-Web Analytics- Growth Hacking

SUGGESTED ACTIVITIES:

1. Subscribe to a weekly/quarterly newsletter and analyze how it's content and structure aid with the branding of the company and how it aids its potential customer segments.
2. Perform keyword search for a skincare hospital website based on search volume and competition using Google keyword planner tool.
3. Demonstrate how to use the Google WebMasters Indexing API
4. Discuss an interesting case study regarding how an insurance company manages leads.
5. Discuss negative and positive impacts and ethical implications of using social media for political advertising.
6. Discuss how Predictive analytics is impacting marketing automation.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

CO1: To gain insight on the concept of digital marketing and the role of a digital manager.
CO2: To understand and administer the website and the search engines.
CO3: To understand how to use MISC and Google Webmaster tools.
CO4: To understand the concepts of lead management and digital marketing.
CO5:To gain knowledge on the latest digital marketing trends

REFERENCES

1. Chaffey, D. (2019). Digital marketing strategy, Implementation and Practice. Pearson
2. Chaffey, D., & Smith, P. R. (2017). Digital marketing excellence: planning, optimizing and integrating online marketing. Taylor & Francis. ·
3. Kaufman, I., & Horton, C. (2014). Digital marketing: Integrating strategy and tactics with values, a guidebook for executives, managers, and students. Routledge.
4. Royle, J., & Laing, A. (2014). The digital marketing skills gap: Developing a Digital Marketer Model for the communication industries. International Journal of Information Management, 34(2), 65-73.
5. Dodson, I. (2016). The art of digital marketing: the definitive guide to creating strategic, targeted, and measurable online campaigns. John Wiley & Sons.

PROGRESS THROUGH KNOWLEDGE

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2
2	2	1	2	2	2	2
3	2	1	2	2	2	2
4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

MC4016	SOFTWARE ARCHITECTURE	L T P C
		3 0 0 3

COURSE OBJECTIVES:

- Understand software architectural requirements and drivers
- Be exposed to architectural styles and views
- Be familiar with architectures for emerging technologies

UNIT I INTRODUCTION AND ARCHITECTURAL DRIVERS 9

Introduction – Software architecture - Architectural structures – Influence of software architecture on organization - both business and technical – Architecture Business Cycle- Functional requirements – Technical constraints – Quality Attributes

UNIT II QUALITY ATTRIBUTE WORKSHOP 9

Quality Attribute Workshop – Documenting Quality Attributes – Six part scenarios – Case studies.

UNIT III ARCHITECTURAL VIEWS 9

Introduction – Standard Definitions for views – Structures and views – Representing views-available notations – Standard views – 4+1 view of RUP, Siemens 4 views, SEI's perspectives and views – Case studies

UNIT IV ARCHITECTURAL STYLES 9

Introduction – Data flow styles – Call-return styles – Shared Information styles – Event styles – Case studies for each style

UNIT V DOCUMENTING THE ARCHITECTURE 9

Good practices – Documenting the Views using UML – Merits and Demerits of using visual languages – Need for formal languages – Architectural Description Languages – ACME – Case studies. Special topics: SOA and Web services – Cloud Computing – Adaptive structures

SUGGESTED ACTIVITIES:

1. List the stakeholders for a software architecture. How do project managers, chief technical officers, chief information officers, analysts, customers, and users fit into your list?
2. Which quality attributes tend to be the most important to systems in your organization? How are those attributes specified? How does the architect know what they are, what they mean, and what precise levels of each are required?
3. Software architecture is often compared to building architecture. What are the strong points of this comparison? What is the correspondence in buildings to software architecture structures and views? To patterns? What are the weaknesses of the comparison? When does it break down?
4. How does a UML class diagram relate to the styles discussed? Does that diagram show decomposition, uses, generalization, or another combination?
5. You are a new hire to a project. Lay out a sequence of documentation you would like to have to acquaint you with your new position

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Explain influence of software architecture on business and technical activities

CO2: Summarize quality attribute workshop

CO3: Identify key architectural structures

CO4:Use styles and views to specify architecture

CO5: Design document for a given architecture

REFERENCES

1. Len Bass, Paul Clements, and Rick Kazman, “Software Architectures Principles and Practices”, 2n Edition, Addison-Wesley, 2003.
2. Anthony J Lattanze, “Architecting Software Intensive System. A Practitioner's Guide”, 1st Edition, Auerbach Publications, 2010.
3. Paul Clements, Felix Bachmann, Len Bass, David Garlan, James Ivers, Reed Little, Paulo Merson, Robert Nord, and Judith Stafford, “Documenting Software Architectures. Views and Beyond”, 2ndEdition, Addison-Wesley, 2010
4. Paul Clements, Rick Kazman, and Mark Klein, “Evaluating software architectures: Methods and case studies.”,1st Edition, Addison-Wesley, 2001.
5. Mark Hansen, “SOA Using Java Web Services”, 1st Edition, Prentice Hall, 2007
6. David Garlan, Bradley Schmerl, and Shang-Wen Cheng, “Software Architecture-Based Self-Adaptation,” 31-56. Mieso K Denko, Laurence Tianruo Yang, and Yan Zang (eds.), “Autonomic Computing and Networking”.1st Edition, Springer Verlag 2009.

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2
2	2	1	2	2	2	2
3	2	1	2	2	2	2
4	2	1	2	2	2	2
5	2	3	2	2	2	2
Avg	2	1.4	2	2	2	2

MC4017 **DIGITAL FORENSICS** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To learn the security issues network layer and transport layer.
- To be exposed to security issues of the application layer.
- To be familiar with forensics tools.
- To analyze and validate forensics data.
- To perform digital forensic analysis based on the investigator's position.

UNIT I INTRODUCTION **9**

Digital Forensics – Uses- Digital Forensics Process – Locard’s Exchange Principle – Scientific

Method – Role of Forensic examiner in Judicial System – Key technical concepts – Bits, bytes and numbering schemes- File extension and file signatures – Storage and memory- computing environment - Legal, Professional and Ethical aspects of Cyber Forensics

UNIT II ANTI-FORENSICS & LEGAL 9

Introduction – Hiding data – Password attacks – Additional resources – Steganography – Data destruction. Legal: Fourth Amendment – Criminal law-searches without a warrant – searching with a warrant- Electronic discovery-Expert testimony

UNIT III EVIDENCE COLLECTION 9

Evidence Collection – Collection option – Obstacles – Types of Evidence – The rules of Evidence – General Procedure – Collection and archiving – Methods of collection – Artifacts – Collection steps – Controlling Contamination: The Chain of Custody Duplication and Preservation of Digital Evidence: Preserving the digital Crime Scene – Computer Evidence processing steps - Legal Aspects of Collecting and Preserving Computer Forensic Evidence - Computer Image Verification and Authentication.

UNIT IV COMPUTER FORENSICS 9

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques – Incident and incident response methodology – Forensic duplication and investigation. Preparation for IR: Creating response tool kit and IR team. – Forensics Technology and Systems – Understanding Computer Investigation – Data Acquisition

UNIT V NETWORK FORENSICS & MOBILE DEVICE FORENSICS 9

Introduction – Network fundamentals – Network Security tools – Network evidence and investigations. Mobile device forensics: Cellular Network – Cell phone evidence – Cell phone forensic tools- Global Positioning systems.

COURSE OUTCOMES

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

CO1:Understand the digital forensic process and to play the role of forensic examiner.
CO2:Include the Legal amendments in the analysis of the digital forensic process
CO3:Demonstrate evidence collection related to digital forensic process
CO4:Explore the computer forensics, network forensics and mobile device forensics.
CO5: Use the forensics tools for real world problem

SUGGESTED ACTIVITIES

1. Illustrate with an example about file signature. Why file signature is important in digital forensics.
2. Explore the legal Fourth amendment related to criminal laws in digital forensics. Write about searching and seizing computers, laptops, and other electronic gadgets as an evidence in Criminal Investigations
3. Describe legal aspects of collecting and preserving computer forensic evidence.
4. Explain the steps involved in incident response methodology.
5. Give the guidelines for mobile device forensics. Why mobile forensic is important?

TOTAL: 45 PERIODS

REFERENCES

1. John Sammons, The Basics of Digital Forensics The Primer for Getting Started in Digital Forensics, Second Edition, Syngress, 2015.
2. Bill Nelson,Amelia Phillips, Christopher Steuart, Guide to Computer Forensics and Investigations, 1st Edition, Cengage Learning, 2014
3. Cory Altheide and Harlan Carvey, —Digital Forensics with Open Source Tools, 1st Edition, Elsevier publication, April 2011.
4. Nihad A. Hassan, Digital Forensics Basics: A Practical Guide Using Windows OS, 1st Edition,APress, 2019
5. Thomas J. Holt, Adam M.Bossler, K.C.Seigfried – Spellar, Cybercrime and Digital Forensics An Introduction, 1st Edition, Taylor and Francis,New York, 2015.
6. Darren R. Hayes, A Practical Guide to Digital Forensics Investigations,2ndEdition , Pearson Education, 2020.

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2
2	2	1	2	2	2	2
3	2	1	2	2	2	2
4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

MC4018 WIRELESS NETWORKING L T P C
3 0 0 3

COURSE OBJECTIVES:

The student should be made:

- To understand the concept about Wireless networks, protocol stack and standards
- To understand and analyse the network layer solutions for Wireless networks
- To study about fundamentals of 3G Services, its protocols and applications
- To learn about evolution of 4G Networks, its architecture and applications
- To explore the architecture of 5G, 5G Modulation Schemes and to analyse the concept of MIMO and other research areas in 5G

UNIT I WIRELESS LAN 9

Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum, IEEE802.11: System architecture, protocol architecture, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, WPAN – IEEE 802.15.4, Wireless USB, Zigbee, 6LoWPAN, WirelessHART- IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX

UNIT II MOBILE NETWORK LAYER 9

Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6- Network layer in the internet- Mobile IP session initiation protocol - mobile ad-hoc network:

Routing: Destination-Sequenced Distance-Vector (DSDV), Dynamic source routing, IoT: CoAP. TCP enhancements for wireless protocols

UNIT III 3G OVERVIEW 9

Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3G-MSC, 3G-SGSN, 3G-GGSN, 3GPP Architecture, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High speed Downlink packet access (HSDPA)- LTE network architecture and protocol, User equipment, CDMA2000 overview- Radio and Network components, Network structure, Radio Network, TD-CDMA, TD – SCDMA

UNIT IV 4G NETWORKS 9

Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Cognitive Radio, IMS Architecture, LTE, Advanced Broadband Wireless Access and Services, MVNO.

UNIT V 5G NETWORKS 9

Introduction to 5G, vision and challenges, 5G NR – New Radio – air interface of 5G, radio access, Ultra-Dense Network Architecture and Technologies for 5G- Generalized frequency division multicarrier (GFDM)- Principles, Transceiver Block diagram-MIMO in LTE, Theoretical background, Single user MIMO, Multi-user MIMO, Capacity of massive MIMO: a summary, Basic forms of massive MIMO implementation.

SUGGESTED ACTIVITIES:

1. Build a simple WLAN Topology using ns-3 scripting or CORE GUI
2. Performance Analysis of MANET Routing Protocols using ns3 or INET Framework
3. 5G NR Network Simulation using Simu 5G or 5G-LENA
4. Describe some problems with Wi-Fi access for an apartment building and explain how it can be rectified.
5. Study error and throughput varies in a wireless LAN network changes as the distance between the Access Point and the wireless nodes is varied with NetSim or any Simulation tool
6. Study how call blocking probability varies as the load on GSM network increases continuously

TOTAL: 45 PERIODS

PROGRESS THROUGH KNOWLEDGE

COURSE OUTCOMES:

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

CO1: Select a wireless network environment for an application based on factors like distance etc
CO2: Implement Packet Delivery from source to destination in a mobile network
CO3: Select 3G wireless technology and protocol based on the requirement
CO4: Understand various 4G networking technologies and their unique functionalities
CO5: Get an overview of the implementation latest network Architecture , its principles and evolution

REFERENCES

1. Jochen Schiller, Mobile Communications, Second Edition, Pearson Education 2012.
2. Vijay Garg, —Wireless Communications and networkingǁ, First Edition, Elsevier 2007.
3. AfifOsseiran, Jose.F.Monserrat and Patrick Marsch, "5G Mobile and Wireless

Communications Technology", Cambridge University Press, First Edition2016.
4. Anurag Kumar, D.Manjunath, Joy kuri, —Wireless Networking, First Edition, Elsevier 2011.
5. Xiang, W; Zheng, K; Shen, X.S; "5G Mobile Communications", Springer, First Edition2016
6. Saad Z Asif, "5G Mobile Communication,Concepts and Challenges", First EditionCRC Press
7. Thomas L. Marzetta, Erik G. Larsson, Hong Yang,HienQuoc Ngo, "Fundamentals of Massive MIMO", Cambridge University Press, First Edition2018

CO-PO Mapping

CO	POs					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
1	2	1	2	2	2	2
2	2	1	2	2	2	2
3	2	1	2	2	2	2
4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

MC4019 DATA VISUALIZATION TECHNIQUES L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand the categories of data quality principles.
- To describe data through visual representation.
- To provide basic knowledge about how large datasets are represented into visual graphics and easily understand the complex relationships within the data.
- To design effective visualization techniques for any different problems

UNIT I INTRODUCTION 9

Visualization – visualization process – role of cognition – Pseudocode conventions – Scatter plot - Data foundation : Types of data - Structure within and between records - Data preprocessing – Human perceptions and information processing

UNIT II VISUALIZATION FOUNDATIONS 9

Semiology of graphical Symbols – Eight Visual Variables – Historical Perspective- Visualization Techniques for spatial data – One-dimensional data- two dimensional data – Three dimensional data- dynamic data – combining techniques- Visualization of Geospatial data – Visualization of Point, line, area data

UNIT III DESIGNING EFFECTIVE VISUALIZATION 9

Steps in Designing Visualization – problems in Designing Effective Visualization – Comparing and evaluating visualization techniques – Visualization Systems

UNIT IV INFORMATION DASHBOARD DESIGN 9

Characteristics of dashboards – Key goals in visual design process – Dashboard display media – Designing dashboards for usability – Meaningful organization – Maintaining consistency – Aesthetics of dashboards – Testing for usability – Case Studies: Sales dashboard, Marketing analysis dashboard

UNIT V VISUALIZATION SYSTEMS 9

Systems based on Data type-systems based on Analysis type – Text analysis and visualization – Modern integrated visualization systems – toolkit-Research directions in visualization – issues of cognition, perception and reasoning –issues of evaluation - issues of Hardware.

Suggested Activities

1. Brief about Data Visualization with tools and techniques involved. Write its application in Data Analytics.
2. Discuss about visualization technique for two-dimensional data
3. Explore the steps involved in designing effective visualization.
4. Create a dashboard using visualization techniques for road accidents in TamilNadu
5. Summarize Visualization Toolkit and discuss by taking a case study.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Describe principles of visual perception
CO2: Apply visualization techniques for various data analysis tasks – numerical data
CO3: Apply visualization techniques for various data analysis tasks – Non numerical data
CO4: Design effective visualization techniques for different problems
CO5: Design information dashboard

REFERENCES

1. Matthew O. Ward , Georges Grinstein , Daniel Keim “Interactive Data Visualization: Foundations, Techniques, and Applications”, CRC Press; 2nd edition, 2015
2. Stephen Few, "Now you see it: Simple Visualization Techniques for Quantitative Analysis", 1st Edition, Analytics Press, 2009.
3. Stephen Few, "Information Dashboard Design: The Effective Visual Communication of Data",1st Edition, O'Reilly,2006.
4. Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", 1st Edition, O'Reilly, 2013.
5. Andy Kirk, “Data Visualization: A Handbook for Data Driven Design”, 2nd Edition, Sage Publications, India, 2019.
6. Claus O.Wilke, “Fundamentals of Data Visualization”, 1st Edition, O’Reilly Media, USA, 2019

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2
2	2	1	2	2	2	2

3	2	1	2	2	2	2
4	2	1	2	2	3	3
5	2	1	2	2	3	3
Avg	2	1	2	2	2.4	2.4

MC4020 DATA MINING AND DATA WAREHOUSING TECHNIQUES **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To characterize the kinds of patterns that can be discovered by association rule mining.
- To implement classification techniques on large datasets.
- To analyse various clustering techniques in real world applications.
- To get exposed to the concepts of data warehousing architecture and implementation

UNIT I DATA MINING & DATA PREPROCESSING 9

Data Mining– Concepts , DBMS vs Data mining , kinds of Data, Applications, Issues and Challenges–Need for Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.

UNIT II ASSOCIATION RULE MINING AND CLASSIFICATION 9

Introduction to Association rules – Association Rule Mining – Mining Frequent Itemsets with and without Candidate Generation –Classification versus Prediction – Data Preparation for Classification and Prediction

UNIT III CLASSIFICATION AND PREDICTION TECHNIQUES 9

Classification by Decision Tree – Bayesian Classification – Rule Based Classification – Bayesian Belief Networks – Classification by Backpropagation – Support Vector Machines – K-Nearest Neighbor Algorithm – Linear Regression, Nonlinear Regression

UNIT IV CLUSTERING TECHNIQUES 9

Cluster Analysis – Partitioning Methods: k-Means and k- Medoids – Hierarchical Methods: Agglomerative and Divisive –Model Based Clustering Methods: Fuzzy clusters and Expectation-Maximization Algorithm

PROGRESS THROUGH KNOWLEDGE

UNIT V DATA WAREHOUSE 9

Need for Data Warehouse – Database versus Data Warehouse – Multidimensional Data Model – Schemas for Multidimensional Databases – OLAP operations – OLAP versus OLTP – Data Warehouse Architecture – Extraction, Transformation and Loading (ETL)

SUGGESTED ACTIVITIES:

1. Perform attribute ranking for a dataset (Eg: contact-lenses dataset https://archive.ics.uci.edu/ml/datasets/lenses) using any two attribute ranking methods.
2. Identify the association rules in the above dataset using Apriori algorithm.
3. Implement K-Nearest Neighbor for classification of a dataset (Eg: Iris dataset https://archive.ics.uci.edu/ml/datasets/Iris).
4. Demonstrate the K-means clustering process in the above dataset.
5. Describe the steps in building Data warehouse using open source tools (Eg: Pentaho Data

Integration Tool)

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1:Identify data mining techniques in building intelligent model.

CO2: Illustrate association mining techniques on transactional databases.

CO3:Apply classification and clustering techniques in real world applications.

CO4:Evaluate various mining techniques on complex data objects.

CO5: Design, create and maintain data warehouses

REFERENCES

1. Jiawei Han, Micheline Kamber, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2012.
2. K. P. Soman, Shyam Diwakar, V. Ajay, “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2009.
3. Data Warehousing, Data Mining, & OLAP – Alex Berson, Stephen Smith, TMHill,2008.
4. David L. Olson Dursun Delen, "Advanced Data Mining Techniques," Springer-Verlag Berlin Heidelberg, 2008
5. G. K. Gupta, “Introduction to Data Min Data Mining with Case Studies”, Eastern Economy Edition, Prentice Hall of India, Third Edition, 2014

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	2	2	2	2	2
2	2	2	2	2	2	2
3	2	2	2	2	2	2
4	3	3	3	3	3	3
5	3	3	3	3	3	3
Avg	2	2	2	2	2	2

MC4021 **AGILE METHODOLOGIES** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
- To provide a good understanding of software design and a set of software technologies and APIs.
- To do a detailed examination and demonstration of Agile development and testing techniques.
- To understand the benefits and pitfalls of working in an Agile team.
- To understand Agile development and testing

UNIT I AGILE FUNDAMENTAL 9

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

UNIT II AGILE PROCESSES 9

Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices

UNIT III AGILITY AND KNOWLEDGE MANAGEMENT 9

Agile Information Systems – Agile Decision Making –Development, Acquisition, Refinement, Distribution, Deployment, Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM)

UNIT IV AGILITY AND REQUIREMENTS ENGINEERING 9

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment,– Agile Requirements Modeling and Generation

UNIT V AGILITY AND QUALITY ASSURANCE 9

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Agile Approach in Global Software Development - Agile Scrum - Scrum Master – Scaling Projects using Scrum

SUGGESTED ACTIVITIES:

1. Describe all the phases of Agile software development methodologies for student enrollment system
2. Discuss the five values of Extreme programming practices and explain the use cases involved in airline reservation system
3. Describe about agile knowledge sharing and the role of Story-Card Maturity Model for airline reservation system
4. Describe the requirement engineering challenges for agile software development of any one the system (Use Jira Software for project planning)
5. Discuss the role and responsibility of quality assurance in an agile methodology for airline reservation system

TOTAL: 45 PERIODS

COURSE OUTCOMES:

CO1: Realize the importance of interacting with business stakeholders in determining the requirements for a software system

CO2: Perform iterative software development processes: how to plan them, how to execute them.

CO3:Point out the impact of social aspects on software development success.

CO4:Develop techniques and tools for improving team collaboration and software quality.

CO5: Show how agile approaches can be scaled up to the enterprise level

REFERENCES

1. David J. Anderson and Eli Schragenheim,, “Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results”, Illustrated Edition, Prentice Hall PTR, 2004
2. Orit Hazza and Yaepl Dubinsky, “Agile Software Engineering,: Undergraduate Topics in Computer Science, Springer Verlag, First Edition,2009
3. Craig Larman, “Agile and Iterative Development: A Manager’s Guide”, Pearson Education, Second Impression, 2007
4. Kevin C. Desouza, “Agile Information Systems: Conceptualization, Construction, and Management”, Elsevier, Butterworth-Heinemann, FirstEdition,2007
5. Ken Schwaber, “Agile Project Management with Scrum”, Illustrated, Revised Edition Microsoft Press, 2004
6. Konnor Cluster, “Agile Project Management: Learn How To Manage a Project With Agile Methods, Scrum, Kanban and Extreme Programming”, Independently Published,FirstEdition,2019

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2
2	2	1	2	2	2	2
3	2	1	2	2	2	2
4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

MC4022 ORGANIZATIONAL BEHAVIOR L T P C
3 0 0 3

PROGRESS THROUGH KNOWLEDGE

COURSE OBJECTIVES:

- To enable the students to understand the Organizational Behavior
- To analyse various factors affecting Personality Organizational Change
- dynamic of groups
- To Understand various type of Group Behavior

UNIT I ORGANIZATIONAL BEHAVIOR INTRODUCTION 9

Organization Behaviour – Definition – Scope and Application in Management – Contributions of Other Disciplines to OB. Emerging Issues in Organizational Behaviour- Organizational behaviour models

UNIT II INDIVIDUAL PROCESSES 9

Personality – types – Factors influencing personality– Theories. Emotions - Theories – Emotional Intelligence- Learning – Types of learners – The learning process – Learning theories.

Perceptions – Importance – Factors influencing perception- Attitudes – Nature of Attitudes Components of Attitudes Formation of Attitude Benefits of Positive Attitude Functions of Attitudes– Measurement-Motivation – Importance – Types – Theories.

UNIT III LEADERSHIP AND POWER 9

Meaning – Importance – Leadership styles – Theories – Leaders Vs Managers – Sources of power – Power centers – Power and Politics.

UNIT IV GROUP DYNAMICS 9

Meaning – Types of Groups – Functions of Small Groups – Group Size Status – Managerial Implications – Group Behaviour – Group Norms – Cohesiveness – Group Thinking

UNIT V ORGANIZATIONAL CHANGE AND DEVELOPMENT 9

Organizational Change: Meaning – Nature of Work Change – Need for Change – Change Process – Types of Change – Factors Influencing Change – Resistance to Change – Overcoming Resistance – Organizational Development: Meaning and Different Types of OD Interventions

SUGGESTED ACTIVITIES:

1. To analyze and understand the impact of various functional modules on the behaviour of individuals with real time examples like buying behavior of consumers in supermarkets.
2. To Analyze and understand the Perception of individuals and performance based on situations like an individual's effectiveness in the workplace(often depends on their personality, attitudes and values along with their motivation) to succeed.
3. Conduct a group discussion among 10 members on some topic and write a report on analysis of behaviour of team members in group decision making
4. Justify the selection of team members for executing a project with the analysis of various factors like domain expertise ,communication skill of members etc
5. To study the Performance of employees on organizational change with respect to environment

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course should be able to:

CO1: Students will have a better understanding of human behavior in organization.
CO2: They will know the framework for managing individual and group performance.
CO3: Characteristics of attitudes and components of attitudes — A brief discussion
CO4: List the determinants of personality
CO5: List the characteristics of various leadership styles.

REFERENCES

1. K. Aswathappa, "Organisational behaviour", Himalaya Publishing House Pvt. Ltd.11th Edition.
2. Stephen P. Robbins, "Organizational Behavior", PHI Learning / Pearson Education, Edition 17, 2016 (Global edition)
3. Fred Luthans, "Organizational Behavior", McGraw Hill, 12th Edition
4. Nelson, Quick, Khandelwal. "ORGB – An innovative approach to learning and teaching". Cengage, 2nd edition 2012
5. Ivancevich, Konopaske Matteson, "Organizational Behaviour & Management", Tata McGraw Hill, 7th edition, 2008

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	1	1	1	1	1	1
2	1	1	1	1	1	1
3	1	1	1	1	1	1
4	1	1	1	1	1	1
5	1	1	1	1	1	1
Avg	1	1	1	1	1	1

MC4023 **WEB DESIGN** **L T P C**
3 0 2 4

COURSE OBJECTIVES:

- To understand the concepts and architecture of the World Wide Web.
- To understand and practice markup languages
- To understand and practice embedded dynamic scripting on client-side Internet
- Programming
- To understand and practice web development techniques on client-side

UNIT I INTRODUCTION TO WWW **9+6**

Understanding the working of Internet-Web Application Architecture-Brief history of Internet-Web Standards – W3C-Technologies involved in Web development – Protocols-Basic Principles involved in developing a website-Five Golden Rules of Web Designing

UNIT II UI DESIGN **9+6**

SVG- Iframes - HTML5 Video and Audio tags - CSS Specificity - Box model - Margins, padding and border – Inline and block elements - Structuring pages using Semantic Tags - Positioning with CSS: Positions, Floats, z-index – CSS with CSS Preprocessors: SASS

UNIT III ADVANCED UI WITH CSS3 **9+6**

Layouts with CSS Grids Flexbox– Responsive web design with media queries - Advanced CSS Effects – Gradients, opacity, box-shadow - CSS3 Animations: Transforms and Transitions - CSS Frameworks: Bootstrap

UNIT IV JAVA SCRIPT **9+6**

JavaScript Events - Modifying CSS of elements using JavaScript- Javascript Classes- Introduction to JQuery – JQuery Selectors - Using JQuery to add interactivity - JQuery Events-Modifying CSS with JQuery -Adding and removing elements with JQuery-AJAX with JQuery-Animations with JQuery (hide, show, animate, fade methods, Slide Method)

UNIT V SERVER-SIDE PROGRAMMING WITH PHP **9+6**

PHP basic syntax-PHP Variables and basic data structures-Using PHP to manage form

submissions-File Handling -Cookies and Sessions with PHP-Working with WAMP and PHPMYADMIN-Establishing connectivity with MySQL using PHP

Lab Components

1. Design a landing page for a website using Adobe XD (Unit 1)
2. Design an Admin Dashboard for an E-commerce website using Adobe XD (Unit 1)
3. Design and develop an event registration form. (Unit 2)
4. Design and develop a sticky navbar using floats and SASS. (Unit 2)
5. Design and develop a developer portfolio page. Develop the layout using flexbox and ensure the page is responsive. (Unit 3)
6. Design and develop pricing card list which are responsive using plain CSS and Flexbox (Unit 3)
7. Develop a register form and validate it using JavaScript. Design the forms using CSS3 and display Error Messages in the HTML page. (Unit 4)
8. Develop a website that uses the 'jsonplaceholder' Api to get posts data and display them in the form of a card. Use Flexbox to style the cards (Unit 4)
9. Develop a php server that Creates, Reads, Updates and Deletes Todo and save them in MySQL database. (Unit 5)
10. Develop a php server that registers and authenticates user session and stores user data in MySQL database. (Unit 5)

COURSE OUTCOMES:

CO1:Create a basic website using HTML and Cascading Style Sheets.
CO2:Create websites with complex layouts
CO3:Add interactivity to websites using simple scripts
CO4:Design rich client presentation using AJAX.
CO5:Add business logic to websites using PHP and databases

TOTAL: 75 PERIODS

REFERENCES

1. David Flanagan, "JavaScript: The Definitive Guide", 7th Edition, O'Reilly Publications,2020
2. Danny Goodman, "Dynamic HTML: The Definitive Reference: A Comprehensive Resource for XHTML, CSS, DOM, JavaScript" , O'Reilly Publications, 3rd Edition,2007
3. Robin Nixon; "Learning PHP, MySQL, JavaScript & CSS: A Step-by-Step Guide to Creating Dynamic Websites", O'Reilly Publications, 2nd Edition,2018
4. David Sawyer McFarland, "CSS: The Missing Manual", O'Reilly Publications, 4th edition, 2015
5. Keith J Grant; "CSS in Depth", Manning Publications. 1st edition,2018
6. Elizabeth Castrol, "HTML5 & CSS3 Visual Quickstart Guide", Peachpit Press, 7th Edition, 2012.
7. Harvey & Paul Deitel& Associates, Harvey Deitel and Abbey Deitel, "Internet and World Wide Web - How to Program", Fifth Edition, Pearson Education, 2012
8. https://developer.mozilla.org/en-US/

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2

2	2	1	2	2	2	2
3	2	1	2	2	2	2
4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

MC4024 **C# AND .NET** **L T P C**
3 0 2 4

COURSE OBJECTIVES:

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

UNIT I .NET FRAMEWORK INTRODUCTION 9

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

UNIT II C# ADVANCED FEATURES 9

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

UNIT III BASE CLASS LIBRARIES AND DATA MANIPULATION 9

Diagnostics Tasks – Threads and Synchronization – Manipulating XML – SAX and DOM – Manipulating files and the Registry – Transactions – Data access with ADO.NET: Introduction, LINQ to Entities and the ADO.NET Entity Framework, Querying a Database with LINQ – Creating the ADO.NET Entity Data Model Class Library, Creating a Windows Forms Project – Data Bindings between Controls

UNIT VI WINDOW AND WEB BASED APPLICATIONS 9

Window Based Applications – Core ASP.NET – ASP.NET Web Forms – Server Controls, Data Binding – ASP.NET State Management, Tracing, Caching, Error Handling, Security, Deployment, User and Custom Controls – Windows Communication Foundation (WCF)

UNIT V NET COMPACT FRAMEWORK 9

Reflection – .Net Remoting-.Net Security – Localization – Peer-to-Peer Networking – Building P2P Applications – .Net Compact Framework – Compact Edition DataStores – Testing and Debugging – Optimizing performance – Packaging and Deployment

List of Experiments

1. Write a program in C# to check whether a number is palindrome or not
2. Design a simple calculator using switch statement in C#
3. Write a program in C# to find the roots of quadratic equation.
4. Using try, catch and finally blocks write a program in C# to demonstrate error handling
5. Write a program in C# to build a class which implements an interface which already exists.
6. Implement linked lists in C# using the existing collections name space
7. Write a C# program to create a dataset for student details, use grid view to display information.
8. Write a C# program to add new rows and new columns in the above program (student details) and create methods to access the dataset
9. Write an ASP.Net program to display a welcome message in the form when the button is clicked.
10. Write an ASP.Net program containing a listbox, button, an image and label controls. When the user clicks on an item in the listbox, its image should be displayed in the image control. When the user clicks the button, the cost of the selected item should be displayed in the control.

COURSE OUTCOMES:

Up on completion of the course the students will be able to

CO1: Understand the difference between .NET and Java framework.

CO2: Work with the basic and advanced features of C# language.

CO3: Create applications using various data providers.

CO4: Create a web application using ASP.NET.

CO5: Create mobile applications using .NET compact framework.

TOTAL: 75 PERIODS

REFERENCES

1. Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner, “Professional C# and .NET 4.5”, Wiley, First Edition2012
2. Andrew Troelsen, “Pro C# 5.0 and the .NET 4.5 Framework”, Apress publication, First Edition2012
3. Ian Gariffiths, Mathew Adams, Jesse Liberty, “Programming C# 4.0”, O‘Reilly, Sixth Edition, 2010
4. Andy Wigley, Daniel Moth, “Peter Foot, —Mobile Development Handbook”, Microsoft Press,2nd Edition, 2011
5. Herbert Schildt, “C# - The Complete Reference”, Tata McGraw Hill, FirstEdition2010.

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2
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4	2	1	2	2	2	2
5	2	1	2	2	2	2

Avg	2	1	2	2	2	2

MC4025 **BIG DATA ANALYTICS** **L T P C**
3 0 2 4

COURSE OBJECTIVES:

- To understand fundamentals of BigData and Hadoop
- To learn about file system configuration in HADOOP
- To learn Map Reduce concept of Hadoop in executing Task
- To learn the Queue Processing and stream processing of Data
- To learn about Hadoop Frameworks

UNIT I INTRODUCTION TO BIG DATA AND HADOOP 9+6

Types of Digital Data - Introduction to Big Data - Challenges of conventional systems - Web data – Evolution of Analytic scalability - Analytic Processes and Tools - Analysis vs Reporting -History of Hadoop - Apache Hadoop - Analyzing Data with Hadoop - Hadoop Streaming

Lab Components:

Perform setting up and Installing Hadoop

UNIT II HDFS & HADOOP I/O 9+6

Hadoop Distributed File System :The Design of HDFS- HDFS Concepts- The Command-Line Interface- Hadoop File Systems- Data Flow- Parallel Copying with distcp- Hadoop Archives- Hadoop I/O: Data Integrity- Compression- Serialization

Lab Components:

- Implement HDFS Command Reference:
- Listing contents of directory, Displaying and printing disk usage, Moving files & directories ,Copying files and directories
- Implement the following file management tasks in Hadoop: Writing a file into HDFS
- Reading data from HDFS, Retrieving files , Deleting files

UNIT III MAPREDUCE 9+6

Analyzing the Data with Hadoop- Hadoop Pipes- MapReduce Types - Input Formats- Output Formats- MapReduce Features - MapReduce Works - Anatomy of a MapReduce Job Run – Failures - Job Scheduling - Shuffle and Sort - Task Execution

Lab Components:

- Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
- Implement Matrix vector multiplication map reduce program

UNIT IV QUEUEING AND STREAM PROCESSING SYSTEMS 9+6

Queueing: Queueing systems, Introduction to kafka, producer consumer, brokers, types of queues - single consumer, multi consumer queue servers.

Streaming systems: Stream processing – queues and workers - micro batch streaming processing - introduction to kafka streaming processing API

Lab Components:

Implement Single consumer queue in Kafka

Implement video streaming with producer consumer in Kafka

UNIT V HADOOP FRAMEWORKS 9+6

Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators.

Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data

Lab Components:

- Install and Run Pig then write Pig Latin scripts to sort, group, join your data.
- Write a Pig Latin scripts for finding TF-IDF value for book dataset (A corpus of eBooks available at: Project Gutenberg)
- Install and Run Hive then use Hive to create, alter, and drop databases, tables

COURSE OUTCOMES:

CO1: Able to apply Hadoop for analyzing Big Volume of Data
CO2: Able to access ,store , do operations on data as Files and directories
CO3; Able to implement MapReduce Concept in analyzing BigData
CO4: Able to implement event streaming using Kafka API
CO5: Able to access volume of data with Hadoop Framework

TOTAL: 75 PERIODS

REFERENCES

1. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with advanced analytics, John Wiley & sons, 2012.
2. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007
3. Tom White, Hadoop: The Definitive Guide, O'Reilly, 2009
4. Paul Zikopoulos ,Dirk DeRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles , David Corigan , "Harness the Power of Big Data The IBM Big Data Platform ", Tata McGraw Hill Publications, 2012.
5. Kafka: The Definitive Guide- Real-Time Data and Stream Processing at Scale, by Gwen Shapira, Neha Narkhede ,Todd Palino

CO-PO Mapping

CO	POs					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
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4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

MC4026 **SOFTWARE QUALITY AND TESTING** **L T P C**
3 0 2 4

COURSE OBJECTIVES:

- To know the behavior of the testing techniques and to design test cases to detect the errors in the software
- To get insight into software testing methodologies
- To understand standard emerging areas in testing
- To learn about the software quality models.
- To understand the models and metrics of software quality and reliability

UNIT I INTRODUCTION **9+6**

Basic concepts and Preliminaries – Theory of Program Testing– Unit Testing – Control Flow Testing –Data Flow Testing– System Integration Testing

UNIT II SOFTWARE TESTING METHODOLOGY **9+6**

Software Test Plan–Components of Plan - Types of Technical Reviews - Static and Dynamic Testing- – Software Testing in Spiral Manner - Information Gathering - Test Planning - Test Coverage - Test Evaluation - Acceptance Test – Summarize Testing Results.

UNIT III EMERGING SPECIALIZED AREAS IN TESTING **9+6**

Test Process Assessment – Test Automation Assessment - Test Automation Framework –Agile Testing – Testing Center of Excellence – Onsite/Offshore Model - Modern Software Testing Tools – Software Testing Trends – Methodology to Develop Software Testing Tools.

UNIT VI SOFTWARE QUALITY MODELS **9+6**

Software quality –Verification versus Validation– Components of Quality Assurance – SQA Plan – Quality Standards – CMM – PCMM – CMMI – Malcolm Baldrige National Quality Award

UNIT V QUALITY THROUGH CONTINUOUS IMPROVEMENT PROCESS **9+6**

Role of Statistical Methods in Software Quality – Transforming Requirements into Test Cases – Deming's Quality Principles – Continuous Improvement through Plan Do Check Act (PDCA)

List of Experiments

1. Perform data flow testing for any C program to verify the def-use variables (Ex: largest of two numbers)
2. Using Selenium IDE, Write a test suite containing minimum 4 test cases for any simple C program (Ex: To check Adam Number)
3. Write and test a program to update 10 student records into tables into Excel file. (Selenium)
4. Write and test a program to select the number of students who have scored more than 60 in any one subject (or all subjects). (Selenium)
5. Write and test a program to login to a specific web page. (Selenium)
6. Write and test a program to provide a total number of objects present / available on the page. (Selenium)
7. Write and test a program to get the number of list items in a list / combo box. (Selenium)
8. Identify system specification and design test cases to test any application using any one of a testing tool (Selenium/Bugzilla/Test Director)
9. Automate the test cases of the above system using any test automation tool (Bugzilla /QA Complete)

10. Design test cases for web pages to test any web sites (Web Performance Analyzer/Open STA)

COURSE OUTCOMES:

Upon completion of the course the students will be able to

CO1:choose the software testing techniques to cater to the need of the project

CO2:identify the components of software quality assurance systems

CO3:apply various software testing strategies

CO4:design and develop software quality models

CO5:make use of statistical methods in software quality.

TOTAL: 75 PERIODS

REFERENCES

1. William E.Lewis, "Software Testing and Continuous Quality Improvement", 3rdEdition, Auerbach Publications, 2011
2. KshirasagarNaik and PriyadarshiTripathy, "Software Testing and Quality Assurance Theory and Practice", 2nd Edition, John Wiley & Sons Publication, 2011
3. Ron Patton, "Software Testing", 2nd Edition, Pearson Education, 2007
4. Glenford J. Myers, Tom Badgett, Corey Sandler, "The Art of Software Testing", 3rd Edition, John Wiley & Sons Publication, 2012.
5. Paul C. Jorgensen, "Software Testing, A Craftman'sApproach", CRC Press Taylor & Francis Group, Fourth Edition, 2018

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2
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3	2	1	2	2	2	2
4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

MC4027 **ADVANCED JAVA PROGRAMMING** **L T P C 3 0 2 4**

COURSE OBJECTIVES:

- To understand the fundamentals of web programming and client side scripting.
- To learn server side development using servlets, web sockets.
- To learn the Spring framework and build applications using Spring.
- To learn and implement the concept of Java Persistence API.
- To learn the advanced client side scripting and framework.

UNIT I INTRODUCTION TO WEB & JAVASCRIPT 9 +6

Introduction to Web: Server - Client - Communication Protocol (HTTP), Javascript Prototypes - Classes - Modules – Fetch API – JS Canvas - Storage: LocalStorage, Cookies, IndexedDB, JSON

Lab Components

1. Create an event registration application using javascript. It should implement different widgets for registration form and registered records view using tabs. It should perform the form validation. (Unit I)
2. Create a javascript application in an Object Oriented way using Classes and Modules. It should also use browser storage for persistence. (Unit I)

UNIT II SERVER SIDE PROGRAMMING 9 +6

Web Server: Web Containers - Web Components, Servlet: Lifecycle - Request - Servlet Context - Response - Filter - Session - Dispatching Requests, WebSocket, Logging - Log4j2, Build tool - Gradle. Introduction to Spring: IoC Container and Dependency Injection (DI)

Lab Components

1 Build a web application using Gradle. The server side of the application should implement RESTful APIs using Servlet and do necessary logging. The client side of the application should be a single page application which consumes the RESTful APIs through AJAX. (Unit II)

2.. Build a chat application using WebSocket. (Unit II)

UNIT III SPRING 9 +6

Spring Configuration and Spring Boot, Spring MVC, Spring Bean Lifecycle - DispatcherServlet and Configuration - Interceptors – Annotations, Controllers - Views - Input Validation -File Upload-Container,Dependency and IOC .

Lab Components

1. Create a Spring MVC application. The application should handle form validation, file upload, session tracking.
2. Implement a RESTful Spring Boot application using Spring REST, Spring Security and Spring Cache.

UNITI IV AOP,JAVA PERSISTENCE API AND HIBERNATE 9 +6

Aspect Oriented Programming(AOP) - Entity: Basic, Embeddable and Collection Types - Identifiers - Entity Relationship - Inheritance, Persistence Context and Entity Manager, JPQL, Criteria API, Spring Data JPA - Specification and Projection.

Lab Components

1. Design a system using JPA and Hibernate. The system should have multiple entities and relationships between the entities. The database schema should be generated through Hibernate. Provide RESTful endpoints for CRUD operations for the defined entities. Also, support pagination and searching using JPA's JPQL and Criteria API. (Unit IV)
2. Create a Spring RESTful Application with Spring Data JPA. Support pagination and searching using Specifications. (Unit IV)

UNIT V ADVANCED SPRING PROGRAMMING 9 +6

Spring Boot JDBC - Spring Boot Actuator - Spring Cloud -Spring Boot Testing - Spring Security Architecture , Spring Cache - Building RESTful Web Services

Lab Components

1. Create a React application with different components and interactions between the components.
2. Develop a full-stack application using React and Spring. Make use of Spring REST, Spring

Security, Spring Data JPA, Hibernate, Spring Boot, Gradle and ReactJS state and component mechanism.

COURSE OUTCOMES:

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

CO1: To write client side scripting.

CO2: To implement the server side of the web application.

CO3:To implement Web Application using Spring.

CO4: To implement a Java application using Java Persistence API.

CO5: To implement a full-stack Single Page Application using React, Spring and JPA.

TOTAL:75 PERIODS

REFERENCES

1. David Flanagan, “Java Script: The Definitive Guide”, O’Reilly Media, Inc, 7th Edition, 2020
2. Matt Frisbie, "Professional JavaScript for Web Developers", Wiley Publishing, Inc, 4th Edition, ISBN: 978-1-119-36656-0, 2019
3. Alex Banks, Eve Porcello, "Learning React", O’Reilly Media, Inc, 2nd Edition, 2020
4. David R. Heffelfinger, "Java EE 8 Application Development", Packt Publishing, First edition2017
5. Benjamin Muschko, "Gradle in Action", Manning Publications, First edition2014
6. IulianaCosmina, Rob Harrop, Chris Schaefer, Clarence Ho, "Pro Spring 5: An In-Depth Guide to the Spring Framework and Its Tools", Apress, Fifth edition2017

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2
2	2	1	2	2	2	2
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4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

MC4028 NETWORK PROGRAMMING AND SECURITY L T P C
3 0 2 4

COURSE OBJECTIVES:

- To understand the basics of Network Programming
- To be familiar with building network applications
- To design and implement client server Applications using TCP and UDP Sockets
- To expose with various socket options
- To get aware of Network security for Network Programming

UNIT I INTRODUCTION 9 +6

TCP/IP Layer Model – Multicast, broadcast and Anycast - Socket address Structures – Byte ordering functions – address conversion functions – Elementary TCP Sockets – socket, connect, bind, listen, accept, read, write , close functions – Iterative Server – Concurrent Server

Lab Components

1. Socket Creation
2. Implementation of Client-Server Communication Using TCP

UNIT II UNIT TITLE 9 +6

TCP Echo Server – TCP Echo Client – Posix Signal handling – Server with multiple clients – boundary conditions: Server process Crashes, Server host Crashes, Server Crashes and reboots, Server Shutdown

Lab Components

1. Implementation of TCP Echo Client Server
2. Design a multiuser TCP client - server chat application

UNIT III SOCKET OPTIONS AND MULTIPLEXING 9 +6

Socket options – getsocket and setsocket functions – generic socket options – IP socket options – ICMP socket options – TCP socket options I/O multiplexing – I/O Models – select function – shutdown function – TCP echo Server (with multiplexing) – poll function – TCP echo Client (with Multiplexing)

Lab Components

1. TCP echo server with multiplexing to estimate round trip time from client to server.
2. Design a server for multi-player tic tac toe game

UNIT IV ELEMENTARY UDP SOCKETS 9 +6

UDP echo Server – UDP echo Client – Multiplexing TCP and UDP sockets – Domain name system – gethostbyname function – Ipv6 support in DNS – gethostbyadr function – getservbyname and getservbyport functions

Lab Components

1. Design a UDP client/server Chat application
2. Design a UDP Domain Name Server (DNS)

UNIT V NETWORK SECURITY 9 +6

SSL - SSL Architecture, SSL Protocols, SSL Message, Secure Electronic Transaction (SET). TLS –TLS Protocols, DTLS Protocols, PKI – Fundamentals, Standards and Applications

Lab Components

1. Automated Attack and Penetration Tools Exploring N-Stalker, a Vulnerability Assessment Tool.

COURSE OUTCOMES:

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

CO1:Design and implement the client/server programs using variety of protocols

CO2: Understand the key protocols which support Internet

CO3:Demonstrate advanced knowledge of programming interfaces for network communication

CO4: Use the basic tools for design and testing of network programs in Unix environment.

CO5:Identify some of the factors driving the need for network security

TOTAL: 75 PERIODS

REFERENCES

1. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff ,"Unix Network Programming, Volume 1: The Sockets Networking API", Third Edition, ISBN:0-13-141155-1, Addison Wesley Pearson Education,2004
2. Behrouz A Forouzan,DebdeepMukhopadhyay "Cryptography and Network Security" ,Second Edition, ISBN -13:978-0-07—070208-0 Tata McGraw Hill Education Private Limited 2010
3. William Stallings, "Cryptographic and network security Principles and Practices",Fourth Edition, Publisher Prentice Hall, November 2005
4. Andre Perez, "Network Security", First Edition, Publisher John Wiley & Sons, 2014
5. Gary R. Wright , W. Richard Stevens, "TCP/IP Illustrated: The Implementation" , ISBN 0-201-63354-X , Vol. 2, 1st Edition , Addison Wesley Professional, January 2008

CO-PO Mapping

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4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

AUDIT COURSES

AX4091 ENGLISH FOR RESEARCH PAPER WRITING L T P C
2 0 0 0

COURSE OBJECTIVES:

- Teach how to improve writing skills and level of readability
- Tell about what to write in each section
- Summarize the skills needed when writing a Title
- Infer the skills needed when writing the Conclusion
- Ensure the quality of paper at very first-time submission

UNIT I INTRODUCTION TO RESEARCH PAPER WRITING 6

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT II PRESENTATION SKILLS 6

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction

UNIT III TITLE WRITING SKILLS 6

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check

UNIT IV RESULT WRITING SKILLS 6

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT V VERIFICATION SKILLS 6

Useful phrases, checking Plagiarism, how to ensure paper is as good as it could possibly be the first- time submission

TOTAL: 30 PERIODS

COURSE OUTCOMES:

CO1 –Understand that how to improve your writing skills and level of readability
CO2 – Learn about what to write in each section
CO3 – Understand the skills needed when writing a Title
CO4 – Understand the skills needed when writing the Conclusion
CO5 – Ensure the good quality of paper at very first-time submission

REFERENCES:

1. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011
2. Day R How to Write and Publish a Scientific Paper, Cambridge University Press 2006
3. Goldbort R Writing for Science, Yale University Press (available on Google Books) 2006
4. Highman N, Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book 1998.

CO-PO Mapping

CO	POs					
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1	1	3	1	1	1	1
2	1	3	1	1	1	1
3	1	3	1	1	1	1
4	1	3	1	1	1	1
5	1	3	1	1	1	1
Avg	1	3	1	1	1	1

AX4092 DISASTER MANAGEMENT L T P C
2 0 0 0

COURSE OBJECTIVES:

- Summarize basics of disaster
- Explain a critical understanding of key concepts in disaster risk reduction and humanitarian

response.

- Illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Develop the strengths and weaknesses of disaster management approaches

UNIT I INTRODUCTION 6

Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT II REPERCUSSIONS OF DISASTERS AND HAZARDS 6

Economic Damage, Loss of Human and Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

UNIT III DISASTER PRONE AREAS IN INDIA 6

Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides And Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases and Epidemics

UNIT IV DISASTER PREPAREDNESS AND MANAGEMENT 6

Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT V RISK ASSESSMENT 6

Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival

TOTAL : 30 PERIODS

COURSE OUTCOMES:

CO1: Ability to summarize basics of disaster

CO2: Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.

CO3: Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

CO4: Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

CO5: Ability to develop the strengths and weaknesses of disaster management approaches

REFERENCES

1. Goel S. L., Disaster Administration And Management Text And Case Studies",Deep & Deep Publication Pvt. Ltd., New Delhi,2009.
2. NishithaRai, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'NewRoyal book Company,2007.

3. Sahni, PardeepEt.Al. ," Disaster Mitigation Experiences And Reflections", Prentice Hall OfIndia, New Delhi,2001.

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	1	2	1	1	1	1
2	1	2	1	1	1	1
3	1	2	1	1	1	1
4	1	2	1	1	1	1
5	1	1	1	1	1	1
Avg	1	1.8	1	1	1	1

AX4093 CONSTITUTION OF INDIA L T P C
2 0 0 0

COURSE OBJECTIVES:

Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional
- Role and entitlement to civil and economic rights as well as the emergence nation hood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolutionin1917and its impact on the initial drafting of the Indian Constitution.

UNIT I HISTORY OF MAKING OF THE INDIAN CONSTITUTION

History, Drafting Committee, (Composition & Working)

UNIT II PHILOSOPHY OF THE INDIAN CONSTITUTION

Preamble, Salient Features

UNIT III CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES

Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT IV ORGANS OF GOVERNANCE

Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

UNIT V LOCAL ADMINISTRATION

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO, Municipal Corporation. Pachayati raj: Introduction, PRI: Zila

Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy(Different departments), Village level:Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT VI ELECTION COMMISSION

Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.

TOTAL: 30 PERIODS

SUGGESTED READING

1. The Constitution of India,1950(Bare Act),Government Publication.
2. Dr.S.N.Busi, Dr.B. R.Ambedkar framing of Indian Constitution,1st Edition, 2015.
3. M.P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis,2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

COURSE OUTCOMES

Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization
- of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party[CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	1	1	1	1	1	1
2	1	1	1	1	1	1
3	1	1	1	1	1	1
4	1	1	1	1	1	1
5	1	1	1	1	1	1
Avg	1	1	1	1	1	1

AX4094 **நற்றமிழ் இலக்கியம்** **L T P C**
2 0 0 0

UNIT I சங்க இலக்கியம் **6**

1. தமிழின் துவக்க நூல் தொல்காப்பியம்
   – எழுத்து, சொல், பொருள்

2. அகநானூறு (82)
- இயற்கை இன்னிசை அரங்கம்
3. குறிஞ்சிப் பாட்டின் மலர்க்காட்சி
4. புறநானூறு (95,195)
- போரை நிறுத்திய ஔவையார்

UNIT II **அறநெறித் தமிழ்** **6**

1. அறநெறி வகுத்த திருவள்ளுவர்
- அறம் வலியுறுத்தல், அன்புடைமை, ஒப்புரவறிதல், ஈகை, புகழ்
2. பிற அறநூல்கள் - இலக்கிய மருந்து
– ஏலாதி, சிறுபஞ்சமூலம், திரிகடுகம், ஆசாரக்கோவை (தூய்மையை வலியுறுத்தும் நூல்)

UNIT III **இரட்டைக் காப்பியங்கள்** **6**

1. கண்ணகியின் புரட்சி
- சிலப்பதிகார வழக்குரை காதை
2. சமூகசேவை இலக்கியம் மணிமேகலை
- சிறைக்கோட்டம் அறக்கோட்டமாகிய காதை

UNIT IV **அருள்நெறித் தமிழ்** **6**

1. சிறுபாணாற்றுப்படை
- பாரி முல்லைக்குத் தேர் கொடுத்தது, பேகன் மயிலுக்குப் போர்வை கொடுத்தது, அதியமான் ஔவைக்கு நெல்லிக்கனி கொடுத்தது, அரசர் பண்புகள்
2. நற்றிணை
- அன்னைக்குரிய புன்னை சிறப்பு
3. திருமந்திரம் (617, 618)
- இயமம் நியமம் விதிகள்
4. தர்மச்சாலையை நிறுவிய வள்ளலார்
5. புறநானூறு
- சிறுவனே வள்ளலானான்
6. அகநானூறு (4) - வண்டு
நற்றிணை (11) - நண்டு
கலித்தொகை (11) - யானை, புறா
ஐந்திணை 50 (27) - மான்
ஆகியவை பற்றிய செய்திகள்

UNIT V **நவீன தமிழ் இலக்கியம்** **6**

1. உரைநடைத் தமிழ்,
- தமிழின் முதல் புதினம்,
- தமிழின் முதல் சிறுகதை,
- கட்டுரை இலக்கியம்,

- பயண இலக்கியம்,
- நாடகம்,

2. நாட்டு விடுதலை போராட்டமும் தமிழ் இலக்கியமும்,
3. சமுதாய விடுதலையும் தமிழ் இலக்கியமும்,
4. பெண் விடுதலையும் விளிம்பு நிலையினரின் மேம்பாட்டில் தமிழ் இலக்கியமும்,
5. அறிவியல் தமிழ்,
6. இணையத்தில் தமிழ்,
7. சுற்றுச்சூழல் மேம்பாட்டில் தமிழ் இலக்கியம்.

TOTAL: 30 PERIODS

தமிழ் இலக்கிய வெளியீடுகள் / புத்தகங்கள்

1. தமிழ் இணைய கல்விக்கழகம் (Tamil Virtual University)
   - www.tamilvu.org
2. தமிழ் விக்கிப்பீடியா (Tamil Wikipedia)
   - https://ta.wikipedia.org
3. தர்மபுர ஆதீன வெளியீடு
4. வாழ்வியல் களஞ்சியம்
   - தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்
5. தமிழ்கலைக் களஞ்சியம்
   - தமிழ் வளர்ச்சித் துறை (thamilvalarchithurai.com)
6. அறிவியல் களஞ்சியம்
   - தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	1	1	1	1	1	1
2	1	1	1	1	1	1
3	1	1	1	1	1	1
4	1	1	1	1	1	1
5	1	1	1	1	1	1
Avg	1	1	1	1	1	1

BRIDGE COURSES

BX4001 DATA STRUCTURES AND ALGORITHMS

L	T	P	C
3	0	2	4

OBJECTIVES:

- Be familiar with basic techniques of algorithm analysis.
- Be exposed to the concept of ADTs.
- Learn linear data structures-List, Stack and Queue.
- Learn nonlinear data structures-Tree and Graphs.
- Be exposed to sorting, searching and hashing algorithms

UNIT I INTRODUCTION **9 +6**

Introduction - Abstract Data Types (ADT) – Arrays and its representation –Structures – Fundamentals of algorithmic problem solving – Important problem types – Fundamentals of the analysis of algorithm – analysis framework – Asymptotic notations, Properties, Recurrence Relation.

Lab Experiments:

1. Develop a program to perform various array operations
2. Write a program to find running time complexity by considering each statement in the program for a given set of numbers.

UNIT II LINEAR DATA STRUCTURES - STACK, QUEUE **9 +6**

Stack ADT – Operations on Stack - Applications of stack – Infix to postfix conversion – evaluation of expression - Queue ADT – Operations on Queue - Circular Queue - Applications of Queue.

Lab Experiments:

1. Write a program to convert infix to postfix using stack data structure
2. Develop a program to perform circular queue operations

UNIT III LINEAR DATA STRUCTURES – LIST **9+6**

List ADT - Array-based Implementation - Linked list implementation - Singly Linked Lists – Circularly linked lists – Doubly Linked Lists - Applications of linked list – Polynomial Addition.

Lab Experiments:

1. Perform Polynomial Manipulation using Single Linked List.
2. Implement the various operations in double linked list.

UNIT IV SEARCHING, SORTING AND HASH TECHNIQUES **9 +6**

Searching: Linear search – Binary Search- comparison of linear search and binary search, Sorting algorithms: Insertion sort - Bubble sort – selection sort - Hashing: Hash Functions – Separate Chaining – Open Addressing – Rehashing.

Lab Experiments:

1. Write a program to perform binary search
2. Write a program to sort a given set of numbers and compare among Bubble Sort, Selection Sort and Insertion Sort with respect to computational complexity.

UNIT V NON LINEAR DATA STRUCTURES - TREES AND GRAPHS **9 +6**

Trees and its representation – left child right sibling data structures for general trees- Binary Tree – Binary

tree traversals –- Binary Search Tree - Graphs and its representation - Graph Traversals - Depth-first traversal – breadth-first traversal-Application of graphs.

Lab Experiments:

1. Write a program to delete a node from a given Binary search tree
2. Write a program to perform Graph Traversals

TOTAL : 75 PERIODS

COURSE OUTCOMES:

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

- analyze algorithms and determines their time complexity.
- understand the concepts of data types, data structures and linear structures
- apply data structures to solve various problems
- apply different Sorting, Searching and Hashing algorithms.
- understand non-linear data structures

REFERENCES

1. Anany Levitin "Introduction to the Design and Analysis of Algorithms" 3rd Edition, Pearson Education
2. A.K. Sharma, "Data Structures using C", 2nd Edition, Pearson Education Asia, 2013
3. E. Horowitz, Anderson-Freed and S.Sahni, "Fundamentals of Data structures in C", 2ndEdition,University Press, 2007
4. E.Balagursamy," Data Structures using C", Tata McGraw Hill 2015 Reprint
5. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, India, 2016
6. Jean Paul Tremblay and Paul G. Sorensen, "An Introduction to Data Structures with Applications", 2nd Edition, Tata McGraw Hill, New Delhi, 2017.

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2
2	2	1	2	2	2	2
3	2	1	2	2	2	2
4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

BX4002 PROBLEM SOLVING AND PROGRAMMING IN C L T P C
3 0 2 4

COURSE OBJECTIVES:

- To understand the basic concepts of problem solving approaches and to develop the algorithms

- Apply the techniques of structured (functional) decomposition to break a program into smaller pieces and describe the mechanics of parameter passing.
- To design, implements, test, and apply the basic C programming concepts

UNIT I INTRODUCTION TO COMPUTER PROBLEM SOLVING 9

Introduction – The Problem Solving aspect – Top down design – Implementation of algorithm – Program Verification – The efficiency of algorithms – The analysis of algorithms – Fundamental Algorithms

UNIT II PROGRAMMING AND ALGORITHMS 9

Programs and Programming – building blocks for simple programs -pseudo code representation – flow charts - Programming Languages - compiler –Interpreter, Loader and Linker - Program execution – Classification of Programming Language - Structured Programming Concept – Illustrated Problems: Algorithm to check whether a given number is Armstrong numberor not- Find factorial of a number

UNIT III BASICS OF 'C', INPUT / OUTPUT & CONTROL STATEMENTS 9 +10

Introduction- Identifier – Keywords - Variables – Constants – I/O Statements - Operators - Initialization – Expressions – Expression Evaluation – Lvalues and Rvalues – Type Conversion in C –Formatted input and output functions - Specifying Test Condition for Selection and Iteration- Conditional Execution - and Selection – Iteration and Repetitive Execution- go to Statement – Nested Loops- Continue and break statements.

Lab Experiments:

1. Write programs to get some input , perform some operation and display the output using I/O statements
2. Write a program to execute some specific statements based on the test condition
3. Write programs to implement nested loop

UNIT IV ARRAYS, STRINGS, FUNCTIONS AND POINTERS 9 +10

Array – One dimensional Character Arrays- Multidimensional Arrays- Arrays of Strings – Two dimensional character array – functions - parameter passing mechanism scope – storage classes – recursion - comparing iteration and recursion- pointers – pointer operators - uses of pointers- arrays and pointers – pointers and strings - pointer indirection pointers to functions - Dynamic memory allocation.

PROGRESS THROUGH KNOWLEDGE

Lab Experiments

1. Write a program in C to get the largest element of an array using the function.
2. Display all prime numbers between two intervals using functions.
3. Reverse a sentence using recursion.
4. Write a C program to concatenate two strings

UNIT V USER-DEFINED DATATYPES & FILES 9 +10

Structures – initialization - nested structures – structures and arrays – structures and pointers - union– type def and enumeration types - bit fields - File Management in C – Files and Streams – File handling functions – Sequential access file- Random access file – Command line arguments.

Lab Experiments:

1. Write a C program to Store Student Information in Structure and Display it.
2. The annual examination is conducted for 10 students for five subjects.

3. Write a program to read the data from a file and determine the following:
   Total marks obtained by each student; Topper of the class

COURSE OUTCOMES:

- Able to design a computational solution for a given problem.
- Able to break a problem into logical modules that can be solved (programmed).
- Able to transform a problem solution into programs involving programming constructs.
- To write programs using structures, strings, arrays, pointers and files for solving complex computational problems.
- Able to introduce modularity using functions and pointers which permit ad hoc runtime polymorphism.

TOTAL : 75 PERIODS

REFERENCES:

1. Deitel and Deitel, "C How to Program", Pearson Education. 2013, 7th Edition
2. Byron S Gottfried, —Programming with C, Schaums Outlines, Second Edition, Tata McGraw-Hill, 2006
3. Brian W. Kernighan and Dennis M. Ritchie, "The C programming Language", Edition? 2nd edition 2015, Pearson Education India
4. How to solve it by Computer, R. G. Dromey, Pearson education, Fifth Edition, 2007
5. Kamthane, A.N., "Programming with ANSI and Turbo C", Pearson Education, Delhi, 3rdEdition, 2015
6. PradipDey, ManasGhosh, —Computer Fundamentals and Programming in C, Second Edition, Oxford University Press, 2013.

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2
2	2	1	2	2	2	2
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4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

BX4003 **INTRODUCTION TO COMPUTER ORGANIZATION AND OPERATING SYSTEMS** **L T P C 3 0 0 3**

COURSE OBJECTIVES:

- To learn the basic structure and operations of a computer.
- To learn the arithmetic and logic unit and implementation of fixed-point and floating point arithmetic unit.
- To understand the memory hierarchies, cache memories and virtual memories and to learn the different ways of communication with I/O devices.
- To understand the basic concepts and functions of Operating Systems

- To understand Process and various Scheduling Algorithms of OS

UNIT I BASIC STRUCTURE AND ARITHMETIC OPERATIONS 9

.Functional Units – Basic Operational Concepts – Instructions: Language of the Computer – Operations, Operands – Instruction representation – Logical operations – Decision Making – MIPS Addressing-Arithmetic for Computers

UNIT II PROCESSOR AND CONTROL UNIT 9

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

UNIT III MEMORY & I/O SYSTEMS 9

Memory Hierarchy - Memory technologies – cache memory – measuring and improving cache performance – virtual memory –-Accessing I/O Devices – Interrupts – Direct Memory Access – Bus structure –Interface circuits – USB

UNIT IV OPERATING SYSTEMS OVERVIEW 9

Operating system overview-objectives and functions, Evolution of Operating System- Operating System Structure - System Calls- Processes – Process Concept, Inter-process Communication

UNIT V PROCESS MANAGEMENT 9

CPU Scheduling – Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Threads Overview– The critical-section problem, Semaphores, Classical problems of synchronization, Critical regions

TOTAL : 45 PERIODS

COURSE OUTCOMES:

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

- Understand the basics structure of computers, operations and instructions.
- Design arithmetic and logic unit, control unit.
- Understand the various memory systems and I/O communication.
- Understand operating system functions, types, system calls
- Analyze Process and various scheduling algorithms

REFERENCES:

PROGRESS THROUGH KNOWLEDGE

1. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, Computer Organization and Embedded Systems, Sixth Edition, Tata McGraw Hill, 2012
3. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne - Operating System Concepts, 9th Edition, John Wiley and Sons Inc., 2012.
4. John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012
5. John L. Hennessey and David A. Patterson, Computer Architecture – A Quantitative Approach, Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.
6. Andrew S. Tanenbaum - Modern Operating Systems, 4th Edition, Pearson Education, 2014.

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
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2	2	1	2	2	2	2
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4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

BX4004 DATABASE MANAGEMENT SYSTEMS **L T P C**
3 0 2 4

OBJECTIVES:

- To understand the fundamentals of data models and conceptualize and depict a database system using ER diagram.
- To make a study of SQL and relational database design.
- To know about data storage techniques and query processing.
- To impart knowledge in transaction processing, concurrency control techniques and recovery procedures.

UNIT I INTRODUCTION **9**

File systems versus Database systems – Data Models – DBMS Architecture – Data Independence – Data Modeling using Entity – Relationship Model –E-R Modeling.

UNIT II RELATIONAL MODEL AND QUERY EVALUATION **9**

Relational Model Concepts – Relational Algebra – SQL – Basic Queries – Complex SQL Queries – Views – Constraints

UNIT III DATABASE DESIGN & APPLICATION DEVELOPMENT **9+10**

Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

UNIT IV TRANSACTION PROCESSING **9+10**

Quey Pocessing-Transaction Processing – Properties of Transactions - Serializability – Transaction support in SQL - Locking Techniques –Validation Techniques –– Recovery concepts – Shadow paging – Log Based Recovery.

UNIT V FILES AND INDEXING **9+10**

File operations – Hashing Techniques – Indexing – Single level and Multi-level Indexes – B+ tree – Static Hashing

LIST OF EXPERIMENTS:

Data Definition Commands to create, describe, alter, rename, drop and truncate the tables

1. Data Manipulation Commands for inserting, deleting, updating and retrieving in Tables
2. Transaction Control Language Commands like Commit, Rollback and Save Point
3. Illustrate the statements to create index and drop index
4. Perform database querying using simple query, nested query, subquery and join operations
5. Create a PL/SQL block to implement implicit and explicit cursors
6. Create a PL/SQL block to implement procedures and functions
7. Create a PL/SQL block to execute triggers
8. Execute a procedure which handles exception using PL/SQL
9. Create a embedded PL/SQL block to connect with any host language like 'C'

COURSE OUTCOMES:

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

- Understand the basic concepts of the database and data models.
- Design a database using ER diagrams and map ER into Relations and normalize the relations
- Acquire the knowledge of query evaluation to monitor the performance of the DBMS.
- Develop a simple database applications using normalization.
- Acquire the knowledge about different special purpose databases and to critique how they differ from traditional database systems.

TOTAL : 75 PERIODS

REFERENCES:

1. Abraham Silberschatz, Henry F.Korth and S.Sundarshan "Database System Concepts", Seventh Edition, McGraw Hill, 2017.
2. Ramez Elmasri and Shamkant Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education Delhi, 2017
3. RaghuRamakrishnan, —Database Management Systems‖, Fourth Edition, McGrawHill College Publications, 2015.
4. Lee Chao, "Database Development and Management", Auerbach Publications, 1st edition, 2010
5. Carlos Coronel, Peter Rob, and Stephen Morris, "Database Principles Fundamentals of Design, Implementation, and Management –10th Edition", Course Technology, Cengage Learning, 2013
6. C.J. Date, "An Introduction to Database Systems", Eighth Edition, Pearson Education Delhi, 2003

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
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3	2	1	2	2	2	2
4	2	1	2	2	2	2
5	2	1	2	2	2	2

Avg	2	1	2	2	2	2

BX4005 MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To introduce Mathematical Logic and their rules for validating arguments and programmes.
- To introduce counting principles for solving combinatorial problems.
- To give exposure to Graph models and their utility in connectivity problems.
- To introduce abstract notion of Algebraic structures for studying cryptographic and its related areas.
- To introduce Boolean algebra as a special algebraic structure for understanding logical circuit problems.

UNIT I LOGIC AND PROOFS 9

Propositional Logic – Propositional Equivalences – Predicates and Quantifiers – Nested Quantifiers – Rules of Inference – Introduction to Proofs – Proof Methods and Strategy.

UNIT II COMBINATORICS 9

Mathematical Induction – Strong Induction and Well Ordering – The Basics of Counting - The Pigeonhole Principle – Permutations and Combinations – Recurrence Relations Solving Linear Recurrence Relations Using Generating Functions – Inclusion – Exclusion – Principle and Its Applications

UNIT III GRAPHS 9

Graphs and Graph Models – Graph Terminology and Special Types of Graphs – Matrix Representation of Graphs and Graph Isomorphism – Connectivity – Euler and Hamilton Paths.

UNIT VI ALGEBRAIC STRUCTURES 9

Groups – Subgroups – Homomorphisms – Normal Subgroup and Coset – Lagrange‘s Theorem – Definitions and Examples of Rings and Fields.

UNIT V LATTICES AND BOOLEAN ALGEBRA 9

Partial Ordering – Posets – Lattices as Posets – Properties of Lattices – Lattices as Algebraic Systems – Sub Lattices – Direct Product And Homomorphism – Some Special Lattices – Boolean Algebra

TOTAL : 45 PERIODS

COURSE OUTCOMES:

CO1: Apply Mathematical Logic to validate logical arguments and programmes.
CO2: Apply combinatorial counting principles to solve application problems.
CO3: Apply graph model and graph techniques for solving network other connectivity related problems.
CO4: Apply algebraic ideas in developing cryptograph techniques for solving network security problems.
CO5: Apply Boolean laws in developing and simplifying logical circuits.

REFERENCES:

1. Kenneth H.Rosen, “Discrete Mathematics and its Applications”, Tata McGraw Hill Pub. Co.Ltd., Seventh Edition, Special Indian Edition, New Delhi, 2011.

2. Tremblay J.P. and Manohar R, “Discrete Mathematical Structures with Applications to Computer Science”, Tata McGraw Hill Pub. Co. Ltd, 30th Reprint, New Delhi, 2011.
3. Ralph. P. Grimaldi, “Discrete and Combinatorial Mathematics: An Applied Introduction”, Pearson Education, 3rd Edition, New Delhi, 2014.
4. ThomasKoshy, “Discrete Mathematics with Applications”, 2nd Edition, Elsevier Publications, Boston, 2006.
5. SeymourLipschutz and Mark Lipson,”Discrete Mathematics”, Schaum‘s Outlines, Tata McGraw Hill Pub. Co. Ltd., Third Edition, New Delhi, 2013

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2
2	2	1	2	2	2	2
3	2	1	2	2	2	2
4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

BX4006 **BASICS OF COMPUTER NETWORKS** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To understand networking concepts and basic communication model
- To understand network architectures and components required for data communication.
- To analyze the function and design strategy of physical, data link, network layer and transport layer
- To acquire basic knowledge of various application protocol for internet security issues and services

UNIT I NETWORK FUNDAMENTALS 9

Uses of Networks – Categories of Networks -Communication model –Data transmission concepts and terminology – Protocol architecture – Protocols – OSI – TCP/IP – LAN Topology - Transmission media

UNIT II DATA LINK LAYER 9

Data link control - Flow Control – Error Detection and Error Correction - MAC – Ethernet, Token ring, Wireless LAN MAC – Blue Tooth – Bridges.

UNIT III NETWORK LAYER 9

Network layer – Switching concepts – Circuit switching – Packet switching –IP — Datagrams —IP addresses- IPV6– ICMP – Routing Protocols – Distance Vector – Link State- BGP

UNIT IV TRANSPORT LAYER 9

Transport layer –service –Connection establishment – Flow control – Transmission control protocol –

Congestion control and avoidance – User datagram protocol

UNIT V APPLICATIONS AND SECURITY **9**

Applications - DNS- SMTP – WWW –SNMP- Security –threats and services - DES- RSA.

COURSE OUTCOMES:

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

- Able to trace the flow of information from one node to another node in the network
- Able to Identify the components required to build different types of networks
- Able to understand the functionalities needed for data communication into layers
- Able to choose the required functionality at each layer for given application
- Able to understand the working principles of various application protocols and fundamentals of security issues and services available

TOTAL : 45 PERIODS

REFERENCES:

1. Larry L. Peterson & Bruce S. Davie, “Computer Networks – A systems Approach”, Fifth Edition, Morgan Kaufmann, 2012.
2. James F. Kurose, Keith W. Ross, “Computer Networking: A Top-down Approach, Pearson Education, Limited, sixth edition, 2012.
3. AndrewS.Tannenbaum, David J. Wetherall, “Computer Networks” Fifth Edition, Pearson Education 2011.
4. Forouzan, “Data Communication and Networking”, Fifth Edition , TMH 2012.
5. William Stallings, —Data and Computer Communications‖, Tenth Edition, Pearson Education, 2013.
6. Larry L. Peterson & Bruce S. Davie, “Computer Networks – A systems Approach”, Fifth Edition, Morgan Kaufmann, 2012.

CO-PO Mapping

CO	POs					
	PO1	PO2	PO3	PO4	PO5	PO6
1	2	1	2	2	2	2
2	2	1	2	2	2	2
3	2	1	2	2	2	2
4	2	1	2	2	2	2
5	2	1	2	2	2	2
Avg	2	1	2	2	2	2

PROGRESS THROUGH KNOWLEDGE

OPEN ELECTIVES

OCE431 INTEGRATED WATER RESOURCES MANAGEMENT L T P C
3 0 0 3

OBJECTIVE

- Students will be introduced to the concepts and principles of IWRM, which is inclusive of the economics, public-private partnership, water & health, water & food security and legal & regulatory settings.

UNIT I CONTEXT FOR IWRM 9

Water as a global issue: key challenges – Definition of IWRM within the broader context of development – Key elements of IWRM - Principles – Paradigm shift in water management - Complexity of the IWRM process – UN World Water Assessment - SDGs.

UNIT II WATER ECONOMICS 9

Economic view of water issues: economic characteristics of water good and services – Non-market monetary valuation methods – Water economic instruments – Private sector involvement in water resources management: PPP objectives, PPP models, PPP processes, PPP experiences through case studies.

UNIT III LEGAL AND REGULATORY SETTINGS 9

Basic notion of law and governance: principles of international and national law in the area of water management - Understanding UN law on non-navigable uses of international water courses – International law for groundwater management – World Water Forums – Global Water Partnerships - Development of IWRM in line with legal and regulatory framework.

UNIT IV WATER AND HEALTH WITHIN THE IWRM CONTEXT 9

Links between water and health: options to include water management interventions for health – Health protection and promotion in the context of IWRM – Global burden of Diseases - Health impact assessment of water resources development projects – Case studies.

UNIT V AGRICULTURE IN THE CONCEPT OF IWRM 9

Water for food production: 'blue' versus 'green' water debate – Water foot print - Virtual water trade for achieving global water and food security –- Irrigation efficiencies, irrigation methods - current water pricing policy– scope to relook pricing.

TOTAL: 45 PERIODS

OUTCOMES

- On completion of the course, the student is expected to be able to

CO1 Describe the context and principles of IWRM; Compare the conventional and integrated ways of water management.
CO2 Select the best economic option among the alternatives; illustrate the pros and cons of PPP through case studies.
CO3 Apply law and governance in the context of IWRM.
CO4 Discuss the linkages between water-health; develop a HIA framework.
CO5 Analyse how the virtual water concept pave way to alternate policy options.

REFERENCES:

1. Cech Thomas V., Principles of water resources: history, development, management and policy. John Wiley and Sons Inc., New York. 2003.
2. Mollinga .P. etal " Integrated Water Resources Management", Water in South Asia Volume I, Sage Publications, 2006.
3. Technical Advisory Committee, Integrated Water Resources management, Technical Advisory Committee Background Paper No: 4. Global water partnership, Stockholm, Sweden. 2002.
4. Technical Advisory Committee, Dublin principles for water as reflected in comparative assessment of institutional and legal arrangements for Integrated Water Resources Management, Technical Advisory Committee Background paper No: 3. Global water partnership, Stockholm, Sweden. 1999.
5. Technical Advisory Committee, Effective Water Governance". Technical Advisory Committee Background paper No: 7. Global water partnership, Stockholm, Sweden, 2003.

OCE432 WATER, SANITATION AND HEALTH L T P C
3 0 0 3

OBJECTIVES:

- Understand the accelerating health impacts due to the present managerial aspects and initiatives in water and sanitation and health sectors in the developing scenario

UNIT I FUNDAMENTALS WASH 9

Meanings and Definition: Safe Water- Health, Nexus: Water- Sanitation - Health and Hygiene – Equity issues-Water security - Food Security. Sanitation And Hygiene (WASH) and Integrated Water Resources Management (IWRM) - Need and Importance of WASH

UNIT II MANAGERIAL IMPLICATIONS AND IMPACT 9

Third World Scenario – Poor and Multidimensional Deprivation--Health Burden in Developing Scenario -Factors contribute to water, sanitation and hygiene related diseases-Social: Social Stratification and Literacy Demography: Population and Migration- Fertility - Mortality-Environment: Water Borne-Water Washed and Water Based Diseases - Economic: Wage - Water and Health Budgeting -Psychological: Non-compliance - Disease Relapse - Political: Political Will.

UNIT III CHALLENGES IN MANAGEMENT AND DEVELOPMENT 9

Common Challenges in WASH - Bureaucracy and Users- Water Utilities -Sectoral Allocation:-Infrastructure- Service Delivery: Health services: Macro and Micro- level: Community and Gender Issues- Equity Issues - Paradigm Shift: Democratization of Reforms and Initiatives.

UNIT IV GOVERNANCE 9

Public health -Community Health Assessment and Improvement Planning (CHA/CHIP)-Infrastructure and Investments on Water, (WASH) - Cost Benefit Analysis – Institutional Intervention-Public Private Partnership - Policy Directives - Social Insurance -Political Will vs Participatory Governance -

UNIT V INITIATIVES 9

Management vs Development -Accelerating Development- Development Indicators -Inclusive Development-Global and Local- Millennium Development Goal (MDG) and Targets - Five Year Plans - Implementation - Capacity Building - Case studies on WASH.

TOTAL: 45 PERIODS

OUTCOMES:

- **CO1** Capture to fundamental concepts and terms which are to be applied and understood all through the study.
- **CO2** Comprehend the various factors affecting water sanitation and health through the lens of third world scenario.
- **CO3** Critically analyse and articulate the underlying common challenges in water, sanitation and health.
- **CO4** Acquire knowledge on the attributes of governance and its say on water sanitation and health.
- **CO5** Gain an overarching insight in to the aspects of sustainable resource management in the absence of a clear level playing field in the developmental aspects.

REFERENCES

1. Bonitha R., Beaglehole R.,Kjellstorm, 2006, "Basic Epidemiology", 2nd Edition, World Health Organization.

2. Van Note Chism, N. and Bickford, D. J. (2002), Improving the environment for learning: An expanded agenda. New Directions for Teaching and Learning, 2002: 91–98. doi: 10.1002/tl.83Improving the Environment for learning: An Expanded Agenda

3. National Research Council. *Global Issues in Water, Sanitation, and Health: Workshop Summary***.** Washington, DC: The National Academies Press, 2009.

4. Sen, Amartya 1997. On Economic Inequality. Enlarged edition, with annex by JamesFoster and Amartya Sen, Oxford: Claredon Press, 1997.

5. Intersectoral Water Allocation Planning and Management, 2000, World Bank Publishers www. Amazon.com

6. Third World Network.org (www.twn.org).

OCE433 PRINCIPLES OF SUSTAINABLE DEVELOPMENT L T P C
3 0 0 3

OBJECTIVES:

- To impart knowledge on environmental, social and economic dimensions of sustainability and the principles evolved through landmark events so as to develop an action mindset for sustainable development.

UNIT I SUSTAINABILITY AND DEVELOPMENT CHALLEGES 9

Definition of sustainability – environmental, economical and social dimensions of sustainability - sustainable development models – strong and weak sustainability – defining development-millennium development goals – mindsets for sustainability: earthly, analytical, precautionary, action and collaborative– syndromes of global change: utilisation syndromes, development syndromes, and sink syndromes – core problems and cross cutting Issues of the 21 century - global, regional and local environmental issues – social insecurity - resource degradation –climate change – desertification.

UNIT II PRINCIPLES AND FRAME WORK 9

History and emergence of the concept of sustainable development - our common future - Stockholm to Rio plus 20– Rio Principles of sustainable development – Agenda 21 natural step-peoples earth charter – business charter for sustainable development –UN Global Compact - Role

of civil society, business and government – United Nations' 2030 Agenda for sustainable development – 17 sustainable development goals and targets, indicators and intervention areas

UNIT III SUSTAINABLE DEVELOPMENT AND WELLBEING 9

The Unjust World and inequities - Quality of Life - Poverty, Population and Pollution - Combating Poverty - - Demographic dynamics of sustainability - Strategies to end Rural and Urban Poverty and Hunger – Sustainable Livelihood Framework- Health, Education and Empowerment of Women, Children, Youth, Indigenous People, Non-Governmental Organizations, Local Authorities and Industry for Prevention, Precaution , Preservation and Public participation.

UNIT IV SUSTAINABLE SOCIO-ECONOMIC SYSTEMS 10

Sustainable Development Goals and Linkage to Sustainable Consumption and Production – Investing in Natural Capital- Agriculture, Forests, Fisheries - Food security and nutrition and sustainable agriculture- Water and sanitation - Biodiversity conservation and Ecosystem integrity – Ecotourism - Sustainable Cities – Sustainable Habitats- Green Buildings - Sustainable Transportation –– Sustainable Mining - Sustainable Energy– Climate Change –Mitigation and Adaptation - Safeguarding Marine Resources - Financial Resources and Mechanisms

UNIT V ASSESSING PROGRESS AND WAY FORWARD 8

Nature of sustainable development strategies and current practice**-** Sustainability in global, regional and national context –Approaches to measuring and analysing sustainability– limitations of GDP- Ecological Footprint- Human Development Index- Human Development Report – National initiatives for Sustainable Development - Hurdles to Sustainability - Science and Technology for sustainable development –Performance indicators of sustainability and Assessment mechanism – Inclusive Green Growth and Green Economy – National Sustainable Development Strategy Planning and National Status of Sustainable Development Goals

TOTAL: 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1 Explain and evaluate current challenges to sustainability, including modern world social, environmental, and economic structures and crises.

CO2 Identify and critically analyze the social environmental, and economic dimensions of sustainability in terms of UN Sustainable development goals

CO3 Develop a fair understanding of the social, economic and ecological linkage of Human well being, production and consumption

CO4 Evaluate sustainability issues and solutions using a holistic approach that focuses on connections between complex human and natural systems.

CO5 Integrate knowledge from multiple sources and perspectives to understand environmental limits governing human societies and economies and social justice dimensions of sustainability.

REFERENCES:

1. Tom Theis and Jonathan Tomkin, Sustainability: A Comprehensive Foundation, Rice University, Houston, Texas, 2012

2. A guide to SDG interactions:from science to implementation, International Council for Science, Paris,2017

3. Karel Mulder, Sustainable Development for Engineers - A Handbook and Resource Guide, Rouledge Taylor and Francis, 2017.

4. The New Global Frontier - Urbanization, Poverty and Environmentin the 21st Century - *George Martine,Gordon McGranahan,Mark Montgomery and Rogelio Fernández-Castilla,* IIED and UNFPA, Earthscan, UK, 2008
5. Nolberto Munier, Introduction to Sustainability: Road to a Better Future, Springer, 2006
6. Barry Dalal Clayton and Stephen Bass, Sustainable Development Strategies- a resource book", Earthscan Publications Ltd, London, 2002.

OCE434 ENVIRONMENTAL IMPACT ASSESSMENT L T P C
3 0 0 3

OBJECTIVES:

- To make the students to understand environmental clearance, its legal requirements and to provide knowledge on overall methodology of EIA, prediction tools and models, environmental management plan and case studies.

UNIT I INTRODUCTION 9

Historical development of Environmental Impact Assessment (EIA). Environmental Clearance- EIA in project cycle. legal and regulatory aspects in India – types and limitations of EIA –EIA process-screening – scoping - terms of reference in EIA- setting – analysis – mitigation. Cross sectoral issues –public hearing in EIA- EIA consultant accreditation.

UNIT II IMPACT INDENTIFICATION AND PREDICTION 10

Matrices – networks – checklists – cost benefit analysis – analysis of alternatives – expert systems in EIA. prediction tools for EIA – mathematical modeling for impact prediction – assessment of impacts – air – water – soil – noise – biological — cumulative impact assessment

UNIT III SOCIO-ECONOMIC IMPACT ASSESSMENT 8

Socio-economic impact assessment - relationship between social impacts and change in community and institutional arrangements. factors and methodologies- individual and family level impacts. communities in transition-rehabilitation

UNIT IV EIA DOCUMENTATION AND ENVIRONMENTAL MANAGEMENT PLAN 9

Environmental management plan - preparation, implementation and review – mitigation and rehabilitation plans – policy and guidelines for planning and monitoring programmes – post project audit – documentation of EIA findings – ethical and quality aspects of environmental impact assessment

UNIT V CASE STUDIES 9

Mining, power plants, cement plants, highways, petroleum refining industry, storage & handling of hazardous chemicals, common hazardous waste facilities, CETPs, CMSWMF, building and construction projects

TOTAL: 45 PERIODS

OUTCOMES:

- On completion of the course, the student is expected to be able to
  - **CO1** Understand need for environmental clearance, its legal procedure, need of EIA, its types, stakeholders and their roles
  - **CO2** Understand various impact identification methodologies, prediction techniques and model of impacts on various environments

CO3 Understand relationship between social impacts and change in community due to development activities and rehabilitation methods

CO4 Document the EIA findings and prepare environmental management and monitoring plan

CO5 Identify, predict and assess impacts of similar projects based on case studies

REFERENCES:

1. EIA Notification 2006 including recent amendments, by Ministry of Environment, Forest and Climate Change, Government of India

2. Sectoral Guidelines under EIA Notification by Ministry of Environment, Forest and Climate Change, Government of India

3. Canter, L.W., Environmental Impact Assessment, McGraw Hill, New York. 1996

4. Lawrence, D.P., Environmental Impact Assessment – Practical solutions to recurrent problems, Wiley-Interscience, New Jersey. 2003

5. Lee N. and George C. 2000. Environmental Assessment in Developing and Transitional Countries. Chichester: Willey

6. World Bank –Source book on EIA ,1999

7. Sam Mannan, Lees' Loss Prevention in the Process Industries, Hazard Identification Assessment and Control, 4th Edition, Butterworth Heineman, 2012.

OME431 VIBRATION AND NOISE CONTROL STRATEGIES **L T P C**

3 0 0 3

OBJECTIVES

- To appreciate the basic concepts of vibration in damped and undamped systems
- To appreciate the basic concepts of noise, its effect on hearing and related terminology
- To use the instruments for measuring and analyzing the vibration levels in a body
- To use the instruments for measuring and analyzing the noise levels in a system
- To learn the standards of vibration and noise levels and their control techniques

UNIT- I BASICS OF VIBRATION **9**

Introduction – Sources and causes of Vibration-Mathematical Models - Displacement, velocity and Acceleration - Classification of vibration: free and forced vibration, undamped and damped vibration, linear and non-linear vibration - Single Degree Freedom Systems - Vibration isolation - Determination of natural frequencies

UNIT- II BASICS OF NOISE **9**

Introduction - Anatomy of human ear - Mechanism of hearing - Amplitude, frequency, wavelength and sound pressure level - Relationship between sound power, sound intensity and sound pressure level - Addition, subtraction and averaging decibel levels - sound spectra -Types of sound fields - Octave band analysis - Loudness.

UNIT- III INSTRUMENTATION FOR VIBRATION MEASUREMENT **9**

Experimental Methods in Vibration Analysis.- Vibration Measuring Instruments - Selection of Sensors - Accelerometer Mountings - Vibration Exciters - Mechanical, Hydraulic, Electromagnetic

and Electrodynamics – Frequency Measuring Instruments -. System Identification from Frequency Response -Testing for resonance and mode shapes

UNIT- IV INSTRUMENTATION FOR NOISE MEASUREMENT AND ANALYSIS 9

Microphones - Weighting networks - Sound Level meters, its classes and calibration - Noise measurements using sound level meters - Data Loggers - Sound exposure meters - Recording of noise - Spectrum analyser - Intensity meters - Energy density sensors - Sound source localization.

UNIT- V METHODS OF VIBRATION CONTROL, SOURCES OF NOISE AND ITS CONTROL 9

Specification of Vibration Limits – Vibration severity standards - Vibration as condition Monitoring Tool – Case Studies - Vibration Isolation methods - Dynamic Vibration Absorber – Need for Balancing - Static and Dynamic Balancing machines – Field balancing - Major sources of noise - Noise survey techniques – Measurement technique for vehicular noise - Road vehicles Noise standard – Noise due to construction equipment and domestic appliances – Industrial noise sources and its strategies – Noise control at the source – Noise control along the path – Acoustic Barriers – Noise control at the receiver -- Sound transmission through barriers – Noise reduction Vs Transmission loss - Enclosures

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course the student will be able to

1. apply the basic concepts of vibration in damped and undamped systems
2. apply the basic concepts of noise and to understand its effects on systems
3. select the instruments required for vibration measurement and its analysis
4. select the instruments required for noise measurement and its analysis.
5. recognize the noise sources and to control the vibration levels in a body and to control noise under different strategies.

REFERENCES:

1. Singiresu S. Rao, “Mechanical Vibrations”, Pearson Education Incorporated, 2017.
2. Graham Kelly. Sand Shashidhar K. Kudari, “Mechanical Vibrations”, Tata McGraw –Hill Publishing Com. Ltd., 2007.
3. Ramamurti. V, “Mechanical Vibration Practice with Basic Theory”, Narosa Publishing House, 2000.
4. William T. Thomson, “Theory of Vibration with Applications”, Taylor & Francis, 2003.
5. G.K. Grover, “Mechanical Vibrations”, Nem Chand and Bros.,Roorkee, 2014.
6. A.G. Ambekar, “Mechanical Vibrations and Noise Engineering”, PHI Learning Pvt. Ltd., 2014.
7. David A. Bies and Colin H. Hansen, “Engineering Noise Control – Theory and Practice”, Spon Press, London and New York, 2009.

OME432 ENERGY CONSERVATION AND MANAGEMENT IN DOMESTIC SECTORS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1. To learn the present energy scenario and the need for energy conservation.
2. To understand the different measures for energy conservation in utilities.
3. Acquaint students with principle theories, materials, and construction techniques to create energy efficient buildings.

4. To identify the energy demand and bridge the gap with suitable technology for sustainable habitat

5. To get familiar with the energy technology, current status of research and find the ways to optimize a system as per the user requirement

UNIT I ENERGY SCENARIO 9

Primary energy resources - Sectorial energy consumption (domestic, industrial and other sectors), Energy pricing, Energy conservation and its importance, Energy Conservation Act-2001 and its features – Energy star rating.

UNIT II HEATING, VENTILLATION & AIR CONDITIONING 9

Basics of Refrigeration and Air Conditioning – COP / EER / SEC Evaluation – SPV system design & optimization for Solar Refrigeration.

UNIT III LIGHTING, COMPUTER, TV 9

Specification of Luminaries – Types – Efficacy – Selection & Application – Time Sensors – Occupancy Sensors – Energy conservation measures in computer – Television – Electronic devices.

UNIT IV ENERGY EFFICIENT BUILDINGS 9

Conventional versus Energy efficient buildings – Landscape design – Envelope heat loss and heat gain – Passive cooling and heating – Renewable sources integration.

UNIT V ENERGY STORAGE TECHNOLOGIES 9

Necessity & types of energy storage – Thermal energy storage – Battery energy storage, charging and discharging– Hydrogen energy storage & Super capacitors – energy density and safety issues – Applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

1. Understand technical aspects of energy conservation scenario.
2. Energy audit in any type for domestic buildings and suggest the conservation measures.
3. Perform building load estimates and design the energy efficient landscape system.
4. Gain knowledge to utilize an appliance/device sustainably.
5. Understand the status and current technological advancement in energy storage field.

REFERENCES:

1. Yogi Goswami, Frank Kreith, Energy Efficiency and Renewable energy Handbook, CRC Press, 2016
2. ASHRAE Handbook 2020 – HVAC Systems & Equipment
3. Paolo Bertoldi, Andrea Ricci, Anibal de Almeida, Energy Efficiency in Household Appliances and Lighting, Conference proceedings, Springer, 2001
4. David A. Bainbridge, Ken Haggard, Kenneth L. Haggard, Passive Solar Architecture: Heating, Cooling, Ventilation, Daylighting, and More Using Natural Flows, Chelsea Green Publishing, 2011.
5. Guide book for National Certification Examination for Energy Managers and Energy Auditors (Could be downloaded from www.energymanagertraining.com)
6. Ibrahim Dincer and Mark A. Rosen, Thermal Energy Storage Systems and Applications, John Wiley & Sons 2002.

7. Robert Huggins, Energy Storage: Fundamentals, Materials and Applications, 2nd edition, Springer, 2015

8. Ru-shiliu, Leizhang, Xueliang sun, Electrochemical technologies for energy storage and conversion, Wiley publications, 2012.

OME433 ADDITIVE MANUFACTURING L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Need - Development - Rapid Prototyping Rapid Tooling – Rapid Manufacturing – Additive Manufacturing. AM Process Chain- Classification – Benefits.

UNIT II DESIGN FOR ADDITIVE MANUFACTURING 9

CAD Model Preparation - Part Orientation and Support Structure Generation -Model Slicing - Tool Path Generation Customized Design and Fabrication - Case Studies.

UNIT III VAT POLYMERIZATION 9

Stereolithography Apparatus (SLA)- Materials -Process -Advantages Limitations- Applications. Digital Light Processing (DLP) - Materials – Process - Advantages - Applications. Multi Jet Modelling (MJM) - Principles - Process - Materials - Advantages and Limitations.

UNIT IV MATERIAL EXTRUSION AND SHEET LAMINATION 9

Fused Deposition Modeling (FDM)- Process-Materials - Applications and Limitations. Sheet Lamination Process: Laminated Object Manufacturing (LOM)- Basic Principle- Mechanism: Gluing or Adhesive Bonding – Thermal Bonding- Materials- Application and Limitation - Bio-Additive Manufacturing Computer Aided Tissue Engineering (CATE) – Case studies

POWDER BASED PROCESS

Selective Laser Sintering (SLS): Process –Mechanism– Typical Materials and Application- Multi Jet Fusion - Basic Principle-– Materials- Application and Limitation - Three Dimensional Printing - Materials -Process - Benefits and Limitations. Selective Laser Melting (SLM) and Electron Beam Melting (EBM): Materials – Process - Advantages and Applications. Beam Deposition Process: Laser Engineered Net Shaping (LENS)- Process -Material Delivery - Process Parameters - Materials -Benefits -Applications.

UNIT V CASE STUDIES AND OPPORTUNITIES ADDITIVE MANUFACTURING PROCESSES 9

Education and training - Automobile- pattern and mould - tooling - Building Printing-Bio Printing - medical implants -development of surgical tools Food Printing -Printing Electronics. Business Opportunities and Future Directions - Intellectual Property.

TOTAL: 45 PERIODS

REFERENCES:

1. Andreas Gebhardt and Jan-Steffen Hötter “Additive Manufacturing: 3D Printing for Prototyping and Manufacturing”, Hanser publications, United States, 2015, ISBN: 978-1- 56990-582-1.
2. Ian Gibson, David W. Rosen and Brent Stucker “Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing”, 2nd edition, Springer., United States, 2015, ISBN13: 978-1493921126.

3. Amit Bandyopadhyay and Susmita Bose, “Additive Manufacturing”, 1st Edition, CRC Press., United States, 2015, ISBN-13: 978-1482223590
4. Andreas Gebhardt, “Understanding Additive Manufacturing: Rapid Prototyping, Rapid Manufacturing”, Hanser Gardner Publication, Cincinnati., Ohio, 2011, ISBN :9783446425521.
5. Chua C.K., Leong K.F., and Lim C.S., “Rapid prototyping: Principles and applications”, Third edition, World Scientific Publishers, 2010.

OME434 ELECTRIC VEHICLE TECHNOLOGY L T P C
3 0 0 3

UNIT I NEED FOR ELECTRIC VEHICLES 9

History and need for electric and hybrid vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies, comparison of diesel, petrol, electric and hybrid vehicles, limitations, technical challenges

UNIT II ELECTRIC VEHICLE ARCHITECHTURE 9

Electric vehicle types, layout and power delivery, performance – traction motor characteristics, tractive effort, transmission requirements, vehicle performance, energy consumption, Concepts of hybrid electric drive train, architecture of series and parallel hybrid electric drive train, merits and demerits, mild and full hybrids, plug-in hybrid electric vehicles and range extended hybrid electric vehicles, Fuel cell vehicles.

UNIT III ENERGY STORAGE 9

Batteries – types – lead acid batteries, nickel based batteries, and lithium based batteries, electrochemical reactions, thermodynamic voltage, specific energy, specific power, energy efficiency, Battery modeling and equivalent circuit, battery charging and types, battery cooling, Ultra-capacitors, Flywheel technology, Hydrogen fuel cell, Thermal Management of the PEM fuel cell

UNIT IV ELECTRIC DRIVES AND CONTROL 9

Types of electric motors – working principle of AC and DC motors, advantages and limitations, DC motor drives and control, Induction motor drives and control, PMSM and brushless DC motor - drives and control , AC and Switch reluctance motor drives and control – Drive system efficiency – Inverters – DC and AC motor speed controllers

UNIT V DESIGN OF ELECTRIC VEHICLES 9

Materials and types of production, Chassis skate board design, motor sizing, power pack sizing, component matching, Ideal gear box – Gear ratio, torque–speed characteristics, Dynamic equation of vehicle motion, Maximum tractive effort – Power train tractive effort Acceleration performance, rated vehicle velocity – maximum gradability, Brake performance, Electronic control system, safety and challenges in electric vehicles. Case study of Nissan leaf, Toyota Prius, tesla model 3, and Renault Zoe cars.

TOTAL: 45 PERIODS

REFERENCES:

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, 2nd edition CRC Press, 2011.

2. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.
3. James Larminie, John Lowry, Electric Vehicle Technology Explained - Wiley, 2003.
4. Ehsani, M, “Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design”, CRC Press, 2005

OME435	NEW PRODUCT DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- Applying the principles of generic development process; and understanding the organization structure for new product design and development.
- Identfying opportunity and planning for new product design and development.
- Conducting customer need analysis; and setting product specification for new product design and development.
- Generating, selecting, and testing the concepts for new product design and development.
- Appling the principles of Industrial design and prototype for new product design and development.

UNIT I INTRODUCTION TO PRODUCTDESIGN & DEVELOPMENT 9

Introduction – Characteristics of Successful Product Development – People involved in Product Design and Development – Duration and Cost of Product Development – The Challenges of Product Development – The Product Development Process – Concept Development: The Front-End Process – Adapting the Generic Product Development Process – Product Development Process Flows – Product Development Organizations.

UNIT II OPPORTUNITY DENTIFICATION & PRODUCT PLANNING 9

Opportunity Identification: Definition – Types of Opportunities – Tournament Structure of Opportunity Identification – Effective Opportunity Tournaments – Opportunity Identification Process – Product Planning: Four types of Product Development Projects – The Process of Product Planning.

UNIT III IDENTIFYING CUSTOMER NEEDS & PRODUCT SPECIFICATIONS 9

Identifying Customer Needs: The Importance of Latent Needs – The Process of Identifying Customer Needs. Product Specifications: Definition – Time of Specifications Establishment – Establishing Target Specifications – Setting the Final Specifications

UNIT IV CONCEPT GENERATION, SELECTION & TESTING 9

Concept Generation: Activity of Concept Generation – Structured Approach – Five step method of Concept Generation. Concept Selection: Methodology – Concept Screening and Concepts Scoring. Concept testing: Seven Step activities of concept testing.

UNITV INDUSTRIAL DESIGN & PROTOTYPING 9

Industrial Design: Need and Impact–Industrial Design Process. Prototyping – Principles of Prototyping – Prototyping Technologies – Planning for Prototypes.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Apply the principles of generic development process; and understand the organization structure for new product design and development.
- Identify opportunity and plan for new product design and development.
- Conduct customer need analysis; and set product specification for new product design and development.
- Generate, select, and test the concepts for new product design and development.
- Apply the principles of Industrial design and prototype for design and develop new products.

TEXT BOOK:

1. Ulrich K.T., Eppinger S. D. and Anita Goyal, "Product Design and Development "McGraw-Hill Education; 7 edition, 2020.

REFERENCES:

1. Belz A., 36-Hour Course: "Product Development" McGraw-Hill, 2010.

2. Rosenthal S.,"Effective Product Design and Development", Business One Orwin,Homewood, 1992,ISBN1-55623-603-4.

2. Pugh.S,"Total Design Integrated Methods for Successful Product Engineering", Addison Wesley Publishing,1991,ISBN0-202-41639-5.

3. Chitale, A. K. and Gupta, R. C., Product Design and Manufacturing, PHI Learning, 2013.

4. Jamnia, A., Introduction to Product Design and Development for Engineers, CRC Press, 2018.

OBA431 SUSTAINABLE MANAGEMENT L T P C
3 0 0 3

COURSE OBJECTIVES:

- To provide students with fundamental knowledge of the notion of corporate sustainability.
- To determine how organizations impacts on the environment and socio-technical systems, the relationship between social and environmental performance and competitiveness, the approaches and methods.

UNIT I MANAGEMENT OF SUSTAINABILITY 9

Management of sustainability -rationale and political trends: An introduction to sustainability management, International and European policies on sustainable development, theoretical pillars in sustainability management studies.

UNIT II CORPORATE SUSTAINABILITY AND RESPONSIBILITY 9

Corporate sustainability parameter, corporate sustainability institutional framework, integration of sustainability into strategic planning and regular business practices, fundamentals of stakeholder engagement.

UNIT III SUSTAINABILITY MANAGEMENT: STRATEGIES AND APPROACHES 9

Corporate sustainability management and competitiveness: Sustainability-oriented corporate strategies, markets and competitiveness, Green Management between theory and practice, Sustainable Consumption and Green Marketing strategies, Environmental regulation and strategic

postures; Green Management approaches and tools; Green engineering: clean technologies and innovation processes; Sustainable Supply Chain Management and Procurement.

UNIT IV SUSTAINABILITY AND INNOVATION 9

Socio-technical transitions and sustainability, Sustainable entrepreneurship, Sustainable pioneers in green market niches, Smart communities and smart specializations.

UNIT V SUSTAINABLE MANAGEMENT OF RESOURCES, COMMODITIES AND COMMONS 9

Energy management, Water management, Waste management, Wild Life Conservation, Emerging trends in sustainable management, Case Studies.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

CO1: An understanding of sustainability management as an approach to aid in evaluating and minimizing environmental impacts while achieving the expected social impact.
CO2: An understanding of corporate sustainability and responsible Business Practices
CO3: Knowledge and skills to understand, to measure and interpret sustainabilityperformances.
CO4: Knowledge of innovative practices in sustainable business and community management
CO5: Deep understanding of sustainable management of resources and commodities

REFERENCES:

1. Daddi, T., Iraldo, F., Testa, Environmental Certification for Organizations and Products: Management, 2015
2. Christian N. Madu, Handbook of Sustainability Management 2012
3. Petra Molthan-Hill, The Business Student's Guide to Sustainable Management: Principles and Practice, 2014
4. Margaret Robertson, Sustainability Principles and Practice, 2014
5. Peter Rogers, An Introduction to Sustainable Development, 2006

OBA432 MICRO AND SMALL BUSINESS MANAGEMENT L T P C
3 0 0 3

COURSE OBJECTIVES

- To familiarize students with the theory and practice of small business management.
- To learn the legal issues faced by small business and how they impact operations.

UNIT I INTRODUCTION TO SMALL BUSINESS 9

Creation, Innovation, entrepreneurship and small business - Defining Small Business –Role of Owner – Manager – government policy towards small business sector –elements of entrepreneurship –evolution of entrepreneurship –Types of Entrepreneurship – social, civic, corporate - Business life cycle - barriers and triggers to new venture creation – process to assist start ups – small business and family business.

UNIT II SCREENING THE BUSINESS OPPORTUNITY AND FORMULATING THE BUSINESS PLAN 9

Concepts of opportunity recognition; Key factors leading to new venture failure; New venture screening process; Applying new venture screening process to the early stage small firm Role

planning in small business – importance of strategy formulation – management skills for small business creation and development.

UNIT III BUILDING THE RIGHT TEAM AND MARKETING STRATEGY 9

Management and Leadership – employee assessments – Tuckman's stages of group development - The entrepreneurial process model - Delegation and team building - Comparison of HR management in small and large firms - Importance of coaching and how to apply a coaching model.

Marketing within the small business - success strategies for small business marketing - customer delight and business generating systems, - market research, - assessing market performance-sales management and strategy - the marketing mix and marketing strategy.

UNIT IV FINANCING SMALL BUSINESS 9

Main sources of entrepreneurial capital; Nature of 'bootstrap' financing - Difference between cash and profit - Nature of bank financing and equity financing - Funding-equity gap for small firms. Importance of working capital cycle - Calculation of break-even point - Power of gross profit margin- Pricing for profit - Credit policy issues and relating these to cash flow management and profitability.

UNIT V VALUING SMALL BUSINESS AND CRISIS MANAGEMENT 9

Causes of small business failure - Danger signals of impending trouble - Characteristics of poorly performing firms - Turnaround strategies - Concept of business valuation - Different valuation measurements - Nature of goodwill and how to measure it - Advantages and disadvantages of buying an established small firm - Process of preparing a business for sale.

TOTAL: 45 PERIODS

COURSE OUTCOMES

CO1. Familiarise the students with the concept of small business
CO2. In depth knowledge on small business opportunities and challenges
CO3. Ability to devise plans for small business by building the right skills and marketing strategies
CO4. Identify the funding source for small start ups
CO5. Business evaluation for buying and selling of small firms

REFERENCES

1. Hankinson,A.(2000). "The key factors in the profile of small firm owner-managers that influence business performance. The South Coast Small Firms Survey, 1997-2000." Industrial and Commercial Training 32(3):94-98.
2. Parker,R.(2000). "Small is not necessarily beautiful: An evaluation of policy support for small and medium-sized enterprise in Australia." Australian Journal of Political Science 35(2):239-253.
3. Journal articles on SME's.

OBA433 INTELLECTUAL PROPERTY RIGHTS L T P C
3 0 0 3

COURSE OBJECTIVE

- To understand intellectual property rights and its valuation.

UNIT I INTRODUCTION 9

Intellectual property rights - Introduction, Basic concepts, Patents, Copyrights, Trademarks, Trade Secrets, Geographic Indicators; Nature of Intellectual Property, Technological Research, Inventions and Innovations, History - the way from WTO to WIPO, TRIPS.

UNIT II PROCESS 9

New Developments in IPR, Procedure for grant of Patents, TM, GIs, Patenting under Patent Cooperation Treaty, Administration of Patent system in India, Patenting in foreign countries.

UNIT III STATUTES 9

International Treaties and conventions on IPRs, The TRIPs Agreement, PCT Agreement, The Patent Act of India, Patent Amendment Act (2005), Design Act, Trademark Act, Geographical Indication Act, Bayh- Dole Act and Issues of Academic Entrepreneurship.

UNIT IV STRATEGIES IN INTELLECTUAL PROPERTY 9

Strategies for investing in R&D, Patent Information and databases, IPR strength in India, Traditional Knowledge, Case studies.

UNIT V MODELS 9

The technologies Know-how, concept of ownership, Significance of IP in Value Creation, IP Valuation and IP Valuation Models, Application of Real Option Model in Strategic Decision Making, Transfer and Licensing.

TOTAL: 45 PERIODS

COURSE OUTCOMES

CO1: Understanding of intellectual property and appreciation of the need to protect it
CO2: Awareness about the process of patenting
CO3: Understanding of the statutes related to IPR
CO4: Ability to apply strategies to protect intellectual property
CO5: Ability to apply models for making strategic decisions related to IPR

REFERENCES

1. V. Sople Vinod, Managing Intellectual Property by (Prentice hall of India Pvt.Ltd), 2006.

2. Intellectual Property rights and copyrights, EssEss Publications.

3. Primer, R. Anita Rao and Bhanoji Rao, Intellectual Property Rights, Lastain Book company.

4. Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2006.

5. WIPO Intellectual Property Hand book.

OBA434 ETHICAL MANAGEMENT L T P C

3 0 0 3

COURSE OBJECTIVE

- To help students develop knowledge and competence in ethical management and decision making in organizational contexts.

UNIT I ETHICS AND SOCIETY 9

Ethical Management- Definition, Motivation, Advantages-Practical implications of ethical management. Managerial ethics, professional ethics, and social Responsibility-Role of culture and society's expectations- Individual and organizational responsibility to society and the community.

UNIT II ETHICAL DECISION MAKING AND MANAGEMENT IN A CRISIS 9

Managing in an ethical crisis, the nature of a crisis, ethics in crisis management, discuss case studies, analyze real-world scenarios, develop ethical management skills, knowledge, and competencies. Proactive crisis management.

UNIT III STAKEHOLDERS IN ETHICAL MANAGEMENT 9

Stakeholders in ethical management, identifying internal and external stakeholders, nature of stakeholders, ethical management of various kinds of stakeholders: customers (product and service issues), employees (leadership, fairness, justice, diversity) suppliers, collaborators, business, community, the natural environment (the sustainability imperative, green management, Contemporary issues).

UNIT IV INDIVIDUAL VARIABLES IN ETHICAL MANJAGEMENT 9

Understanding individual variables in ethics, managerial ethics, concepts in ethical psychology-ethical awareness, ethical courage, ethical judgment, ethical foundations, ethical emotions/intuitions/intensity. Utilization of these concepts and competencies for ethical decision-making and management.

UNIT V PRACTICAL FIELD-GUIDE, TECHNIQUES AND SKILLS 9

Ethical management in practice, development of techniques and skills, navigating challenges and dilemmas, resolving issues and preventing unethical management proactively. Role modelling and creating a culture of ethical management and human flourishing.

TOTAL: 45 PERIODS

COURSE OUTCOMES

CO1: Role modelling and influencing the ethical and cultural context.
CO2: Respond to ethical crises and proactively address potential crises situations.
CO3: Understand and implement stakeholder management decisions.
CO4: Develop the ability, knowledge, and skills for ethical management.
CO5: Develop practical skills to navigate, resolve and thrive in management situations

PROGRESS THROUGH KNOWLEDGE

REFERENCES

1. Brad Agle, Aaron Miller, Bill O' Rourke, The Business Ethics Field Guide: the essential companion to leading your career and your company, 2016.

2. Steiner & Steiner, Business, Government & Society: A managerial Perspective, 2011.

3. Lawrence & Weber, Business and Society: Stakeholders, Ethics, Public Policy, 2020.

ET4251 IoT FOR SMART SYSTEMS LT P C
3 0 0 3

COURSE OBJECTIVES:

1. To study about **Internet of Things** technologies and its role in real time applications.
2. To introduce the infrastructure required for IoT

3. To familiarize the accessories and communication techniques for IoT.
4. To provide insight about the embedded processor and sensors required for IoT
5. To familiarize the different platforms and Attributes for IoT

UNIT I INTRODUCTION TO INTERNET OF THINGS 9

Overview, Hardware and software requirements for IOT, Sensor and actuators, Technology drivers, Business drivers, Typical IoT applications, Trends and implications.

UNIT II IOT ARCHITECTURE 9

IoT reference model and architecture -Node Structure - Sensing, Processing, Communication, Powering, Networking - Topologies, Layer/Stack architecture**,** IoT standards, Cloud computing for IoT, Bluetooth, Bluetooth Low Energy beacons.

UNIT III PROTOCOLS AND WIRELESS TECHNOLOGIES FOR IOT 9

PROTOCOLS:

NFC, SCADA and RFID, Zigbee MIPI, M-PHY, UniPro, SPMI, SPI, M-PCIe GSM, CDMA, LTE, GPRS, small cell.

Wireless technologies for IoT: WiFi (IEEE 802.11), Bluetooth/Bluetooth Smart, ZigBee/ZigBee Smart, UWB (IEEE 802.15.4), 6LoWPAN, Proprietary systems-Recent trends.

UNIT IV IOT PROCESSORS 9

Services/Attributes: Big-Data Analytics for IOT, Dependability,Interoperability, Security, Maintainability.

Embedded processors for IOT :Introduction to Python programming -Building IOT with RASPERRY PI and Arduino.

UNIT V CASE STUDIES 9

Industrial IoT, Home Automation, smart cities, Smart Grid, connected vehicles, electric vehicle charging, Environment, Agriculture, Productivity Applications, IOT Defense

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of this course, the students will have the ability to

CO1: Analyze the concepts of IoT and its present developments.
CO2: Compare and contrast different platforms and infrastructures available for IoT
CO3: Explain different protocols and communication technologies used in IoT
CO4: Analyze the big data analytic and programming of IoT
CO5: Implement IoT solutions for smart applications

REFERENCES:

1. ArshdeepBahga and VijaiMadisetti : A Hands-on Approach “Internet of Things”,Universities Press 2015.
2. Oliver Hersent , David Boswarthick and Omar Elloumi “ The Internet of Things”, Wiley,2016.
3. Samuel Greengard, “ The Internet of Things”, The MIT press, 2015.

4. Adrian McEwen and Hakim Cassimally"Designing the Internet of Things "Wiley,2014.

5. Jean- Philippe Vasseur, Adam Dunkels, "Interconnecting Smart Objects with IP: The Next Internet" Morgan Kuffmann Publishers, 2010.
6. Adrian McEwen and Hakim Cassimally, "Designing the Internet of Things", John Wiley and sons, 2014.
7. Lingyang Song/DusitNiyato/ Zhu Han/ Ekram Hossain," Wireless Device-to-Device Communications and Networks, CAMBRIDGE UNIVERSITY PRESS,2015.
8. OvidiuVermesan and Peter Friess (Editors), "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers Series in Communication, 2013.
9. Vijay Madisetti , ArshdeepBahga, "Internet of Things (A Hands on-Approach)", 2014.
10. Zach Shelby, Carsten Bormann, "6LoWPAN: The Wireless Embedded Internet", John Wiley and sons, 2009.
11. Lars T.Berger and Krzysztof Iniewski, "Smart Grid applications, communications and security", Wiley, 2015.
12. JanakaEkanayake, KithsiriLiyanage, Jianzhong Wu, Akihiko Yokoyama and Nick Jenkins, " Smart Grid Technology and Applications", Wiley, 2015.
13. UpenaDalal,"Wireless Communications & Networks,Oxford,2015.

ET4072 MACHINE LEARNING AND DEEP LEARNING L T P C
3 0 0 3

COURSE OBJECTIVES:

The course is aimed at

1. Understanding about the learning problem and algorithms
2. Providing insight about neural networks
3. Introducing the machine learning fundamentals and significance
4. Enabling the students to acquire knowledge about pattern recognition.
5. Motivating the students to apply deep learning algorithms for solving real life problems.

UNIT I LEARNING PROBLEMS AND ALGORITHMS 9

Various paradigms of learning problems, Supervised, Semi-supervised and Unsupervised algorithms

UNIT II NEURAL NETWORKS 9

Differences between Biological and Artificial Neural Networks - Typical Architecture, Common Activation Functions, Multi-layer neural network, Linear Separability, Hebb Net, Perceptron, Adaline, Standard Back propagation Training Algorithms for Pattern Association - Hebb rule and Delta rule, Hetero associative, Auto associative, Kohonen Self Organising Maps, Examples of Feature Maps, Learning Vector Quantization, Gradient descent, Boltzmann Machine Learning.

UNIT III MACHINE LEARNING – FUNDAMENTALS & FEATURE SELECTIONS & CLASSIFICATIONS 9

Classifying Samples: The confusion matrix, Accuracy, Precision, Recall, F1- Score, the curse of dimensionality, training, testing, validation, cross validation, overfitting, under-fitting the data, early stopping, regularization, bias and variance. Feature Selection, normalization, dimensionality

reduction, Classifiers: KNN, SVM, Decision trees, Naïve Bayes, Binary classification, multi class classification, clustering.

UNIT IV DEEP LEARNING: CONVOLUTIONAL NEURAL NETWORKS 9

Feed forward networks, Activation functions, back propagation in CNN, optimizers, batch normalization, convolution layers, pooling layers, fully connected layers, dropout, Examples of CNNs.

UNIT V DEEP LEARNING: RNNS, AUTOENCODERS AND GANS 9

State, Structure of RNN Cell, LSTM and GRU, Time distributed layers, Generating Text, Autoencoders: Convolutional Autoencoders, Denoising autoencoders, Variational autoencoders, GANs: The discriminator, generator, DCGANs

TOTAL : 45 PERIODS

COURSE OUTCOMES (CO):

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

CO1 : Illustrate the categorization of machine learning algorithms.

CO2: Compare and contrast the types of neural network architectures, activation functions

CO3: Acquaint with the pattern association using neural networks

CO4: Elaborate various terminologies related with pattern recognition and architectures of convolutional neural networks

CO5: Construct different feature selection and classification techniques and advanced neural network architectures such as RNN, Autoencoders, and GANs.

REFERENCES:

1. J. S. R. Jang, C. T. Sun, E. Mizutani, Neuro Fuzzy and Soft Computing - A Computational Approach to Learning and Machine Intelligence, 2012, PHI learning
2. Deep Learning, Ian Good fellow, YoshuaBengio and Aaron Courville, MIT Press, ISBN: 9780262035613, 2016.
3. The Elements of Statistical Learning. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Second Edition. 2009.
4. Pattern Recognition and Machine Learning. Christopher Bishop. Springer. 2006.
5. Understanding Machine Learning. Shai Shalev-Shwartz and Shai Ben-David. Cambridge University Press. 2017.

PROGRESS THROUGH KNOWLEDGE

PX4012 RENEWABLE ENERGY TECHNOLOGY L T P C

3 0 0 3

OBJECTIVES:

To impart knowledge on

- Different types of renewable energy technologies
- Standalone operation, grid connected operation of renewable energy systems

UNIT I INTRODUCTION 9

Classification of energy sources – Co2 Emission - Features of Renewable energy - Renewable energy scenario in India -Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment Per Capital Consumption - CO_2 Emission - importance of renewable energy sources, Potentials – Achievements– Applications.

UNIT II SOLAR PHOTOVOLTAICS 9

Solar Energy: Sun and Earth-Basic Characteristics of solar radiation- angle of sunrays on solar collector-Estimating Solar Radiation Empirically - Equivalent circuit of PV Cell- Photovoltaic cell-characteristics: P-V and I-V curve of cell-Impact of Temperature and Insolation on I-V characteristics-Shading Impacts on I-V characteristics-Bypass diode -Blocking diode.

UNIT III PHOTOVOLTAIC SYSTEM DESIGN 9

Block diagram of solar photo voltaic system : Line commutated converters (inversion mode) - Boost and buck-boost converters - selection of inverter, battery sizing, array sizing - PV systems classification- standalone PV systems - Grid tied and grid interactive inverters- grid connection issues.

UNIT IV WIND ENERGY CONVERSION SYSTEMS 9

Origin of Winds: Global and Local Winds- Aerodynamics of Wind turbine-Derivation of Betz's limit-Power available in wind-Classification of wind turbine: Horizontal Axis wind turbine and Vertical axis wind turbine- Aerodynamic Efficiency-Tip Speed-Tip Speed Ratio-Solidity-Blade Count-Power curve of wind turbine - Configurations of wind energy conversion systems: Type A, Type B, Type C and Type D Configurations- Grid connection Issues - Grid integrated SCIG and PMSG based WECS.

UNIT V OTHER RENEWABLE ENERGY SOURCES 9

Qualitative study of different renewable energy resources: ocean, Biomass, Hydrogen energy systems, Fuel cells, Ocean Thermal Energy Conversion (OTEC), Tidal and wave energy, Geothermal Energy Resources.

TOTAL : 45 PERIODS

OUTCOMES:

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

CO1: Demonstrate the need for renewable energy sources.

CO2: Develop a stand-alone photo voltaic system and implement a maximum power point tracking in the PV system.

CO3: Design a stand-alone and Grid connected PV system.

CO4: Analyze the different configurations of the wind energy conversion systems.

CO5: Realize the basic of various available renewable energy sources

REFERENCES:

1. S.N.Bhadra, D. Kastha, & S. Banerjee "Wind Electrical Systems", Oxford UniversityPress, 2009.
2. Rai. G.D, "Non conventional energy sources", Khanna publishes, 1993.
3. Rai. G.D," Solar energy utilization", Khanna publishes, 1993.
4. Chetan Singh Solanki, "Solar Photovoltaics: Fundamentals, Technologies and Applications", PHI Learning Private Limited, 2012.
5. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006
6. Gray, L. Johnson, "Wind energy system", prentice hall of India, 1995.
7. B.H.Khan, " Non-conventional Energy sources", , McGraw-hill, 2nd Edition, 2009.
8. Fang Lin Luo Hong Ye, " Renewable Energy systems", Taylor & Francis Group,2013.

PS4093 **SMART GRID** **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To Study about Smart Grid technologies, different smart meters and advanced metering infrastructure.
- To know about the function of smart grid.
- To familiarize the power quality management issues in Smart Grid.
- To familiarize the high performance computing for Smart Grid applications
- To get familiarized with the communication networks for Smart Grid applications

UNIT I INTRODUCTION TO SMART GRID 9

Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, Comparison of Micro grid and Smart grid, Present development & International policies in Smart Grid, Smart Grid Initiative for Power Distribution Utility in India – Case Study.

UNIT II SMART GRID TECHNOLOGIES 9

Technology Drivers, Smart Integration of energy resources, Smart substations, Substation Automation, Feeder Automation ,Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control, Distribution systems: DMS, Volt/Var control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plug in Hybrid Electric Vehicles (PHEV) – Grid to Vehicle and Vehicle to Grid charging concepts.

UNIT III SMART METERS AND ADVANCED METERING INFRASTRUCTURE 9

Introduction to Smart Meters, Advanced Metering infrastructure (AMI) drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit(PMU) & their application for monitoring & protection. Demand side management and demand response programs, Demand pricing and Time of Use, Real Time Pricing, Peak Time Pricing.

UNIT IV POWER QUALITY MANAGEMENT IN SMART GRID 9

Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.

Unit V HIGH PERFORMANCE COMPUTING FOR SMART GRID APPLICATIONS 9

Architecture and Standards -Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN), Broadband over Power line (BPL), PLC, Zigbee, GSM, IP based Protocols, Basics of Web Service and CLOUD Computing, Cyber Security for Smart Grid.

TOTAL : 45 PERIODS

COURSE OUTCOME:

Students able to

CO1: Relate with the smart resources, smart meters and other smart devices.

CO2: Explain the function of Smart Grid.

CO3: Experiment the issues of Power Quality in Smart Grid.

CO4: Analyze the performance of Smart Grid.

CO5**:** Recommend suitable communication networks for smart grid applications

REFERENCES

1. Stuart Borlase 'Smart Grid: Infrastructure, Technology and Solutions', CRC Press 2012.
2. JanakaEkanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu, Akihiko Yokoyama, 'Smart Grid: Technology and Applications', Wiley, 2012.
3. Mini S. Thomas, John D McDonald, 'Power System SCADA and Smart Grids', CRC Press, 2015
4. Kenneth C.Budka, Jayant G. Deshpande, Marina Thottan, 'Communication Networks for Smart Grids', Springer, 2014
5. SMART GRID Fundamentals of Design and Analysis, James Momoh, IEEE press, A John Wiley & Sons, Inc., Publication.

DS4015 BIG DATA ANALYTICS L T P C

3 0 0 3

COURSE OBJECTIVES:

- To understand the basics of big data analytics
- To understand the search methods and visualization
- To learn mining data streams
- To learn frameworks
- To gain knowledge on R language

UNIT I INTRODUCTION TO BIG DATA 9

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.

UNIT II SEARCH METHODS AND VISUALIZATION 9

Search by simulated Annealing – Stochastic, Adaptive search by Evaluation – Evaluation Strategies –Genetic Algorithm – Genetic Programming – Visualization – Classification of Visual Data Analysis Techniques – Data Types – Visualization Techniques – Interaction techniques – Specific Visual data analysis Techniques

UNIT III MINING DATA STREAMS 9

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

UNIT IV FRAMEWORKS 9

MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed File Systems – Case Study- Preventing Private Information Inference Attacks on Social Networks- Grand Challenge: Applying Regulatory Science and Big Data to Improve Medical Device Innovation

UNIT V R LANGUAGE 9

Overview, Programming structures: Control statements -Operators -Functions -Environment and scope issues -Recursion -Replacement functions, R data structures: Vectors -Matrices and arrays -Lists -Data frames -Classes, Input/output, String manipulations

COURSE OUTCOMES:

CO1:understand the basics of big data analytics

CO2: Ability to use Hadoop, Map Reduce Framework.

CO3: Ability to identify the areas for applying big data analytics for increasing the business outcome.

CO4:gain knowledge on R language

CO5: Contextually integrate and correlate large amounts of information to gain faster insights.

TOTAL:45 PERIODS

REFERENCE:

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 3rd edition 2020.
3. Norman Matloff, The Art of R Programming: A Tour of Statistical Software Design, No Starch Press, USA, 2011.
4. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, John Wiley & sons, 2012.
5. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007.

NC4201 INTERNET OF THINGS AND CLOUD L T P C

3 0 0 3

COURSE OBJECTIVES:

- To understand Smart Objects and IoT Architectures
- To learn about various IOT-related protocols
- To build simple IoT Systems using Arduino and Raspberry Pi.
- To understand data analytics and cloud in the context of IoT
- To develop IoT infrastructure for popular applications

UNIT I FUNDAMENTALS OF IoT 9

Introduction to IoT – IoT definition – Characteristics – IoT Complete Architectural Stack – IoT enabling Technologies – IoT Challenges. Sensors and Hardware for IoT – Hardware Platforms – Arduino, Raspberry Pi, Node MCU. A Case study with any one of the boards and data acquisition from sensors.

UNIT II PROTOCOLS FOR IoT 9

Infrastructure protocol (IPV4/V6/RPL), Identification (URIs), Transport (Wifi, Lifi, BLE), Discovery, Data Protocols, Device Management Protocols. – A Case Study with MQTT/CoAP usage-IoT privacy, security and vulnerability solutions.

UNIT III CASE STUDIES/INDUSTRIAL APPLICATIONS 9

Case studies with architectural analysis: IoT applications – Smart City – Smart Water – Smart Agriculture – Smart Energy – Smart Healthcare – Smart Transportation – Smart Retail – Smart waste management.

UNIT IV CLOUD COMPUTING INTRODUCTION 9

Introduction to Cloud Computing - Service Model – Deployment Model- Virtualization Concepts – Cloud Platforms – Amazon AWS – Microsoft Azure – Google APIs.

UNIT V IoT AND CLOUD 9

IoT and the Cloud - Role of Cloud Computing in IoT - AWS Components - S3 – Lambda - AWS IoT Core -Connecting a web application to AWS IoT using MQTT- AWS IoT Examples. Security Concerns, Risk Issues, and Legal Aspects of Cloud Computing- Cloud Data Security

TOTAL:45 PERIODS

COURSE OUTCOMES:

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

CO1: Understand the various concept of the IoT and their technologies..
CO2: Develop IoT application using different hardware platforms
CO3: Implement the various IoT Protocols
CO4: Understand the basic principles of cloud computing.
CO5: Develop and deploy the IoT application into cloud environment

REFERENCES

1. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman ,CRC Press, 2017

2. Adrian McEwen, Designing the Internet of Things, Wiley,2013.

3. EMC Education Services, “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, Wiley publishers, 2015.

4. Simon Walkowiak, “Big Data Analytics with R” PackT Publishers, 2016

5. Bart Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications”, Wiley Publishers, 2015.

MX4073 MEDICAL ROBOTICS L T P C

3 0 0 3

COURSE OBJECTIVES:

- To explain the basic concepts of robots and types of robots
- To discuss the designing procedure of manipulators, actuators and grippers
- To impart knowledge on various types of sensors and power sources
- To explore various applications of Robots in Medicine
- To impart knowledge on wearable robots

UNIT I INTRODUCTION TO ROBOTICS 9

Introduction to Robotics, Overview of robot subsystems, Degrees of freedom, configurations and concept of workspace, Dynamic Stabilization

Sensors and Actuators

Sensors and controllers, Internal and external sensors, position, velocity and acceleration sensors, Proximity sensors, force sensors Pneumatic and hydraulic actuators, Stepper motor control circuits, End effectors, Various types of Grippers, PD and PID feedback actuator models

UNIT II MANIPULATORS & BASIC KINEMATICS 9

Construction of Manipulators, Manipulator Dynamic and Force Control, Electronic and pneumatic manipulator, Forward Kinematic Problems, Inverse Kinematic Problems, Solutions of Inverse Kinematic problems

Navigation and Treatment Planning

Variable speed arrangements, Path determination – Machinery vision, Ranging – Laser – Acoustic, Magnetic, fiber optic and Tactile sensor

UNIT III SURGICAL ROBOTS 9

Da Vinci Surgical System, Image guided robotic systems for focal ultrasound based surgical applications, System concept for robotic Tele-surgical system for off-pump, CABG surgery, Urologic applications, Cardiac surgery, Neuro-surgery, Pediatric and General Surgery, Gynecologic Surgery, General Surgery and Nanorobotics. Case Study

UNIT IV REHABILITATION AND ASSISTIVE ROBOTS 9

Pediatric Rehabilitation, Robotic Therapy for the Upper Extremity and Walking, Clinical-Based Gait Rehabilitation Robots, Motion Correlation and Tracking, Motion Prediction, Motion Replication. Portable Robot for Tele rehabilitation, Robotic Exoskeletons – Design considerations, Hybrid assistive limb. Case Study

UNIT V WEARABLE ROBOTS 9

Augmented Reality, Kinematics and Dynamics for Wearable Robots, Wearable Robot technology, Sensors, Actuators, Portable Energy Storage, Human–robot cognitive interaction (cHRI), Human–robot physical interaction (pHRI), Wearable Robotic Communication - case study

TOTAL:45 PERIODS

PROGRESS THROUGH KNOWLEDGE

COURSE OUTCOMES:

CO1: Describe the configuration, applications of robots and the concept of grippers and actuators
CO2: Explain the functions of manipulators and basic kinematics
CO3: Describe the application of robots in various surgeries
CO4: Design and analyze the robotic systems for rehabilitation
CO5: Design the wearable robots

REFERENCES

1. Nagrath and Mittal, “Robotics and Control”, Tata McGraw Hill, First edition, 2003

2. Spong and Vidhyasagar, “Robot Dynamics and Control”, John Wiley and Sons, First edition, 2008

3. Fu.K.S, Gonzalez. R.C., Lee, C.S.G, “Robotics, control”, sensing, Vision and Intelligence, Tata McGraw Hill International, First edition, 2008

4. Bruno Siciliano, Oussama Khatib, Springer Handbook of Robotics, 1st Edition, Springer, 2008

5. Shane (S.Q.) Xie, Advanced Robotics for Medical Rehabilitation - Current State of the Art and Recent Advances, Springer, 2016

6. Sashi S Kommu, Rehabilitation Robotics, I-Tech Education and Publishing, 2007

7. Jose L. Pons, Wearable Robots: Biomechatronic Exoskeletons, John Wiley & Sons Ltd, England, 2008

8. Howie Choset, Kevin Lynch, Seth Hutchinson, "Principles of Robot Motion: Theory, Algorithms, and Implementations", Prentice Hall of India, First edition, 2005

9. Philippe Coiffet, Michel Chirouze, "An Introduction to Robot Technology", Tata McGraw Hill, First Edition, 1983

10. Jacob Rosen, Blake Hannaford & Richard M Satava, "Surgical Robotics: System Applications & Visions", Springer 2011

11. Jocelyn Troccaz, Medical Robotics, Wiley, 2012

12. Achim Schweikard, Floris Ernst, Medical Robotics, Springer, 2015

VE4202 EMBEDDED AUTOMATION L T P C
3 0 0 3

COURSE OBJECTIVES:

- To learn about the process involved in the design and development of real-time embedded system
- To develop the embedded C programming skills on 8-bit microcontroller
- To study about the interfacing mechanism of peripheral devices with 8-bit microcontrollers
- To learn about the tools, firmware related to microcontroller programming
- To build a home automation system

UNIT - I INTRODUCTION TO EMBEDDED C PROGRAMMING 9

C Overview and Program Structure - C Types, Operators and Expressions - C Control Flow - C Functions and Program Structures - C Pointers And Arrays - FIFO and LIFO - C Structures - Development Tools

UNIT - II AVR MICROCONTROLLER 9

ATMEGA 16 Architecture - Nonvolatile and Data Memories - Port System - Peripheral Features : Time Base, Timing Subsystem, Pulse Width Modulation, USART, SPI, Two Wire Serial Interface, ADC, Interrupts - Physical and Operating Parameters

UNIT – III HARDWARE AND SOFTWARE INTERFACING WITH 8-BIT SERIES CONTROLLERS 9

Lights and Switches - Stack Operation - Implementing Combinational Logic - Expanding I/O - Interfacing Analog To Digital Convertors - Interfacing Digital To Analog Convertors - LED Displays : Seven Segment Displays, Dot Matrix Displays - LCD Displays - Driving Relays - Stepper Motor

Interface - Serial EEPROM - Real Time Clock - Accessing Constants Table - Arbitrary Waveform Generation - Communication Links - System Development Tools

UNIT – IV VISION SYSTEM 9

Fundamentals of Image Processing - Filtering - Morphological Operations - Feature Detection and Matching - Blurring and Sharpening - Segmentation - Thresholding - Contours - Advanced Contour Properties - Gradient - Canny Edge Detector - Object Detection - Background Subtraction

UNIT – V HOME AUTOMATION 9

Home Automation - Requirements - Water Level Notifier - Electric Guard Dog - Tweeting Bird Feeder - Package Delivery Detector - Web Enabled Light Switch - Curtain Automation - Android Door Lock - Voice Controlled Home Automation - Smart Lighting - Smart Mailbox - Electricity Usage Monitor -Proximity Garage Door Opener - Vision Based Authentic Entry System

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: analyze the 8-bit series microcontroller architecture, features and pin details

CO2: write embedded C programs for embedded system application

CO3: design and develop real time systems using AVR microcontrollers

CO4: design and develop the systems based on vision mechanism

CO5: design and develop a real time home automation system

REFERENCES:

1. Dhananjay V. Gadre, "Programming and Customizing the AVR Microcontroller", McGraw-Hill, 2001.

2. Joe Pardue, "C Programming for Microcontrollers ", Smiley Micros, 2005.

3. Steven F. Barrett, Daniel J. Pack, "ATMEL AVR Microcontroller Primer : Programming and Interfacing", Morgan & Claypool Publishers, 2012

4. Mike Riley, "Programming Your Home - Automate With Arduino, Android and Your Computer", the Pragmatic Programmers, Llc, 2012.

5. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer, 2011.

6. Kevin P. Murphy, "Machine Learning - a Probabilistic Perspective", the MIT Press Cambridge, Massachusetts, London, 2012.

CX4016 ENVIRONMENTAL SUSTAINABILITY L T P C

3 0 0 3

UNIT I INTRODUCTION 9

Valuing the Environment: Concepts, Valuing the Environment: Methods, Property Rights, Externalities, and Environmental Problems

UNIT II CONCEPT OF SUSTAINABILITY 9

Sustainable Development: Defining the Concept, the Population Problem, Natural Resource Economics: An Overview, Energy, Water, Agriculture

UNIT III SIGNIFICANCE OF BIODIVERSITY 9

Biodiversity, Forest Habitat, Commercially Valuable Species, Stationary - Source Local Air Pollution, Acid Rain and Atmospheric Modification, Transportation

UNIT IV POLLUTION IMPACTS 9

Water Pollution, Solid Waste and Recycling, Toxic Substances and Hazardous Wastes, Global Warming.

UNIT V ENVIRONMENTAL ECONOMICS 9

Development, Poverty, and the Environment, Visions of the Future, Environmental economics and policy by Tom Tietenberg, Environmental Economics

TOTAL : 45 PERIODS

REFERENCES

1. Andrew Hoffman, Competitive Environmental Strategy - A Guide for the Changing Business Landscape, Island Press.
2. Stephen Doven, Environment and Sustainability Policy: Creation, Implementation, Evaluation, the Federation Press, 2005
3. Robert Brinkmann., Introduction to Sustainability, Wiley-Blackwell., 2016
4. Niko Roorda., Fundamentals of Sustainable Development, 3rd Edn, Routledge, 2020
5. Bhavik R Bakshi., Sustainable Engineering: Principles and Practice, Cambridge University Press, 2019

TX4092 TEXTILE REINFORCED COMPOSITES L T P C
3 0 0 3

UNIT I REINFORCEMENTS 9

Introduction – composites –classification and application; reinforcements- fibres and its properties; preparation of reinforced materials and quality evaluation; preforms for various composites

UNIT II MATRICES 9

Preparation, chemistry, properties and applications of thermoplastic and thermoset resins; mechanism of interaction of matrices and reinforcements; optimization of matrices

UNIT III COMPOSITE MANUFACTURING 9

Classification; methods of composites manufacturing for both thermoplastics and thermosets- Hand layup, Filament Winding, Resin transfer moulding, prepregs and autoclave moulding, pultrusion, vacuum impregnation methods, compression moulding; post processing of composites and composite design requirements

UNIT IV TESTING 9

Fibre volume and weight fraction, specif ic gravity of composites, tensile, f lexural, impact, compression, inter laminar shear stress and fatigue properties of thermoset and thermoplastic composites.

UNIT V MECHANICS 9

Micro mechanics, macro mechanics of single layer, macro mechanics of laminate, classical lamination theory, failure theories and prediction of inter laminar stresses using at ware

TOTAL: 45 PERIODS

REFERENCES

1. BorZ.Jang,“Advanced Polymer composites”,ASM International,USA,1994.

2. Carlsson L.A. and Pipes R.B., “Experimental Characterization of advanced composite Materials”,SecondEdition,CRCPress,NewJersey,1996.

3. George LubinandStanley T.Peters, “Handbook of Composites”, Springer Publications,1998.

4. Mel. M. Schwartz, “Composite Materials”, Vol. 1 &2, Prentice Hall PTR, New Jersey,1997.

5. RichardM.Christensen,“Mechanics of compositematerials”,DoverPublications,2005.

6. Sanjay K. Mazumdar, “Composites Manufacturing: Materials, Product, and Process Engineering”,CRCPress,2001

NT4002 NANOCOMPOSITE MATERIALS L T P C
3 0 0 3

UNIT I BASICS OF NANOCOMPOSITES 9

Nomenclature, Properties, features and processing of nanocomposites. Sample Preparation and Characterization of Structure and Physical properties. Designing, stability and mechanical properties and applications of super hard nanocomposites.

UNIT II METAL BASED NANOCOMPOSITES 9

Metal-metal nanocomposites, some simple preparation techniques and their properties. Metal-Oxide or Metal-Ceramic composites, Different aspects of their preparation techniques and their final properties and functionality. Fractal based glass-metal nanocomposites, its designing and fractal dimension analysis. Core-Shell structured nanocomposites

UNIT III POLYMER BASED NANOCOMPOSITES 9

Preparation and characterization of diblock Copolymer based nanocomposites; Polymer Carbon nanotubes based composites, their mechanical properties, and industrial possibilities.

UNIT IV NANOCOMPOSITE FROM BIOMATERIALS 9

Natural nanocomposite systems - spider silk, bones, shells; organic-inorganic nanocomposite formation through self-assembly. Biomimetic synthesis of nanocomposites material; Use of synthetic nanocomposites for bone, teeth replacement.

UNIT V NANOCOMPOSITE TECHNOLOGY 9

Nanocomposite membrane structures- Preparation and applications. Nanotechnology in Textiles and Cosmetics-Nano-fillers embedded polypropylene fibers – Soil repellence, Lotus effect - Nano finishing in textiles (UV resistant, anti-bacterial, hydrophilic, self-cleaning, flame retardant finishes), Sun-screen dispersions for UV protection using titanium oxide – Colour cosmetics. Nanotechnology in Food Technology - Nanopackaging for enhanced shelf life - Smart/Intelligent packaging.

TOTAL : 45 PERIODS

REFERENCES:

1. Introduction to Nanocomposite Materials. Properties, Processing, Characterization- Thomas E. Twardowski. 2007. DEStech Publications. USA.
2. Nanocomposites Science and Technology - P. M. Ajayan, L.S. Schadler, P. V.Braun 2006.
3. Physical Properties of Carbon Nanotubes- R. Saito 1998.
4. Carbon Nanotubes (Carbon , Vol 33) - M. Endo, S. Iijima, M.S. Dresselhaus 1997.
5. The search for novel, superhard materials- Stan Vepr¡ek (Review Article) JVST A, 1999
6. Nanometer versus micrometer-sized particles-Christian Brosseau, Jamal BeN Youssef, Philippe Talbot, Anne-Marie Konn, (Review Article) J. Appl. Phys, Vol 93, 2003
7. Diblock Copolymer, - Aviram (Review Article), Nature, 2002
8. Bikramjit Basu, Kantesh Balani Advanced Structural Ceramics, A John Wiley & Sons, Inc.,
9. P. Brown and K. Stevens, Nanofibers and Nanotechnology in Textiles, Woodhead publication, London, 2006

BY4016 IPR, BIOSAFETY AND ENTREPRENEURSHIP L T P C
3 0 0 3

UNIT I IPR 9

Intellectual property rights – Origin of the patent regime – Early patents act & Indian pharmaceutical industry – Types of patents – Patent Requirements – Application preparation filing and prosecution – Patentable subject matter – Industrial design, Protection of GMO's IP as a factor in R&D,IP's of relevance to biotechnology and few case studies.

UNIT II AGREEMENTS, TREATIES AND PATENT FILING PROCEDURES 9

History of GATT Agreement – Madrid Agreement – Hague Agreement – WIPO Treaties – Budapest Treaty – PCT – Ordinary – PCT – Conventional – Divisional and Patent of Addition – Specifications – Provisional and complete – Forms and fees Invention in context of "prior art" – Patent databases – Searching International Databases – Country-wise patent searches (USPTO,espacenet(EPO) – PATENT Scope (WIPO) – IPO, etc National & PCT filing procedure – Time frame and cost – Status of the patent applications filed – Precautions while patenting – disclosure/non-disclosure – Financial assistance for patenting – Introduction to existing schemes Patent licensing and agreement Patent infringement – Meaning, scope, litigation, case studies

UNIT III BIOSAFETY 9

Introduction – Historical Backround – Introduction to Biological Safety Cabinets – Primary Containment for Biohazards – Biosafety Levels – Biosafety Levels of Specific Microorganisms – Recommended Biosafety Levels for Infectious Agents and Infected Animals – Biosafety guidelines – Government of India.

UNIT IV GENETICALLY MODIFIED ORGANISMS 9

Definition of GMOs & LMOs – Roles of Institutional Biosafety Committee – RCGM – GEAC etc. for GMO applications in food and agriculture – Environmental release of GMOs – Risk Analysis – Risk Assessment – Risk management and communication – Overview of National Regulations and relevant International Agreements including Cartegana Protocol.

UNIT V ENTREPRENEURSHIP DEVELOPMENT 9

Introduction – Entrepreneurship Concept – Entrepreneurship as a career – Entrepreneurial

personality – Characteristics of successful Entrepreneur – Factors affecting entrepreneurial growth – Entrepreneurial Motivation – Competencies – Mobility – Entrepreneurship Development Programmes (EDP) - Launching Of Small Enterprise - Definition, Characteristics – Relationship between small and large units – Opportunities for an Entrepreneurial career – Role of small enterprise in economic development – Problems of small scale industries – Institutional finance to entrepreneurs - Institutional support to entrepreneurs.

TOTAL : 45 PERIODS

REFERENCES

1. Bouchoux, D.E., "Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets for the Paralegal", 3rd Edition, Delmar Cengage Learning, 2008.

2. Fleming, D.O. and Hunt, D.L., "Biological Safety: Principles and Practices", 4th Edition, American Society for Microbiology, 2006.

3. Irish, V., "Intellectual Property Rights for Engineers", 2nd Edition, The Institution of Engineering and Technology, 2005.

4. Mueller, M.J., "Patent Law", 3rd Edition, Wolters Kluwer Law & Business, 2009.

5. Young, T., "Genetically Modified Organisms and Biosafety: A Background Paper for Decision-Makers and Others to Assist in Consideration of GMO Issues" 1st Edition, World Conservation Union, 2004.

6. S.S Khanka, "Entrepreneurial Development", S.Chand & Company LTD, New Delhi, 2007.

PROGRESS THROUGH KNOWLEDGE

Principal
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ANNA UNIVERSITY
AFFILIATED INSTITUTIONS
REGULATIONS – 2017
CURRICULUM AND SYLLABUS I TO IV SEMESTERS (FULL TIME)
MASTER OF COMPUTER APPLICATIONS

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

I. To prepare students to pursue lifelong learning and do research in computing field by providing solid technical foundations.
II. To provide students with various computing skills like analysis, design and development of innovative software products to meet the industry needs and excel as software professionals.
III. To prepare students to communicate and function effectively in teams in multidisciplinary fields within the global, societal and environmental context

PROGRAM OUTCOMES (POS) :

On successful completion of the program:

1. **Computational knowledge:** Apply knowledge of computing fundamentals, computing specialisation, mathematics, and domain knowledge appropriate for the computing specialisation to the solution of complex problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex computing problems reaching substantiated conclusions using first principles of mathematics, computing sciences, and relevant domain disciplines.
3. **Design/development of solutions:** Design solutions for complex computing 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.
4. **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.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern computing and IT tools including prediction and modeling to complex computing systems with an understanding of the limitations
6. **Research Aptitude:** Ability to independently carry out research / investigations, identify problems and develop solutions to solve practical problems.
7. **Innovation and Entrepreneurship:** Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the professional computing practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex system building activities with the stake holders and with society at large, such as, being able to comprehend

J.K.K.Munirajah College of Technology
(Autonomous)
T.N.Palayam, Gobi (Tk),
Erode (Dt) - 638 506.

and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the 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.
12. **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.

PROGRAM SPECIFIC OBJECTIVES (PSO)

PSO 1: Able to select suitable data model, appropriate architecture, platform to implement a system with good performance.

PSO 2: Able to design and integrate various system based components to provide user interactive solutions for various challenges.

Mapping Of Programme Educational Objectives With Programme Outcomes And Programme Specific Objectives

Programme Educational Objectives	Programme Outcomes												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	√	√	√	√	√	√	√				√			√
2		√	√	√	√	√	√	√	√		√		√	
3		√		√	√	√			√	√	√	√	√	√

3. SEMESTER COURSE WISE PEO MAPPING

YEAR	SEMESTER	SUBJECT NAME	PEO1	PEO2	PEO3
YEAR 1	SEM 1	Matrices, Probability and Statistics	√		
		Advanced Data Structures and Algorithms	√	√	
		Advanced Database Technology	√	√	
		Object Oriented Software Engineering	√	√	√
		Python Programming	√	√	
		Research Methodology and Intellectual Property Rights	√		
		Advanced Database Technology Lab	√	√	
		Advanced Data Structures and Python Programming Lab	√	√	
		Communication Skills Enhancement – I			√
	SEM 2	Internet Programming	√	√	
		Cloud Computing Technologies	√	√	
		Artificial Intelligence and Machine Learning	√	√	
		Mobile Application Development	√	√	√
		Cyber Security	√	√	√
		Elective I			
		1. Software Project Management	√	√	√
		2. Agile Methodologies	√	√	√
		3. E Learning	√	√	√
		4. Software Quality and Testing	√	√	√
		5. Advances in Operating Systems	√	√	
		6. Digital Image Processing	√	√	
		Internet Programming Laboratory	√	√	
		Artificial Intelligence and Machine Learning Laboratory	√	√	
		Communication Skills Enhancement– II			√

YEAR	SEMESTER	SUBJECT NAME	PEO1	PEO2	PEO3
YEAR 2	SEM 3	Data Science	√	√	√
		Embedded Systems and Internet of Things	√	√	√
		Accounting and Financial Management for Application Development	√	√	√
		Elective II			
		1. Compiler Optimization Techniques	√	√	
		2. C# and .NET programming		√	
		3. Wireless Networking	√	√	

		4. Web Design	√	√	√
		5. Network Programming and Security	√	√	
		6. Microservices and Devops	√	√	
		Elective III			
		1. Social Network Analytics	√	√	√
		2. Bio Inspired Computing	√	√	
		3. Information Retrieval Techniques	√	√	
		4. Software Architecture	√	√	
		5. Digital Forensics	√	√	
		6. Data Mining and Data Warehousing Techniques	√	√	
		Elective IV			
		1. Data Visualization Techniques	√	√	
		2. Operations Research	√	√	
		3. Professional Ethics in IT	√	√	√
		4. Marketing Management			√
		5. Organizational Behavior	√	√	√
		6. Business Data Analytics		√	
		Elective V			
		1. Cryptocurrency and Blockchain Technologies	√	√	
		2. Advances in Networking	√	√	
		3. Soft Computing Techniques	√	√	
		4. Deep Learning	√	√	
		5. Big Data Processing	√	√	
		6. Natural Language Processing	√	√	
		Data Science Laboratory	√	√	
		Internet of Things Laboratory	√	√	
	SEM 4	Project Work	√	√	√

ANNA UNIVERSITY, CHENNAI
REGULATIONS – 2017
AFFILIATED INSTITUTIONS
CHOICE BASED CREDIT SYSTEM
MASTER OF COMPUTER APPLICATIONS

SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT HOURS	L	T	P	C
THEORY								
1.	MA5101	Matrices, Probability and Statistics	FC	5	3	2	0	4
2.	MC5301	Advanced Data Structures and Algorithms	PC	3	3	0	0	3
3.	MC5105	Advanced Database Technology	PC	3	3	0	0	3
4.	MC5106	Object Oriented Software Engineering	PC	3	3	0	0	3
5.	MC5107	Python Programming	PC	3	3	0	0	3
6.	MC5108	Research Methodology and Intellectual Property Rights	PC	2	2	0	0	2
PRACTICALS								
7.	MC5114	Advanced Database Technology Laboratory	PC	4	0	0	4	2
8.	MC5115	Advanced Data Structures and Python Programming Laboratory	PC	4	0	0	4	2
9.	MC5116	Communication Skills Enhancement – I	EEC	2	0	0	2	1
			TOTAL	**29**	**17**	**2**	**10**	**23**

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT HOURS	L	T	P	C
THEORY								
1.	MC5206	Internet Programming	PC	3	3	0	0	3
2.	MC5207	Cloud Computing Technologies	PC	3	3	0	0	3
3.	MC5208	Artificial Intelligence and Machine Learning	PC	3	3	0	0	3
4.	MC5209	Mobile Application Development	PC	4	2	0	2	3
5.	MC5210	Cyber Security	PC	3	3	0	0	3
6.		Professional Elective I	PEC	3	3	0	0	3
PRACTICALS								
7.	MC5214	Internet Programming Laboratory	PC	4	0	0	4	2
8.	MC5215	Artificial Intelligence and Machine Learning Laboratory	PC	4	0	0	4	2
9.	MC5216	Communication Skills Enhancement– II	EEC	2	0	0	2	1
			TOTAL	**29**	**17**	**0**	**12**	**23**

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT HOURS	L	T	P	C
THEORY								
1.	MC5306	Data Science	PC	3	3	0	0	3
2.	MC5307	Embedded Systems and Internet of Things	PC	3	3	0	0	3
3.	MC5308	Accounting and Financial Management for Application Development	PC	3	3	0	0	3
4.		Professional Elective II	PE	3	3	0	0	3
5.		Professional Elective III	PE	3	3	0	0	3
6.		Professional Elective IV	PE	3	3	0	0	3
7.		Professional Elective V:	PE	3	3	0	0	3
PRACTICALS								
1.	MC5314	Data Science Laboratory	PC	4	0	0	4	2
2.	MC5315	Internet of Things Laboratory	PC	4	0	0	4	2
			TOTAL	**29**	**21**	**0**	**8**	**25**

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT HOURS	L	T	P	C
PRACTICALS								
1.	MC5414	Project Work	PC	24	0	0	24	12
			TOTAL	**24**	**0**	**0**	**24**	**12**

TOTAL CREDITS: 83

PROFESSIONAL ELECTIVES

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
PROFESSIONAL ELECTIVE - I , Semester 2								
1.	MC5003	Software Project Management	PE	3	3	0	0	3
2.	MC5016	Agile Methodologies	PE	3	3	0	0	3
3.	MC5017	E Learning	PE	3	3	0	0	3
4.	MC5018	Software Quality and Testing	PE	3	3	0	0	3
5.	MC5019	Advances in Operating Systems	PE	3	3	0	0	3
6.	MC5020	Digital Image Processing	PE	3	3	0	0	3
PROFESSIONAL ELECTIVE – II, Semester 3								
1.	MC5021	Compiler Optimization Techniques	PE	3	3	0	0	3
2.	MC5022	C# and .NET programming	PE	3	3	0	0	3
3.	MC5023	Wireless Networking	PE	3	3	0	0	3
4.	MC5024	Web Design	PE	3	3	0	0	3
5.	MC5025	Network Programming and Security	PE	3	3	0	0	3
6.	MC5026	Microservices and Devops	PE	3	3	0	0	3
PROFESSIONAL ELECTIVE – III, Semester 3								
1.	MC5027	Social Network Analytics	PE		3	0	0	3
2.	MC5028	Bio Inspired Computing	PE		3	0	0	3
3.	MC5029	Information Retrieval Techniques	PE		3	0	0	3
4.	MC5030	Software Architecture	PE		3	0	0	3
5.	MC5031	Digital Forensics	PE	3	3	0	0	3
6.	MC5032	Data Mining and Data Warehousing Techniques	PE	3	3	0	0	3
PROFESSIONAL ELECTIVE – IV, Semester 3								
1.	MC5033	Data Visualization Techniques	PE	3	3	0	0	3
2.	MC5034	Operations Research	PE	3	3	0	0	3
3.	MC5035	Professional Ethics in IT	PE	3	3	0	0	3
4.	MC5036	Marketing Management	PE	3	3	0	0	3
5.	MC5037	Organizational Behavior	PE	3	3	0	0	3
6.	MC5038	Business Data Analytics	PE	3	3	0	0	3

PROFESSIONAL ELECTIVE – V, Semester 3								
1.	MC5039	Cryptocurrency and Blockchain Technologies	PE	3	3	0	0	3
2.	MC5040	Advances in Networking	PE	3	3	0	0	3
3.	MC5041	Soft Computing Techniques	PE	3	3	0	0	3
4.	MC5042	Deep Learning	PE	3	3	0	0	3
5.	MC5043	Big Data Processing	PE	3	3	0	0	3
6.	MC5044	Natural Language Processing	PE	3	3	0	0	3

FOUNDATION COURSES (FC)

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	MA5101	Matrices, Probability and Statistics	FC	5	3	2	0	4

PROFESSIONAL CORE (PC)

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	MC5301	Advanced Data Structures and Algorithms	PC	3	3	0	0	3
2.	MC5105	Advanced Database Technology	PC	3	3	0	0	3
3.	MC5106	Object Oriented Software Engineering	PC	3	3	0	0	3
4.	MC5107	Python Programming	PC	3	3	0	0	3
5.	MC5108	Research Methodology and Intellectual Property Rights	PC	2	2	0	0	2
6.	MC5114	Advanced Database Technology Lab	PC	4	0	0	4	2
7.	MC5115	Advanced Data Structures and Python Programming Lab	PC	4	0	0	4	2
8.	MC5206	Internet Programming	PC	3	3	0	0	3
9.	MC5207	Cloud Computing Technologies	PC	3	3	0	0	3
10	MC5208	Artificial Intelligence and Machine Learning	PC	3	3	0	0	3
11	MC5209	Mobile Application Development	PC	4	2	0	2	3
12	MC5210	Cyber Security	PC	3	3	0	0	3
13	MC5214	Internet Programming Laboratory	PC	4	0	0	4	2
14	MC5215	Artificial Intelligence and Machine Learning Laboratory	PC	4	0	0	4	2

15	MC5306	Data Science	PC	3	3	0	0	3
16	MC5307	Embedded Systems and Internet of Things	PC	3	3	0	0	3
17	MC5308	Accounting and Financial Management for Application Development	PC	3	3	0	0	3
18	MC5314	Data Science Laboratory	PC	4	0	0	4	2
19	MC5315	Internet of Things Laboratory	PC	4	0	0	4	2

EMPLOYABILITY ENHANCEMENT COURSE (EEC)

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	MC5116	Communication Skills Enhancement – I	EEC	2	0	0	2	1
2.	MC5216	Communication Skills Enhancement– II	EEC	2	0	0	2	1
3.	MC5414	Project Work	EEC	24	0	0	24	12

BRIDGE COURSES

SL. NO.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C
	Semester I						
1.	MA5102	Mathematical Foundations of Computer Science	3	3	0	0	3
2.	BX5001	Problem Solving And Programming In C	5	3	0	2	4
3.	BX5002	Digital logic and Computer Organization	3	3	0	0	3
4.	BX5003	Operating Systems	3	3	0	0	3
5.	BX5004	Data Structures and Algorithms	3	3	0	0	3
6.	BX5005	Programming and Data structures using C lab	4	0	0	4	2
	Semester II						
7.	BX5006	Data Base Management Systems	3	3	0	0	3
8.	BX5007	Java Programming	3	3	0	0	3
9	BX5008	Software Engineering	3	3	0	0	3
10.	BX5009	Basics of Computer Networks	3	3	0	0	3
11	BX5010	Java Programming Lab	4	0	0	4	2
12	BX5011	Data Base Management Systems Lab	4	0	0	4	2

MA5101 MATRICES, PROBABILITY AND STATISTICS L T P C
3 2 0 4

OBJECTIVES:

- To provide methods for understanding the consistency and solving the equation as well as for finding the Eigenvalues and Eigenvectors of square matrix.
- To provide foundation on Applied Probability
- To introducethe concepts of correlation and regression of random variables
- To use various statistical techniques in Application problems
- To introduce the concept of Design of Experiments for data analysis

UNIT - I MATRICES AND EIGENVALUE PROBLEMS 5

Matrices - Rank of a Matrix - Consistently of a system of linear equations - Solution of the matrix equation $\Delta x = b$ - Row - reduced Echelon Form - Eigenvalues and Eigenvectors - Properties - Cayley - Hamilton Theorem - Inverse of a matrix.

UNIT - II PROBABILITY AND RANDOM VARIABLES 15

Probability - Axioms of Probability - Conditional Probability - Addition and multiplication laws of Probability - Baye's theorem - Random Variables - Discrete and continuous random variables - Probability mass function and Probability density functions - Cumulative distribution function - Moments and variance of random variables - Properties - Binomial, Poisson, Geometric, Uniform, Exponential, Normal distributions and their properties.

UNIT - III TWO-DIMENTIONAL RANDOM VARIABLES 15

Joint probability distributions - Marginal and conditional probability distributions - Covariance - Correlation - Linear regression lines - Regression curves - Transform of random variables - Central limit theorem (for independent identically random variables).

UNIT - IV TESTING OF HYPOTHESIS 15

Sampling distributions - Tests based on small and large samples - Normal, Student's t, Chi-square and F distributions for testing of mean, variance and proportion and testing of difference of means variances and proportions - Tests for independence of attributes and goodness of fit.

UNIT - V DESIGN OF EXPERIMENTS 15

Analysis of variance - Completely randomized design - Random block design (One-way and Two-way classifications) - Latin square design -2^2 Factorial design.

TOTAL PERIODS:75

OUTCOMES:

After the completion of the course the student will be able to

- Test the consistency and solve system of linear equations as well as find the Eigenvalues and Eigenvector.
- Apply the Probability axioms as well as rules and the distribution of discrete and continuous ideas in solving real world problems.
- Apply the concepts of correlation and regression of random variables in solving application problems.
- Use statistical techniques in testing hypothesis on data analysis.
- Use the appropriate statistical technique of design of experiments in data analysis.

REFERENCE BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, New Delhi, 2015.
2. R.K. Jain and S.R.K Iyenger, Advanced Engineering Mathematics, Narosa Publishing House, New Delhi, 2002.
3. Devore, J.L, Probability and Statistics for Engineering and Sciences, Cengage Learning,
   8th Edition, New Delhi, 2014.
4. Miller and M. Miller, Mathematical Statistics, Pearson Education Inc., Asia 7th Edition, New Delhi, 2011.
5. Richard Johnson, Miller and Freund's Probability and Statistics for Engineer, Prentice Hall of India Private Ltd., 8th Edition, New Delhi, 2011.

Mapping of COs with POs and PSOs														
CO/POs & PSOs	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	√	√	-											
CO2	√	√	-	-									√	
CO3	√	√	√	√									√	
CO4	√	√	√	√	√	√							√	
CO5	√	√	√	√	√	√							√	

MC5301 ADVANCED DATA STRUCTURES AND ALGORITHMS L T P C
3 0 0 3

OBJECTIVES:

- Understand and apply linear data structures-List, Stack and Queue
- Understand the graph algorithms.
- Learn different algorithm analysis techniques.
- Apply data structures and algorithms in real time applications
- Analyze the efficiency of an algorithm

UNIT I LINEAR DATA STRUCTURES 9

Introduction - Abstract Data Types (ADT) – Stack – Queue – Circular Queue - Double Ended Queue - Applications of stack – Evaluating Arithmetic Expressions - Other Applications - Applications of Queue - Linked Lists - Singly Linked List - Circularly Linked List - Doubly Linked lists – Applications of linked list – Polynomial Manipulation.

UNIT II NON-LINEAR DATA STRUCTURES 9

Binary Tree – expression trees – Binary tree traversals – applications of trees – Huffman Algorithm - Binary search tree - Balanced Trees - AVL Tree - B-Tree - Splay Trees – Heap- Heap operations- -Binomial Heaps - Fibonacci Heaps- Hash set.

UNIT III GRAPHS 9

Representation of graph - Graph Traversals - Depth-first and breadth-first traversal - Applications of graphs - Topological sort – shortest-path algorithms - Dijkstra's algorithm – Bellman-Ford algorithm – Floyd's Algorithm - minimum spanning tree – Prim's and Kruskal's algorithms.

UNIT IV ALGORITHM DESIGN AND ANALYSIS 9

Algorithm Analysis – Asymptotic Notations - Divide and Conquer – Merge Sort – Quick Sort - Binary Search - Greedy Algorithms – Knapsack Problem – Dynamic Programming – Optimal Binary Search Tree - Warshall's Algorithm for Finding Transitive Closure.

UNIT V ADVANCED ALGORITHM DESIGN AND ANALYSIS 9

Backtracking – N-Queen's Problem - Branch and Bound – Assignment Problem - P & NP problems – NP-complete problems – Approximation algorithms for NP-hard problems – Traveling salesman problem-Amortized Analysis.

TOTAL: 45 PERIODS

OUTCOMES:

- Implement a program using stack, queue, linked list data structures
- Design and Implement Tree data structures and Sets
- Apply the Graph Data structure and to find shortest path among the several possibilities
- Perform analysis of various algorithms
- Analyze and design algorithms to appreciate the impact of algorithm design in practice.

REFERENCES:

1. AnanyLevitin "Introduction to the Design and Analysis of Algorithms" 3rd EditionPearson Education, 2015.
2. Jean Paul Tremblay and Paul G. Sorensen. "An Introduction to Data Structures with Applications", 2nd Edition, Tata McGraw Hill, New Delhi, 2017
3. Peter Drake, "Data Structures and Algorithms in Java", 4th Edition, Pearson Education 2014
4. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to algorithms", 3rd Edition, PHI Learning Private Ltd, 2012
5. V. Aho, J. E. Hopcroft, and J. D. Ullman, "Data Structures and Algorithms", 1st Edition,Pearson Education, 1983.
6. Michael T.Goodrich, "Algorithm Design: Foundations, Analysis and Internet Examples", 2nd Edition, Wiley India Pvt. Ltd, 2006.

Mapping of COs with POs and PSOs														
COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	√	√	√	√										
CO2	√	√	√	√									√	
CO3	√	√	√	√									√	
CO4	√	√	√	√									√	
CO5	√	√	√	√									√	

MC5105 ADVANCED DATABASE TECHNOLOGY L T P C
3 0 0 3

OBJECTIVES:

- To learn the fundamentals of data modeling and design in advanced databases.
- To study the working principles of distributed databases.
- To have an introductory knowledge about the query processing in object-based databases and its usage.
- To understand the basics of spatial, temporal and mobile databases and their applications.
- To learn emerging databases such as XML, Data warehouse and NoSQL.

UNIT I DISTRIBUTED DATABASES 9

Distributed Systems – Introduction – Architecture – Distributed Database Concepts – DistributedData Storage – Distributed Transactions – Commit Protocols – Concurrency Control – DistributedQuery Processing

UNIT II NOSQL DATABASES 9

NoSQL – CAP Theorem – Sharding - Document based – MongoDB Operation: Insert, Update, Delete, Query, Indexing, Application, Replication, Sharding, Deployment – Using MongoDB with PHP / JAVA – Advanced MongoDB Features – Cassandra: Data Model, Key Space, Table Operations, CRUD Operations, CQL Types – HIVE: Data types, Database Operations, Partitioning – HiveQL – OrientDB Graph database – OrientDB Features

UNIT III ADVANCED DATABASE SYSTEMS 9

Object Oriented Databases-Need for Complex Data Types - The Object-Oriented Data Model-Object-Oriented Languages-Spatial Databases: Spatial Data Types, Spatial Relationships, Spatial Data Structures, Spatial Access Methods – Temporal Databases: Overview – Active Databases – Deductive Databases – RecursiveQueries in SQL – Mobile Databases: Location and Handoff Management, Mobile TransactionModels, Concurrency – Transaction Commit Protocols – Multimedia Databases.

UNIT IV XML AND DATAWAREHOUSE 9

XML Database: XML – XML Schema – XML DOM and SAX Parsers – XSL – XSLT – XPath and XQuery – Data Warehouse: Introduction – Multidimensional Data Modeling – Star and SnowflakeSchema – Architecture – OLAP Operations and Queries.

UNIT V INFORMATION RETRIEVAL AND WEB SEARCH 9

IR concepts – Retrieval Models – Queries in IR system – Text Preprocessing – Inverted Indexing – Evaluation Measures – Web Search and Analytics – Ontology based Search - Current trends.

TOTAL: 45 PERIODS

OUTCOMES:

On completion of the course, the student will be able to:

1. Design a distributed database system and execute distributed queries.
2. Use NoSQL database systems and manipulate the data associated with it.
3. Design a data warehouse system and apply OLAP operations.
4. Design XML database systems and validating with XML schema.
5. Apply knowledge of information retrieval concepts on web databases.

REFERENCES:

1. Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", 6th Edition, McGraw Hill, 2011.
2. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education/Addison Wesley, 2017.
3. C. J. Date, A. Kannan, S. Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
4. Jiawei Han, MichelineKamber ,Jian Pei, "Data Mining: Concepts and Techniques", Third Edition, Morgan Kaufmann, 2012.
5. Brad Dayley, "Teach Yourself NoSQL with MongoDB in 24 Hours", Sams Publishing, First Edition, 2014.
6. ShashankTiwari, "Professional NoSQL", O'Reilly Media, First Edition, 2011.
7. Vijay Kumar, "Mobile Database Systems", John Wiley & Sons, First Edition, 2006

Mapping of COs with POs and PSOs														
COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	√	√	√	√	√				√	√			√	√
CO2	√	√	√	√	√				√	√			√	√
CO3	√	√	√	√	√				√	√			√	√
CO4	√	√	√	√	√				√	√			√	√
CO5	√	√	√	√	√				√	√			√	√

MC5106 OBJECT ORIENTED SOFTWARE ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To understand the phases in object oriented software development
- To gain fundamental concepts of requirements engineering and analysis.
- To know about the different approach for object oriented design and its methods
- To learn about how to perform object oriented testing and how to maintain software
- To provide various quality metrics and to ensure risk management.

UNIT I SOFTWARE DEVELOPMENT LIFE CYCLE 9

Introduction – Object Orientation - Object Oriented Methodologies – Terminologies - Software Development Life Cycle – Conventional Software Life Cycle Models – Build and Fix Model – Waterfall Model – Prototyping Model – Iterative Enhancement Model – Spiral Model – Extreme Programming - Object Oriented Software Life Cycle Models – Selection of Software Development Life Cycle Models

UNIT II OBJECT ORIENTED REQUIREMENTS ELICITATION & ANALYSIS 9

Software Requirement - Requirements Elicitation Techniques – Initial Requirements Document – Use Case Approach – Characteristics of a Good Requirement – SRS Document – Requirements Change Management – Object Oriented Analysis : Identification of Classes

and Relationships, Identifying State and Behavior – Case Study LMS - Managing Object Oriented Software Engineering: Projection Selection and Preparation – Product Development Organization – Project Organization and Management – Project Staffing

UNIT III OBJECT ORIENTED SOFTWARE DESIGN 9

Object Oriented Design – Interaction Diagrams – Sequence Diagram – Collaboration Diagrams – Refinement of Use Case Description – Refinement of Classes and Relationships – Construction of Detailed Class Diagram – Development of Detailed Design & Creation of Software Design Document - Object Oriented Methods : Object Oriented Analysis (OOA / Coad-Yourdon), Object Oriented Design (OOD/Booch) , Hierarchical Object Oriented Design (HOOD), Object Modeling Technique (OMT), Responsibility – Driven Design Case Studies : Warehouse Management System, Telecom

UNIT IV OBJECT ORIENTED TESTING AND MAINTENANCE 9

Software testing: Software Verification Techniques – Object Oriented Checklist :- Functional Testing – Structural Testing – Class Testing – Mutation Testing – Levels of Testing – Static and Dynamic Testing Tools - Software Maintenance – Categories – Challenges of Software Maintenance – Maintenance of Object Oriented Software – Regression Testing

UNIT V SOFTWARE QUALITY & METRICS 9

Need of Object Oriented Software Estimation – Lorenz and Kidd Estimation – Use Case Points Method – Class Point Method – Object Oriented Function Point – Risk Management – Software Quality Models – Analyzing the Metric Data – Metrics for Measuring Size and Structure – Measuring Software Quality - Object Oriented Metrics

TOTAL: 45 PERIODS

OUTCOMES:

- Able to identify the appropriate process model to develop the object oriented software
- Gain knowledge about requirement elicitation and analyzing techniques
- Able to choose and design suitable UML diagrams and methods
- Able to apply correct testing methods and maintain software systems.
- Able to estimate the object oriented application by applying metric data.

REFERENCES:

1. Yogesh Singh, RuchikaMalhotra, " Object – Oriented Software Engineering", PHI Learning Private Limited ,First edition,2012
2. Ivar Jacobson. Magnus Christerson, PatrikJonsson, Gunnar Overgaard, "Object Oriented Software Engineering, A Use Case Driven Approach", Pearson Education, Seventh Impression, 2009
3. Craig Larman, "Applying UML and Patterns, an Introduction to Object-Oriented Analysis and Design and Iterative Development", Pearson Education, Third Edition, 2008.
4. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen, Kelli A. Houston, "Object Oriented Analysis & Design with Applications, Third Edition, Pearson Education,2010
5. Roger S. Pressman, "Software Engineering: A Practitioner's Approach, Tata McGraw-Hill Education, 8th Edition, 2015.
6. Timothy C. Lethbridge and Robert Laganiere, "Object – Oriented Software Engineering, Practical Software Development using UML and Java", Tata McGraw Hill Publishing Company Limited, Second Edition, 2004

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	√	√	√							√	√		√	
CO 2		√	√	√	√					√	√		√	
CO 3			√		√	√			√	√				√
CO 4				√	√	√			√					√
CO 5	√		√		√			√	√			√		√

MC5107 PYTHON PROGRAMMING L T P C
3 0 0 3

OBJECTIVES:

- To develop Python programs with conditionals and loops.
- To define Python functions and use function calls.
- To use Python data structures – lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I PYTHON BASICS 10

Introduction to Python Programming – Python Interpreter and Interactive Mode– Variables and Identifiers – Arithmetic Operators – Values and Types – Statements. Operators – Boolean Values – Operator Precedence – Expression – Conditionals: If-Else Constructs – Loop Structures/Iterative Statements – While Loop – For Loop – Break Statement-Continue statement – Function Call and Returning Values – Parameter Passing – Local and GlobalScope – Recursive Functions.

UNIT II DATA TYPES IN PYTHON 10

Lists, Tuples, Sets, Strings, Dictionary, Modules: Module Loading and Execution – Packages – Making Your OwnModule – The Python Standard Libraries

UNIT III FILE HANDLING AND EXCEPTION HANDLING 8

Files: Introduction – File Path – Opening and Closing Files – Reading and Writing Files –File Position – Exception: Errors and Exceptions, Exception Handling, Multiple Exceptions

UNIT IV MODULES, PACKAGES 9

Modules: Introduction – Module Loading and Execution – Packages – Making Your OwnModule – The Python Libraries for data processing, data mining and visualization-NUMPY, Pandas, Matplotlib, Plotly

UNIT V OBJECT ORIENTED PROGRAMMING IN PYTHON 8

Creating a Class, Class methods, Class Inheritance, Encapsulation, Polymorphism, class method vs. static methods, Python object persistence

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

- Develop algorithmic solutions to simple computational problems
- Structure simple Python programs for solving problems.

- Read and write data from/to files in Python Programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Decompose a Python program into functions.

REFERENCES:

1. ReemaThareja, “Python Programming using Problem Solving Approach”, Oxford University Press, First edition, 2017
2. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, Second Edition, Shroff,O‘Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/)
3. Guido van Rossum, Fred L. Drake Jr., “An Introduction to Python – Revised andUpdated forPython 3.2, Network Theory Ltd., First edition, 2011
4. John V Guttag, “Introduction to Computation and Programming Using Python”,Revised and Expanded Edition, MIT Press, 2013
5. Charles Dierbach, “Introduction to Computer Science using Python”, Wiley IndiaEdition, First Edition, 2016
6. Timothy A. Budd, “Exploring Python”, Mc-Graw Hill Education (India) Private Ltd.,First edition,2011
7. Kenneth A. Lambert, “Fundamentals of Python: First Programs”, Cengage Learning, second edition,2012

Mapping of COs with POs and PSOs														
COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	√	√	√	√	√				√	√			√	√
CO2	√	√	√	√	√				√	√			√	√
CO3	√	√	√	√	√				√	√			√	√
CO4	√	√	√	√	√				√	√			√	√
CO5	√	√	√	√	√				√	√			√	√

MC5108 RESEARCH METHODOLOGY AND INTELLECTUAL PROPERTY RIGHTS

L T P C

2 0 0 2

COURSE OBJECTIVES:

The course should enable the students to:

- Identify an appropriate research problem in their interesting domain.
- Understand ethical issues; understand the Preparation of a research project thesis report.
- Understand the Preparation of a research project thesis report
- Understand the law of patent and copyrights.
- Acquire adequate knowledge of IPR.

UNIT I RESEARCH METHODOLOGY 6

Research Methodology – An Introduction, Objectives, Types of research, Research approaches, Significance, Research methods versus Methodology, Research and Scientific method, Importance, Research process, Criteria, Problems encountered by researchers.

Defining the research problem – Research problem, Selecting the problem, Necessity, Technique involved, An illustration.
Reviewing the Literature – The place of the literature review in research, How to review the Literature, Writing about the literature reviewed.

UNIT II RESEARCH DESIGN 6

Research Design – Meaning, Need, Features, Different research design, Basic principles of experimental designs, Important experimental designs.
Measurement & Scaling techniques – Sampling Design, Measurement in research, Measurement scales, Error, Measurement tools, Scaling, Meaning, Scale classification, Scale construction techniques
Data Collection – Collection of primary data, Collection of secondary data, Selection of appropriate method for data collection.

UNIT III RESEARCH TECHNIQUE AND TOOLS 6

Testing of Hypothesis – Basic concepts, Procedure, Test of Hypothesis, Important parametric Tests, Hypothesis Testing unifications.
Interpretation & Report writing – Meaning, techniques, Precaution in Interpretation, Significance of Report writing, steps, Layout, types, mechanics, precautions.
Use of Tools/ Techniques for research – Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases for Computer Science Discipline, Use of tools / techniques for Research methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism

UNIT IV IINTELLECTUAL PROPERTY RIGHTS 6

Intellectual Property – The concept, IPS in India, development, Trade secrets, utility Models, IPR & Bio diversity, CBD, WIPO, WTO, Right of Property, Common rules, PCT, Features of Agreement, Trademark, UNESCO.

UNIT V PATENTS 6

Patents – Learning objectives, Concept, features, Novelty, Inventive step, Specification, Types of patent application, E-filling, Examination, Grant of patent, Revocation, Equitable Assignments, Licences, Licencing of related patents, patent agents, Registration of patent agents.

TOTAL: 30 PERIODS

REFERENCE BOOKS:

1. Research Methodology: Methods and Techniques by C.R.Kothari, GauravGarg, New Age International 4th Edition 2018 (UNIT I to UNIT III)
2. Research Methodology a step-by-step guide for beginners by Ranjit Kumar, SAGE publications Ltd 3rd Edition 2011 (For the topic Reviewing the Literature under Unit I)
3. Stuart Melville and Wayne Goddard, “Research Methodology: An Introduction for Science & engineering students.Juta and Co., Limited, 1996, First edition
4. Research methods: The concise knowledge base-Trochim, Atomic Dog publishing, First edition,2005..
5. John W. Best & James V. Khan, “Research in Education”, Pearson 8thEdition’year.
6. Professional Programme Intellectual Property Rights, Law and practice, The Institute of Company Secretaries of India, Statutory body under an Act of parliament, September 2013 (UNIT IV & UNIT V)

OUTCOMES: (Cos)

On completion of the course the student would be able to :

CO1: Understand the research problem and Literature review.

CO2: Understand the various research designs and their characteristics.

CO3: Prepare a well-structured research paper and scientific presentations.

CO4: Explore on various IPR Components and process of filing.

CO5 Develop awareness the patent law and procedural mechanismin obtaining a patent.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	√	√		√	√	√	√			√		√	√	
CO 2		√	√		√	√	√					√		√
CO 3		√	√			√		√					√	
CO 4		√	√			√	√		√				√	
CO 5	√			√	√	√	√	√						√

MC5114 ADVANCED DATABASE TECHNOLOGY LABORATORY L T P C
0 0 4 2

OBJECTIVES:

The student should be able:

- To understand the concepts of Open Source DBMS.
- To understand the process of distributing tables across multiple systems
- To understand the process of storing, retrieving spatial and temporal data
- To understand the process of storing, retrieving objects in a database
- To understand the process of storing and retrieving data from a XML Database
- To use the open source database for building a mobile application

EXPERIMENTS IN THE FOLLOWING TOPICS:

1. NOSQL Exercises
   a. MongoDB – CRUD operations,Indexing, Sharding, Deployment
   b. Cassandra: Table Operations, CRUD Operations, CQL Types
   c. HIVE: Data types, Database Operations, Partitioning – HiveQL
   d. OrientDB Graph database – OrientDB Features
2. MySQL Database Creation, Table Creation, Query
3. MySQL Replication – Distributed Databases
4. Spatial data storage and retrieval in MySQL
5. Temporal data storage and retrieval in MySQL
6. Object storage and retrieval in MySQL
7. XML Databases , XML table creation, XQuery FLWOR expression
8. Mobile Database Query Processing using open source DB (MongoDB/MySQL etc)

TOTAL: 60 PERIODS

OUTCOMES:

Upon completion of this course, the student should be able to:

- Design and Implement databases.

- Formulate complex queries using SQL
- Design and Implement applications that have GUI and access databases for backend connectivity
- To design and implement Mobile Databases
- To design and implement databases to store spatial and temporal data objects

Mapping of COs with POs and PSOs														
COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	√	√	√	√	√				√	√			√	√
CO2	√	√	√	√	√				√	√			√	√
CO3	√	√	√	√	√				√	√			√	√
CO4	√	√	√	√	√				√	√			√	√
CO5	√	√	√	√	√				√	√			√	√

MC5115 ADVANCED DATA STRUCTURES AND PYTHON PROGRAMMING LABORATORY

L T P C
0 0 4 2

OBJECTIVES:

- To learn the basic programming constructs in Python.
- To implement Recursive programming in Python
- To implement Divide and Conquer algorithmic technique in Python
- To implement Tree Data structures in Python
- To implement Graphs in Python
- To deploy the standard libraries in Python

EXPERIMENTS:

1. Towers of Hanoi using Recursion
2. To implement Binary Search
3. Merge Sort
4. To implement AVL Trees using Python
5. To implement Splay Trees using Python
6. To implement Red black Trees using Python
7. To implement Graphs using Python
8. Implementing programs using written modules and Python Standard Libraries.
9. Implementing real-time/technical applications using Files and Exception handling.

TOTAL: 60 PERIODS

OUTCOMES:

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

1. Develop algorithmic solutions to simple computational problems
2. Develop and execute Python programs.
3. Decompose a Python program into functions.

4. Represent compound data using Python data structures.
5. Apply Python features in developing software applications.

Mapping of COs with POs and PSOs														
COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	√	√	√	√	√				√	√			√	√
CO2	√	√	√	√	√				√	√			√	√
CO3	√	√	√	√	√				√	√			√	√
CO4	√	√	√	√	√				√	√			√	√
CO5	√	√	√	√	√				√	√			√	√

MC5116 COMMUNICATION SKILLS - I

L	T	P	C
0	0	2	1

OBJECTIVES:

- To provide opportunities to learners to practice English and thereby make them proficient users of the language.
- To enable learners to fine-tune their linguistic skills (LSRW) with the help of Technology.
- To enhance the performance of students listening, speaking, reading and writing and thereby develop their career opportunities.

LIST OF ACTIVITIES:

1. Listening:
   - Listening and practicing neutral accents
   - Listening to short talks and lectures and completing listening comprehension exercises
   - Listening to TED Talks
2. Speaking:
   - Giving one minute talks
   - Participating in small Group Discussions
   - Making Presentations
3. Reading:
   - Reading Comprehension
   - Reading subject specific material
   - Technical Vocabulary
4. Writing:
   - Formal vs Informal Writing
   - Paragraph Writing
   - Essay Writing
   - Email Writing

TOTAL: 30 PERIODS

REFERENCES / MANUALS / SOFTWARE: Open Sources / websites

OUTCOMES:

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

- Listen and comprehend Lectures in English
- Articulate well and give presentations clearly
- Participate in Group Discussions successfully
- Communicate effectively in formal and informal writing
- Write proficient essays and emails

Mapping of COs with POs and PSOs														
COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1									√	√				
CO2									√	√				
CO3									√	√				
CO4										√				
CO5										√				

MC5206 INTERNET PROGRAMMING L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand the fundamentals of web programming and client side scripting.
- To learn the server side development using servlets, websocket.
- To learn the Spring framework and build applications using Spring.
- To learn and implement the concept of Java Persistence API.
- To learn the advanced client side scripting and framework.

UNIT I INTRODUCTION TO WEB & CLIENT SIDE PROGRAMMING 9

Introduction to Web: Server - Client - Communication Protocol (HTTP), JavaScript: Data Types and Variables - Expressions - Operators and Statements - Objects and Arrays - Functions - Classes - Modules - DOM - Events - Storage: LocalStorage, Cookies, IndexedDB, JSON, AJAX

UNIT II SERVER SIDE PROGRAMMING 9

Web Server: Web Containers - Web Components, Servlet: Lifecycle - Request - Servlet Context - Response - Filter - Session - Dispatching Requests, WebSocket, Logging - Log4j2, Build tool - Gradle. Introduction to Spring: IoC Container and Dependency Injection (DI)

UNIT III SPRING 9

Spring Configuration and Spring Boot, Spring MVC: DispatcherServlet and Configuration - Interceptors - Controllers - Views - Input Validation - File Upload, Building RESTful Web Services, Spring Security Architecture, Spring Cache.

UNIT IV JAVA PERSISTENCE API AND HIBERNATE 9

Entity: Basic, Embeddable and Collection Types - Identifiers - Entity Relationship - Inheritance, Persistence Context and Entity Manager, JPQL, Criteria API, Spring Data JPA - Specification and Projection.

UNIT V ADVANCED CLIENT SIDE PROGRAMMING 9

Asynchronous JavaScript: Callbacks - Promises - async and await, React JS: ReactDOM - JSX - Components - Properties - State and Lifecycle - Events - Lifting State Up - Composition and Inheritance - Higher Order Components.

TOTAL: 45 PERIODS

Course Outcomes:

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

- To write client side scripting.
- To implement the server side of the web application.
- To implement Web Application using Spring.
- To implement a Java application using Java Persistence API.
- To implement a full-stack Single Page Application using React, Spring and JPA.

REFERENCE BOOKS

1. David Flanagan, “Java Script: The Definitive Guide”, O’Reilly Media, Inc, 7th Edition, 2020
2. Matt Frisbie, "Professional JavaScript for Web Developers", Wiley Publishing, Inc, 4th Edition, ISBN: 978-1-119-36656-0, 2019
3. Alex Banks, Eve Porcello, "Learning React", O’Reilly Media, Inc, 2nd Edition, 2020 https://reactjs.org/docs
4. David R. Heffelfinger, "Java EE 8 Application Development", Packt Publishing, First edition2017
5. Benjamin Muschko, "Gradle in Action", Manning Publications, First edition2014
6. IulianaCosmina, Rob Harrop, Chris Schaefer, Clarence Ho, "Pro Spring 5: An In-Depth Guide to the Spring Framework and Its Tools", Apress, Fifth edition2017
7. Christian Bauer, Gavin King, and Gary Gregory, "Java Persistence with Hibernate", Manning Publications, \r, 2nd Edition, 2015

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	√	√	√		√								√	
CO 2	√	√	√										√	
CO 3	√	√	√	√	√	√	√	c	√	√	√		√	√
CO 4	√	√	√	√			√	√	√	√	√	√	√	√
CO 5	√	√	√	√	√		√					√	√	√

MC5207 CLOUD COMPUTING TECHNOLOGIES L T P C

3 0 0 3

OBJECTIVES:

- To understand the basic concepts of Distributed systems
- To learn about the current trend and basics of Cloud computing
- To be familiar with various Cloud concepts
- To expose with the Server, Network and storage virtualization
- To be aware of Microservices and DevOps

UNIT I DISTRIBUTED SYSTEMS 9

Introduction to Distributed Systems – Characterization of Distributed Systems – Distributed Architectural Models –Remote Invocation – Request-Reply Protocols – Remote Procedure Call – Remote Method Invocation – Group Communication – Coordination in Group Communication – Ordered Multicast – Time Ordering – Physical Clock Synchronization – Logical Time and Logical Clocks

UNIT II INTRODUCTION TO CLOUD COMPUTING 9

Cloud Computing Basics – Desired features of Cloud Computing – Elasticity in Cloud – On demand provisioning - Applications – Benefits – Cloud Components: Clients, Datacenters & Distributed Servers – Characterization of Distributed Systems – Distributed Architectural Models - Principles of Parallel and Distributed computing - Applications of Cloud computing – Benefits – Cloud services – Open source Cloud Software: Eucalyptus, Open Nebula, Open stack, Aneka, Cloudsim.

UNIT III CLOUD INFRASTRUCTURE 9

Cloud Architecture and Design – Architectural design challenges – Technologies for Network based system - NIST Cloud computing Reference Architecture – Public, Private and Hybrid clouds – Cloud Models : IaaS, PaaS and SaaS – Cloud storage providers - Enabling Technologies for the Internet of Things – Innovative Applications of the Internet of Things.

UNIT IV CLOUD ENABLING TECHNOLOGIES 9

Service Oriented Architecture – Web Services – Basics of Virtualization – Emulation – Types of Virtualization – Implementation levels of Virtualization – Virtualization structures – Tools & Mechanisms – Virtualization of CPU, Memory & I/O Devices – Desktop Virtualization – Server Virtualization – Google App Engine – Amazon AWS - Federation in the Cloud.

UNIT V MICROSERVICES AND DEVOPS 9

Defining Microservices - Emergence of Microservice Architecture – Design patterns of Microservices – The Mini web service architecture – Microservice dependency tree – Challenges with Microservices - SOA vsMicroservice – Microservice and API – Deploying and maintaining Microservices – Reason for having DevOps – Overview of DevOps – History of DevOps – Concepts and terminology in DevOps – Core elements of DevOps – Life cycle of DevOps – Adoption of DevOps - DevOps Tools – Build, Promotion and Deployment in DevOps - DevOps in Business Enterprises.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Use Distributed systems in Cloud Environment
- Articulate the main concepts, key technologies, strengths and limitations of Cloud computing
- Identify the Architecture, Infrastructure and delivery models of Cloud computing
- Install, choose and use the appropriate current technology for the implementation of Cloud
- Adopt Microservices and DevOps in Cloud environment

REFERENCES:

1. Kai Hwang, Geoffrey C. Fox & Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, First Edition, 2012
2. Andrew S. Tanenbaum& Maarten Van Steen, “Distributed Systems - Principles and Paradigms”, Second Edition, Pearson Prentice Hall, 2006
3. Thomas Erl, ZaighamMahood& Ricardo Puttini, “Cloud Computing, Concept, Technology & Architecture”, Prentice Hall, SecondEdition,2013
4. Richard Rodger, “The Tao of Microservices”, ISBN 9781617293146, Manning Publications, First Edition,December 2017.
5. Magnus Larsson, “Hands-On Microservices with Spring Boot and Spring Cloud: Build and deploy microservices using spring cloud, Istio and kubernetes”, Packt Publishing Ltd, First Edition,September 2019.
6. Jim Lewis, “DEVOPS: A complete beginner’s guide to DevOps best practices”, ISBN-13:978-1673259148, ISBN-10: 1673259146, First Edition, 2019.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	√	√	√					√			√	√	√	
CO 2	√	√	√	√	√	√	√	√	√	√		√	√	√
CO 3	√		√		√	√		√	√	√	√	√		√
CO 4	√			√	√	√	√	√	√	√	√	√	√	√
CO 5	√	√			√	√		√			√	√	√	√

MC5208 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING L T P C
3 0 0 3

OBJECTIVES:

- To familiarize with the principles of Artificial intelligence like problem solving, inference, perception, knowledge representation, and learning.
- To understand the various characteristics of Intelligent agents
- To design and implement the machine learning techniques for real world problems
- To gain experience in doing research using Artificial intelligence and Machine learning techniques.

UNIT I ARTIFICIAL INTELLIGENCE 9

Foundation of AI-History of AI-State of Art.-Intelligent Agents: Agents and Environments-Concepts of Rationality-Nature of Environments-Structure of Agents. Problem Solving: Problem Solving by Search: Problem Solving Agents-Searching for Solutions-Uniform Search Strategies-Heuristic Search Strategies- local Search Algorithms and Optimization Problems.

UNIT II KNOWLEDGE AND REASONING 9

Logical Agents: Knowledge Based Agents-Logic-Propositional Logic-Propositional Theorem Proving-Model Checking-Agent based on Propositional Logic. First-Order Logic: Syntax and Semantics- Using First-Order Logic-Knowledge Engineering. Inference in First-Order Logic:

Prepositional Vs. First-Order Inference-Unification and Lifting-Forward Chaining-Backward Chaining –Resolution.

UNIT III BAYESIAN LEARNING 9

Basic Probability Notation- Inference – Independence - Bayes' Rule. Bayesian Learning: Maximum Likelihood and Least Squared error hypothesis-Maximum Likelihood hypotheses for predicting probabilities- Minimum description Length principle -Bayes optimal classifier - Naïve Bayes classifier - Bayesian Belief networks -EM algorithm.

UNIT IV PARAMETRIC MACHINE LEARNING 9

Logistic Regression: Classification and representation – Cost function – Gradient descent – Advanced optimization – Regularization - Solving the problems on overfitting. Perceptron – Neural Networks – Multi – class Classification - Backpropagation – Non-linearity with activation functions (Tanh, Sigmoid, Relu, PRelu) - Dropout as regularization.

UNIT V NON PARAMETRIC MACHINE LEARNING 9

k- Nearest Neighbors- Decision Trees – Branching – Greedy Algorithm - Multiple Branches – Continuous attributes – Pruning. Random Forests:ensemble learning. Boosting – Adaboost algorithm. Support Vector Machines – Large Margin Intuition – Loss Function - Hinge Loss – SVM Kernels.

TOTAL: 45 PERIODS

REFERENCES:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach" , Third Edition Pearson Education Limited, 2015
2. CalumChace , "Surviving AI: The Promise and Peril of Artificial Intelligence", Three CS publication, Second Edition, 2015.
3. Christopher M Bishop, "Pattern Recognition and Machine Learning", Spring 2011 Edition.
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning: Data Mining, Inference and Prediction", Springer 2nd Edition
5. EthemAlpaydin, "Introduction to Machine Learning", Second Edition, MIT Press, 2010.
6. Tom M. Mitchell, "Machine Learning", India Edition, 1st Edition, McGraw-Hill Education Private Limited, 2013
7. Elaine Rich, Kevin Knight, Shivashankar B. Nair, "Artificial Intelligence", Third Edition, Tata McGraw-Hill Education, 2012
8. Elaine Rich, Kevin Knight, Shivashankar B. Nair, "Artificial Intelligence", Third Edition, Tata McGraw-Hill Education, 2012

OUTCOME:

- Apply the techniques of Problem Solving in Artificial Intelligence.
- Implement Knowledge and Reasoning for real world problems.
- Model the various Learning features of Artificial Intelligence
- Analyze the working model and features of Decision tree
- Apply k-nearest algorithm for appropriate research problem.

Mapping of COs with POs and PSOs														
COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	3										
CO2	1	3	3	2	1								1	
CO3	1	2	3	2									1	
CO4	1	3	1	1									1	
CO5	1	3	1										1	

1 – Slight, 2 – Moderate, 3 – Substantial.

MC5209 MOBILE APPLICATION DEVELOPMENT L T P C
2 0 2 3

OBJECTIVES:

- To understand the need and characteristics of mobile applications.
- To design the right user interface for mobile application.
- To understand the design issues in the development of mobile applications.
- To understand the development procedure for mobile application.
- To develop mobile applications using various tools and platforms.

UNIT I INTRODUCTION 12

Mobile Application Model – Infrastructure andManaging Resources – Mobile Device Profiles – Frameworks and Tools.

UNIT II USER INTERFACE 12

Generic UI Development - Multimodal and Multichannel UI –Gesture Based UI – Screen Elements and Layouts – Voice XML.

Lab Component:

i. Implement mobile application using UI toolkits and frameworks.
ii. Design an application that uses Layout Managers and event listeners.

UNIT III APPLICATION DESIGN 12

Memory Management – Design Patterns for Limited Memory – Work Flow for Applicationdevelopment – Java API – Dynamic Linking – Plugins and rule of thumb for using DLLs –Concurrency and Resource Management.

Lab Component:

i. Design a mobile application that is aware of the resource constraints of mobile devices.
ii. Implement an android application that writes data into the SD card.

UNIT IV MOBILE OS 12

Mobile OS: Android, iOS – Android Application Architecture – Android basic components – Intents and Services – Storing and Retrieving data – Packaging and Deployment – Security and Hacking.

Lab Component:

i. Develop an application that makes use of mobile database
ii. Implement an android application that writes data into the SD card.

UNIT V APPLICATION DEVELOPMENT 12

Communication via the Web – Notification and Alarms – Graphics and Multimedia: Layer Animation, Event handling and Graphics services – Telephony – Location based services

Lab Component:

i. Develop web based mobile application that accesses internet and location data.
ii. Develop an android application using telephony to send SMS.

TOTAL: 60 PERIODS

OUTCOMES

On completion of the course, the student will be able to

- Understand the basics of mobile application development frameworks and tools
- To be able to develop a UI for mobile application
- To design mobile applications that manages memory dynamically
- To build applications based on mobile OS like Android, iOs
- To build location based services

REFERENCES:

1. Reto Meier, “Professional Android 4 Application Development”, Wiley, First Edition, 2012
2. ZigurdMednieks, Laird Dornin, G. Blake Meike, Masumi Nakamura, “ProgrammingAndroid”, O’Reilly, 2nd Edition, 2012.
3. Alasdair Allan, “iPhone Programming”, O’Reilly, First Edition, 2010.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO 1		√			√	√			√		√		√	
CO 2	√	√	√		√				√	√	√		√	
CO 3	√	√		√							√	√	√	
CO 4	√	√	√	√							√	√		√
CO 5		√	√	√		√						√	√	

MA5210 CYBER SECURITY L T P C
3 0 0 3

OBJECTIVES

- To learn the principles of cyber security and to identify threats and risks.
- To learn how to secure physical assets and develop system security controls.
- To understand how to apply security for Business applications and Network Communications.
- To learn the technical means to achieve security.
- To learn to monitor and audit security measures.

UNIT I PLANNING FOR CYBER SECURITY 9

Best Practices-Standards and a plan of Action-Security Governance Principles, components and Approach-Information Risk Management-Asset Identification-Threat Identification-Vulnerability Identification-Risk Assessment Approaches-Likelihood and Impact Assessment-Risk Determination, Evaluation and Treatment-Security Management Function-Security Policy-Acceptable Use Policy-Security Management Best Practices.

UNIT II SECURITY CONTROLS 9

People Management-Human Resource Security-Security Awareness and Education-Information Management- Information Classification and handling-Privacy-Documents and Record Management-Physical Asset Management-Office Equipment-Industrial Control Systems-Mobile Device Security- System Development-Incorporating Security into SDLC-Case study on information security policies.

UNIT III CYBER SECURITY FOR BUSINESS APPLICATIONS AND NETWORKS 9

Business Application Management-Corporate Business Application Security-End user Developed Applications-System Access- Authentication Mechanisms-Access Control-System Management-Virtual Servers-Network Storage Systems-Network Management Concepts-Firewall-IP Security-Electronic Communications – Case study on OWASP vulnerabilities using OWASP ZAP tool.

UNIT IV TECHNICAL SECURITY 9

Supply Chain Management-Cloud Security-Security Architecture-Malware Protection-Intrusion Detection-Digital Rights Management-Cryptographic Techniques-Threat and Incident Management-Vulnerability Management-Security Event Management-Forensic Investigations-Local Environment Management-Business Continuity. – Case study on cloud and cryptographic vulnerabilities.

UNIT V SECURITY ASSESSMENT 9

Security Monitoring and Improvement-Security Audit-Security Performance-Information Risk Reporting-Information Security Compliance Monitoring-Security Monitoring and Improvement Best Practices. – Case study on vulnerability assessment using ACUNETIX.

TOTAL: 45 PERIODS

OUTCOMES

On completion of the course, the student will be able to

- Develop a set of risk and security requirements to ensure that there are no gaps in an organization’s security practices.
- Achieve management, operational and technical means for effective cyber security.
- Audit and monitor the performance of cyber security controls.
- To spot gaps in the system and devise improvements.

- Identify and report vulnerabilities in the system

REFERENCES:

1. William Stallings, “Effective Cyber Security- A guide to using Best Practices and Standards”, Addison-Wesley Professional, First Edition,2018.
2. Adam Shostack, “Threat Modelling- Designing for Security”, Wiley Publications,First Edition,2014.
3. Gregory J. Touhill and C. Joseph Touhill, “Cyber Security for Executives- A Practical guide”, Wiley Publications, First Edition,2014.
4. RaefMeeuwisse, “Cyber Security for Beginners”, Second Edition, Cyber Simplicity Ltd, 2017.
5. Patrick Engebretson, “The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy”, 2nd Edition, Syngress, 2013.
6. OWASP ZAP : https://owasp.org/www-project-zap/
7. ACUNETIX: https://www.acunetix.com/

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1		√			√	√			√		√		√	
CO 2	√	√	√		√				√	√	√		√	
CO 3	√	√		√							√	√	√	
CO 4	√	√	√	√							√	√		√
CO 5		√	√	√		√						√	√	

MC5214 INTERNET PROGRAMMING LABORATORY L T P C
0 0 4 2

Course Objectives:

1. To implement the client side of the web application using javascript.
2. To implement the server side of the web application using Servlets and WebSockets.
3. To develop a web application using Spring.
4. To implement a Persistence layer using Hibernate and Spring Data JPA.
5. To develop a full stack single page application using React, Spring and Hibernate.

1. Create an event registration application using javascript. It should implement different widgets for registration form and registered records view using tabs. It should perform the form validation.

2. Create a javascript application in an Object Oriented way using Classes and Modules. It should also use browser storage for persistence.

3. Build a web application using Gradle. The server side of the application should implement RESTful APIs using Servlet and do necessary logging. The client side of the application should be a single page application which consumes the RESTful APIs through AJAX.

4. Build a chat application using WebSocket.

5. Create a Spring MVC application. The application should handle form validation, file upload, session tracking.

6. Implement a RESTful Spring Boot application using Spring REST, Spring Security and Spring Cache.

7. Design a complex system using JPA and Hibernate. The system should have multiple entities and relationships between the entities. The database schema should be generated through Hibernate. Provide RESTful endpoints for CRUD operations for the defined entities. Also, support pagination and searching using JPA's JPQL and Criteria API.

8. Create a Spring RESTful Application with Spring Data JPA. Support pagination and searching using Specifications.

9. Create a React application with different components and interactions between the components.

10. Develop a full-stack application using React and Spring. Make use of Spring REST, Spring Security, Spring Data JPA, Hibernate, Spring Boot, Gradle and React's higher order component.

TOTAL : 60 PERIODS

Course Outcomes:

1. To implement client and server side of the web application.
2. To implement a real time application using WebSocket.
3. To use Spring framework in web development.
4. To implement applications using Java Persistence API.
5. To implement applications using the JavaScript framework React.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CO 1	√	√	√	√	√	√	√	√	√				√	√
CO 2	√	√	√	√	√	√	√	√	√	√	√		√	√
CO 3	√	√	√	√	√				√			√	√	√
CO 4	√	√	√	√	√				√			√	√	√
CO 5	√	√	√	√	√		√		√	√	√	√	√	√

MC5215 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

- To familiarize with the machine learning algorithms and implement in practical situations.
- To involve the students to practice AI algorithms and techniques.
- Learn to use different algorithms for real time data sets.

List of Experiments :

1. Write a program to illustrate problem solving as a search.
2. Write a program to illustrate local search algorithms.
3. Write a program to demonstrate logical agents.
4. Evaluate forward chainer and rule base on at least four different databases. Try to create at least one database that demonstrates an interesting feature of the domain, or an interesting feature of forward chaining in general.
5. Demonstrate agent based on propositional logic.
6. Write a program to implement the naïve Bayesian classifier for a sample training data set. Compute the accuracy of the classifier, considering few test data sets.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file.
9. Write a program to implement k-Nearest Neighbor algorithm to classify the data set.
10. Apply the technique of pruning for a noisy data monk2 data, and derive the decision tree from this data. Analyze the results by comparing the structure of pruned and unpruned tree.
11. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets
12. Implement Support Vector Classification for linear kernel.
13. Implement Logistic Regression to classify the problems such as spam detection. Diabetes predictions so on.

Total: 60 Periods

OUTCOMES:

- Apply the techniques of Problem Solving in Artificial Intelligence.
- Implement Knowledge and Reasoning for real world problems.
- Model the various Learning features of Artificial Intelligence
- Analyze the working model and features of Decision tree
- Apply k-nearest algorithm for appropriate research problem.

Mapping of COs with POs and PSOs														
COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	√	√	√	√	√	√								
CO2	√	√	√	√	√								√	

CO3	√	√	√	√									√	
CO4	√	√	√	√									√	√
CO5	√	√	√	√									√	√

MC5216 COMMUNICATION SKILLS ENHANCEMENT II L T P C
0 0 2 1

OBJECTIVES:

- To provide opportunities to learners to practice their communication skills to make them become proficient users of English.
- To enable learners to fine-tune their linguistic skills (LSRW) with the help of Technology to communicate globally.
- To enhance the performance of learners at placement interviews and group discussions and other recruitment procedures

1. **SOFT SKILLS**
   - People skills
   - Interpersonal skills
   - Team building skills
   - Leadership skills
   - Problem solving skills
2. **PRESENTATION SKILLS**
   - Preparing slides with animation related to the topic
   - Introducing oneself to the audience
   - Introducing the topic
   - Presenting the visuals effectively – 5 minute presentation
3. **GROUP DISCUSSION SKILLS**
   - Participating in group discussions
   - Brainstorming the topic
   - Activities to improve GD skills.
4. **INTERVIEW SKILLS**
   - Interview etiquette – dress code – body language
   - Attending job interviews
   - Answering questions confidently
   - Technical interview – telephone/Skype interview
   - Emotional and cultural intelligence
   - Stress Interview

TOTAL: 30 PERIODS

REFERENCES / MANUALS / SOFTWARE: Open Sources / websites

OUTCOMES:

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

- Students will be able to make presentations and participate in Group discussions withconfidence.
- Students will be able to perform well in theinterviews.

- Students will make effective presentations.

Mapping of COs with POs and PSOs														
COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1									√	√				
CO2									√	√				
CO3									√	√				
CO4										√				
CO5										√				

MC5306 DATA SCIENCE L T P C
3 0 0 3

OBJECTIVES:

- To know the fundamental concepts of data science and analytics.
- To learn fundamental data analysis using R.
- To understand various data modeling techniques.
- To learn the basic and advanced features of open source big data tools and frameworks.
- To study various analytics on stream data.

UNIT I INTRODUCTION TO DATA SCIENCE AND BIG DATA 9

Introduction to Data Science – Data Science Process – Exploratory Data analysis – Big data: Definition, Risks of Big Data, Structure of Big Data – Web Data: The Original Big Data – Evolution Of Analytic Scalability – Analytic Processes and Tools – Analysis versus Reporting – Core Analytics versus Advanced Analytics– Modern Data Analytic Tools – Statistical Concepts: Sampling Distributions – Re-Sampling – Statistical Inference – Introduction to Data Visualization.

UNIT II DATA ANALYSIS USING R 9

Univariate Analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis – Bivariate Analysis: Correlation – Regression Modeling: Linear and Logistic Regression – Multivariate Analysis – Graphical representation of Univariate, Bivariate and Multivariate Analysis in R: Bar Plot, Histogram, Box Plot, Line Plot, Scatter Plot, Lattice Plot, Regression Line, Two-Way cross Tabulation.

UNIT III DATA MODELING 9

Bayesian Modeling – Support Vector and Kernel Methods – Neuro – Fuzzy Modeling – Principal Component Analysis – Introduction to NoSQL: CAP Theorem, MongoDB: RDBMS VsMongoDB, Mongo DB Database Model, Data Types and Sharding – Data Modeling in HBase: Defining Schema – CRUD Operations

UNIT IV DATA ANALYTICAL FRAMEWORKS 10

Introduction to Hadoop: Hadoop Overview – RDBMS versus Hadoop – HDFS (Hadoop Distributed File System): Components and Block Replication – Introduction to MapReduce –

Running Algorithms Using MapReduce – Introduction to HBase: HBase Architecture, HLog and HFile, Data Replication – Introduction to Hive, Spark and Apache Sqoop.

UNIT V STREAM ANALYTICS 8

Introduction To Streams Concepts – Stream Data Model and Architecture – Stream Computing – Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window.

TOTAL: 45 PERIODS

OUTCOMES:

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

1. Convert real world problems to hypothesis and perform statistical testing.
2. Perform data analysis using R.
3. Design efficient modeling of very large data and work with big data platforms..
4. Implement suitable data analysis for stream data.
5. Write efficient MapReduce programs for small problem solving methods.

REFERENCES:

1. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, First Edition,2013.
2. Umesh R Hodeghatta, UmeshaNayak, “Business Analytics Using R – A Practical Approach”, Apress, First Edition,2017.
3. J. Leskowec, AnandRajaraman, Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, Second Edition,2014.
4. NishantGarg, “HBase Essentials”, Packt, First Edition, 2014.
5. Rachel Schutt, Cathy O'Neil, “Doing Data Science”, O'Reilly, First Edition,2013
6. Foster Provost, Tom Fawcet, “Data Science for Business”, O'Reilly, First Edition,2013.
7. Bart Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications”, Wiley, First Edition,2014.
8. https://www3.cs.stonybrook.edu/~skiena/519/

Mapping of COs with POs and PSOs														
COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	√	√	√	√	√				√	√			√	√
CO2	√	√	√	√	√				√	√			√	√
CO3	√	√	√	√	√				√	√			√	√
CO4	√	√	√	√	√				√	√			√	√
CO5	√	√	√	√	√				√	√			√	√

MC5307 EMBEDDED SYSTEMS AND INTERNET OF THINGS L T P C

3 0 0 3

OBJECTIVES:

- To learn the internal architecture and programming of an embedded processor.

- To introduce interfacing I/O devices to the processor and to run, debug programs in an IDE.
- To build a small low cost embedded system using Open Hardware Platforms.
- To apply the concept of Internet of Things in real world scenario.
- To deploy IoT application and connect to the cloud.

UNIT I EMBEDDED CONTROLLER 9

Microcontrollers and Embedded Processors, Introduction to 8051, PSW and Flag Bits, 8051 Register Banks and Stack, Internal Memory Organization of 8051, IO Port Usage in 8051, Types of Special Function Registers and their uses in 8051, Pins Of 8051. Memory Address Decoding, 8031/51 Interfacing With External ROM And RAM. 8051 Addressing Modes.

UNIT II EMBEDDED C PROGRAMMING 9

Memory and I/O Devices Interfacing – Programming Embedded Systems in C – Need for RTOS – Multiple Tasks and Processes – Context Switching – Priority Based Scheduling Policies.

UNIT III FUNDAMENTALS OF IOT 9

Introduction and Characteristics – Physical and Logical Design – IoT Protocols: Link Layer Protocols, Network Layer Protocols, Transport Layer and Application Layer Protocols – IoT Levels – IoT versus M2M – Sensors and Actuators – Power Sources.

UNIT IV BUILDING IOT 9

Open Hardware Platforms: Interfaces, Programming, APIs and Hacks – Web Services – Integration of Sensors and Actuators with Arduino/ Raspberry Pi/ Other Light Weight Boards.

UNIT V APPLICATIONS 9

Complete Design of Embedded Systems – Smart Cities: Smart Parking, Smart Traffic Control, Surveillance – Home Automation: Smart Appliances, Intrusion Detection, Smoke/Gas Detectors – Cloud Storage and Communication APIs: WAMP, Xively, Django – Data and Analytics for IoT.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Analyze architecture of embedded processors and micro controllers.
- Design and deploy timers and interrupts.
- Design and develop the prototype of embedded and IoTsystems.
- Design portable IoT using Arduino/Raspberry Pi /equivalent boards.
- Analyze and develop applications of IoT in real time scenario.

REFERENCES:

1. Wayne Wolf, “Computers as Components: Principles of Embedded Computer System Design”, Elsevier, First Edition, 2006.
2. Muhammad Ali Mazidi, Janice GillispieMazidi, Rolin D. McKinlay, “The 8051 Microcontroller and Embedded Systems”, Pearson Education, Second Edition, 2007.
3. ArshdeepBahga, Vijay Madisetti, “Internet of Things: A Hands-on-Approach**”,** VPT First Edition, 2014.

4. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton, Jerome Henry, “IoT Fundamentals, Networking Technologies, Protocols, and Use cases for the Internet of Thing”, Cisco Press, First Edition,2017.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1		√	√	√	√				√			√	√	
CO 2		√	√		√						√	√	√	
CO 3	√	√	√										√	√
CO 4	√	√	√			√							√	
CO 5	√	√	√	√					√		√		√	

MC5308 ACCOUNTING AND FINANCIAL MANAGEMENT FOR APPLICATION DEVELOPMENT

L T P C
3 0 0 3

OBJECTIVES:

- To understand the basic principles of Double entry system and preparation of balance sheet.
- To understand partnership accounts
- To understand the process of estimating the depreciation of a particular asset.
- To understand single entry accounting

UNIT I INTRODUCTION TO ACCOUNTING 9

Meaning and scope of Accounting, Basic Accounting Concepts and Conventions – Objectives of Accounting – Accounting Transactions – Double Entry Book Keeping – Journal, Ledger, Preparation of Trial Balance – Preparation of Cash Book.

UNIT II FINAL ACCOUNTS 9

Preparation of Final Accounts of a Sole Trading Concern – Adjustments Receipts and Payments Account, Income & Expenditure Account and Balance Sheet of Non Trading Organizations

UNIT III PARTNERSHIP ACCOUNTS 9

Partnership Accounts-Final accounts of partnership firms – Basic concepts of admission, retirement and death of a partner including treatment of goodwill - rearrangement of capitals. (Simple problems on Partnership Accounts).

UNIT IV DEPRECIATION 9

Depreciation – Meaning, Causes, Types – Straight Line Method – Written Down Value Method, Insurance Policy Method, Sinking Fund Method & Annuity Method. Insurance claims – Average Clause (Loss of stock & Loss of Profit)

UNIT V SINGLE ENTRY ACCOUNTING 9

Single Entry – Meaning, Features, Defects, Differences between Single Entry and Double Entry System – Statement of Affairs Method – Conversion Method

TOTAL: 45 PERIODS

OUTCOMES:

- Able to understand the basics of accounting
- Able to understand balance sheet preparation and do analysis
- Able to understand the partnership accounts
- Able to appreciate and depreciate the assets of an organization in accounting
- Able to understand Single Entry Accounting

REFERENCES:

1. R.L.Gupta & V.K.Gupta,Advanced Accounting - Sultan Chand& Sons - New Delhi. Fourteenth Revised and Enlarged Edition,2019
2. Jain &Narang, Financial Accounting - Kalyani Publishers - New Delhi, Twelfth edition - 2014
3. T.S. Reddy & A.Murthy, Financial Accounting - Margham Publications –Chennai-17. 6thEdition,2012
4. Shukla&Grewal, Advanced Accounting – S Chand - New Delhi,19thEdition,2017
5. Nirmal Gupta, Financial Accounting-Ane Books India – New Delhi.Fifth Edition,2012

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1				√						√	√	√		
CO 2				√						√	√	√		
CO 3				√						√	√	√		
CO 4				√						√	√	√		
CO 5				√						√	√	√		

MC5314 DATA SCIENCE LABORATORY L T P C

0 0 4 2

OBJECTIVES:

- To provide hands-on cloud and data analytics frameworks and tools.
- To use the Python/R packages for performing analytics.
- To learn using analytical tools for real world problems.
- To familiarize the usage of distributed frameworks for handling voluminous data.
- To write and deploy analytical algorithms as MapReduce tasks.

EXPERIMENTS:

Do the following experiments using R/Python:

1. Download, install and explore the features of R/Python for data analytics.

2. Use the Diabetes data set from UCI and Pima Indians Diabetes data set forperforming the following:

a. Univariate Analysis: Frequency, Mean, Median, Mode, Variance, StandardDeviation, Skewness and Kurtosis.

b. Bivariate Analysis: Linear and logistic regression modeling.
c. Multiple Regression Analysis
d. Also compare the results of the above analysis for the two data sets.

3. Apply Bayesian and SVM techniques on Iris and Diabetes data set.
4. Apply and explore various plotting functions on UCI data sets.

Implement the following using Hadoop, Map Reduce, HDFS, Hive:

1. Perform setting up and Installing Hadoop in its two operating modes: pseudo-distributed and fully distributed.
2. Implement the following file management tasks in Hadoop: adding files anddirectories, Retrieving files and Deleting files
3.
   (i) Performing a MapReduce Job for word search count (look for specific keywords ina file)
   (ii) Implement stop word elimination problem: Input a large textual file containing onesentence per line and a small file containing a set of stop words (one stop word perline) and save the results in an output textual file containing the same sentences ofthe large input file without the words appearing in the small file.
4. Implement a MapReduce program that processes a weather data set to:
   (i) Find average, max and min temperature for each year in National Climate DataCentre data set.
   (ii) Filter the readings of a set based on value of the measurement. The programmust save the line of input files associated with a temperature value greater than30.0 and store it in a separate file.
5. Install, deploy & configure Apache Spark cluster. Run Apache Spark applicationsusing Scala.
6. Install and run Hive then use Hive to create, alter, and drop databases, tables, views,functions, and indexes.
7. Mini projects on the following:
   (i) Simulate a simple recommender system with Amazon product dataset, Socialtweet data set etc. on Hadoop.
   (ii) Perform a very large text classification run on Hadoop.

TOTAL: 60 PERIODS

OUTCOMES:

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

1. Install analytical tools and configure distributed file system.
2. Have skills in developing and executing analytical procedures in various distributedframeworks and databases.
3. Develop, implement and deploy simple applications on very large datasets.
4. Implement simple to complex data modeling in NoSQL databases.
5. Develop and deploy simple applications in cloud.

MC5315	**INTERNET OF THINGS LABORATORY**	**L T P C**
		0 0 4 2

OBJECTIVES:

- To learn tools relevant to embedded system and IoT development.

- To write simple assembly programs that uses various features of the processor.
- To design and develop IoT application Arduino/Raspberry pi for real world scenario.

EXPERIMENTS:

PART I:

1. Implement assembly and Interfacing Programs Using Embedded C.
2. Embedded Application Development
   (i) Using Arduino and Raspberry Pi
   (ii) Using Bluemix platform
3. IoT Application Development
   (i) Using sensors and actuators (temperature sensor, light sensor, infraredsensor)
   (ii) Interfacing sensors with Arduino/Raspberry Pi/other equivalent boards
   (iii) Reading data from sensors
4. Explore different communication methods with IoT devices.
5. Collecting and processing data from IoT systems in the cloud using XivelyPaaS.
6. Develop IoT applications using Django Framework and Firebase/ Bluemix platform.

TOTAL: 60 PERIODS

OUTCOMES:

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

1. Write and implement simple assembly programs that use various features of theprocessor.
2. Test and experiment different sensors for application development Arduino/Raspberry Pi/ Equivalent boards.
3. Develop IOT applications with different platform and frameworks.

MC5003	SOFTWARE PROJECT MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To know of how to do project planning for the software process.
- To learn the cost estimation techniques during the analysis of the project.
- To understand the quality concepts for ensuring the functionality of the software

UNIT I SOFTWARE PROJECT MANAGEMENT CONCEPTS 9

Introduction to Software Project Management: An Overview of Project Planning: Select Project, Identifying Project scope and objectives, infrastructure, project products and Characteristics. Estimate efforts, Identify activity risks, and allocate resources- TQM, Six Sigma, Software Quality: defining software quality, ISO9126, External Standards.

UNIT II SOFTWARE EVALUATION AND COSTING 9

Project Evaluation: Strategic Assessment, Technical Assessment, cost-benefit analysis, Cash flow forecasting, cost-benefit evaluation techniques, Risk Evaluation. Selection of Appropriate Project approach: Choosing technologies, choice of process models, structured methods.

UNIT III SOFTWARE ESTIMATION TECHNIQUES 9

Software Effort Estimation: Problems with over and under estimations, Basis of software

Estimation, Software estimation techniques, expert Judgment, Estimating by analogy. Activity Planning: Project schedules, projects and activities, sequencing and scheduling Activities, networks planning models, formulating a network model.

UNIT IV RISK MANAGEMENT 9

Risk Management: Nature of Risk, Managing Risk, Risk Identification and Analysis, Reducing the Risk. Resource Allocation: Scheduling resources, Critical Paths, Cost scheduling, Monitoring and Control: Creating Framework, cost monitoring, prioritizing monitoring.

UNIT V GLOBALIZATION ISSUES IN PROJECT MANAGEMENT 9

Globalization issues in project management: Evolution of globalization- challenges in building global teams-models for the execution of some effective management techniques for managing global teams. Impact of the internet on project management: Introduction – the effect of internet on project management – managing projects for the internet – effect on project management activities. Comparison of project management software's: dot Project, Launch pad, openProj. Case study: PRINCE2.

TOTAL : 45 PERIODS

OUTCOMES:

- Understand the activities during the project scheduling of any software application.
- Learn the risk management activities and the resource allocation for the projects.
- Can apply the software estimation and recent quality standards for evaluation of the software projects
- Acquire knowledge and skills needed for the construction of highly reliable software project
- Able to create reliable, replicable cost estimation that links to the requirements of project planning and managing.

REFERENCES:

1. Bob Hughes & Mike Cotterell, "Software Project Management", Tata McGraw- Hill Publications, Fifth Edition 2012
2. Futrell , "Quality Software Project Management", Pearson Education India, 2008
3. Gobalswamy Ramesh, "Managing Global Software Projects", Tata McGraw Hill Publishing Company, 2003
4. Richard H.Thayer "Software Engineering Project Management", IEEE Computer Society
5. S. A. Kelkar," Software Project Management" PHI, New Delhi, Third Edition ,2013
6. http://en.wikipedia.org/wiki/Comparison_of_project_management_software
7. http://www.ogc.gov.uk/methods_prince_2.asp

MC5016 AGILE METHODOLOGIES L T P C
3 0 0 3

OBJECTIVES:

- To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.

- To provide a good understanding of software design and a set of software technologies and APIs.
- To do a detailed examination and demonstration of Agile development and testing techniques.
- To understand the benefits and pitfalls of working in an Agile team.
- To understand Agile development and testing

UNIT I AGILE METHODOLOGY 9

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

UNIT II AGILE PROCESSES 9

Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices

UNIT III AGILITY AND KNOWLEDGE MANAGEMENT 9

Agile Information Systems – Agile Decision Making – Earl's Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment, Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM)

UNIT IV AGILITY AND REQUIREMENTS ENGINEERING 9

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation

UNIT V AGILITY AND QUALITY ASSURANCE 9

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development - Agile Scrum - Scrum Master – Scaling Projects using Scrum

TOTAL: 45 PERIODS

OUTCOMES:

- Realize the importance of interacting with business stakeholders in determining the requirements for a software system
- Perform iterative software development processes: how to plan them, how to execute them.
- Point out the impact of social aspects on software development success.
- Develop techniques and tools for improving team collaboration and software quality.
- Show how agile approaches can be scaled up to the enterprise level

REFERENCES

1. David J. Anderson and Eli Schragenheim,, “Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results”, Illustrated Edition, Prentice Hall PTR, 2004
2. Orit Hazza and Yaepl Dubinsky, “Agile Software Engineering,: Undergraduate Topics in Computer Science, Springer Verlag, First Edition,2009
3. Craig Larman, “Agile and Iterative Development: A Manager’s Guide”, Pearson Education, Second Impression, 2007
4. Kevin C. Desouza, “Agile Information Systems: Conceptualization, Construction, and Management”, Elsevier, Butterworth-Heinemann, First Edition,2007
5. Ken Schwaber, “Agile Project Management with Scrum”, Illustrated, Revised Edition Microsoft Press, 2004
6. KonnorCluster, “Agile Project Management: Learn How To Manage a Project With Agile Methods, Scrum, Kanban and Extreme Programming”, Independently Published,First Edition,2019

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1		√	√	√	√					√	√		√	
CO 2	√	√		√	√				√		√		√	
CO 3		√				√	√	√						√
CO 4				√	√				√	√				√
CO 5	√			√		√	√		√	√		√		√

MC5017 E- LEARNING L T P C

3 0 0 3

OBJECTIVES:

- To learn the various E-learning approaches and Components.
- To explore Design Thinking.
- To understand the types of design models of E-learning.
- To learn about E-learning Authoring tools.
- To know about evaluation and management of E-learning solutions

UNIT I INTRODUCTION 9

Need for E-Learning – Approaches of E-Learning – Components of E-Learning – synchronous and Asynchronous Modes of Learning – Quality of E-Learning – Blended Learning: Activities, Team and Technology – Work Flow to Produce and Deliver E-Learning Content – Design Thinking: Introduction – Actionable Strategy – Act to Learn – Leading Teams to Win.

UNIT II DESIGNING E-LEARNINGCOURSECONTENT 9

Design Models of E-Learning – Identifying and Organizing E-Learning Course Content: Needs Analysis – Analyzing the Target Audience – Identifying Course Content – Defining Learning Objectives – Defining the Course Sequence – Defining Instructional Methods – Defining Evaluation and Delivery Strategies – Case Study.

UNIT III CREATINGINTERACTIVECONTENT 9

Preparing Content: Tips for Content Development and Language Style – Creating Storyboards: Structure of an Interactive E-Lesson – Techniques for Presenting Content – Adding Examples – Integrating Multimedia Elements – Adding Examples – Developing PracticeandAssessmentTests–AddingAdditionalResources–CoursewareDevelopment Authoring Tools – Types of Authoring Tools – Selecting an AuthoringTool.

UNIT IV LEARNINGPLATFORMS 9

Types of Learning Platforms – Proprietary Vs. Open – Source LMS – LMS Vs LCMS – Internally Handled and Hosted LMS – LMS Solutions – Functional Areas of LMS.

UNIT V COURSE DELIVERYAND EVALUATION 9

Components of an Instructor-Led or Facilitated Course – Planning and Documenting Activities – Facilitating Learners Activities – E-Learning Methods and Delivery Formats – Using Communication Tools for E-Learning – Course Evaluation.

TOTAL: 45 PERIODS

OUTCOMES:On completion of course, the students will be able to:

- Distinguish the phases of activities in models of E-learning.
- Identify appropriate instructional methods and delivery strategies.
- Choose appropriate E-learning Authoring tools.
- Create interactive E-learning courseware.
- Evaluate the E-learning courseware.

REFERENCE BOOKS:

1. Clark, R. C., Mayer, R. E., “E-Learning and the Science of Instruction”. Third Edition, 2011.
2. Crews, T. B., Sheth, S. N., Horne, T. M., “Understanding the Learning Personalities of Successful Online Students”, 1st Edition, Educause Review, 2014.
3. Johnny Schneider, “Understanding DesignThinking, Lean and Agile”, 1st Edition, O'Reilly Media,2017.
4. MadhuriDubey, “Effective E–learning Design, Development and Delivery”, 1st Edition, University Press, 2011.

Mapping of COs with POs and PSOs														
COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	3										
CO2	1	3	3	2	1								1	
CO3	1	2	3	2									1	
CO4	1	3	1	1									1	
CO5	1	3	1										1	

1 – Slight, 2 – Moderate, 3 – Substantial.

MC5018 **SOFTWARE QUALITY AND TESTING** **L T P C**
3 0 0 3

OBJECTIVES:

- To know the behavior of the testing techniques and to design test cases to detect the errors in the software
- To get insight into software testing methodologies
- To understand standard emerging areas in testing
- To learn about the software quality models.
- To understand the models and metrics of software quality and reliability.

UNIT I INTRODUCTION **9**

Basic concepts and Preliminaries – Theory of Program Testing– Unit Testing – Control Flow Testing –Data Flow Testing– System Integration Testing

UNIT II SOFTWARETESTINGMETHODOLOGY **9**

Software Test Plan–Components of Plan - Types of Technical Reviews - Static and Dynamic Testing- – Software Testing in Spiral Manner - Information Gathering - Test Planning - Test Coverage - Test Evaluation -Prepare for Next Spiral - Conduct System Test - Acceptance Test – Summarize Testing Results.

UNIT III EMERGING SPECIALIZED AREAS IN TESTING **9**

Test Process Assessment – Test Automation Assessment - Test Automation Framework – Nonfunctional Testing – SOA Testing – Agile Testing – Testing Center of Excellence – Onsite/Offshore Model - Modern Software Testing Tools – Software Testing Trends – Methodology to Develop Software Testing Tools.

UNIT IV SOFTWARE QUALITY MODELS **9**

Software quality –Verification versus Validation– Components of Quality Assurance – SQA Plan – Quality Standards – CMM – PCMM – CMMI – Malcolm Baldrige National Quality Award.

UNIT V QUALITY THROUGH CONTINUOUS IMPROVEMENT PROCESS **9**

Role of Statistical Methods in Software Quality – Transforming Requirements intoTest Cases – Deming's Quality Principles – Continuous Improvement through Plan Do Check Act (PDCA)

TOTAL: 45 PERIODS

OUTCOMES:

Up on completion of the course the students will be able to

- choose the software testing techniques to cater to the need of the project
- identify the components of software quality assurance systems
- apply various software testing strategies
- design and develop software quality models
- make use of statistical methods in software quality.

REFERENCE BOOKS:

1. William E.Lewis, "Software Testing and Continuous Quality Improvement", 3rdEdition, Auerbach Publications, 2011
2. KshirasagarNaik and PriyadarshiTripathy, "Software Testing and Quality Assurance Theory and Practice", 2nd Edition, John Wiley & Sons Publication, 2011
3. Ron Patton, "Software Testing", 2nd Edition, Pearson Education, 2007

4. Glenford J. Myers, Tom Badgett, Corey Sandler, “The Art of Software Testing”, 3rd Edition, John Wiley & Sons Publication, 2012.
5. Paul C. Jorgensen, “Software Testing, A Craftman’sApproach”, CRC Press Taylor & Francis Group, Fourth Edition, 2018

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CO1		√		√		√								
CO2			√	√										
CO3				√	√									
CO4			√		√									
CO5	√	√	√	√	√								1	

MC5019 ADVANCES IN OPERATING SYSTEMS L T P C
3 0 0 3

OBJECTIVES:

- To learn the fundamentals of Operating Systems
- To gain knowledge on Distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols
- To gain insight on to the distributed resource management components viz. the algorithms for implementation of distributed shared memory, recovery and commit protocols
- To know the components and management aspects of Real time, Mobile operating systems

UNIT I FUNDAMENTALS OF OPERATING SYSTEMS 9

Overview – Synchronization Mechanisms – Processes and Threads - Process Scheduling – Deadlocks: Detection, Prevention and Recovery – Models of Resources – Memory Management Techniques.

UNIT II DISTRIBUTED OPERATING SYSTEMS 9

Issues in Distributed Operating System – Architecture – Communication Primitives – Lamport’s Logical clocks – Causal Ordering of Messages – Distributed Mutual Exclusion Algorithms – Centralized and Distributed Deadlock Detection Algorithms – Agreement Protocols

UNIT III DISTRIBUTED RESOURCE MANAGEMENT 9

Distributed File Systems – Design Issues - Distributed Shared Memory – Algorithms for Implementing Distributed Shared memory–Issues in Load Distributing – Scheduling Algorithms – Synchronous and Asynchronous Check Pointing and Recovery – Fault

Tolerance – Two-Phase Commit Protocol – Nonblocking Commit Protocol – Security and Protection

UNIT IV REAL TIME AND MOBILE OPERATING SYSTEMS 9

Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems – Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems – Micro Kernel Design - Client Server Resource Access – Processes and Threads - Memory Management - File system.

UNIT V CASE STUDIES 9

Linux System: Design Principles - Kernel Modules - Process Management Scheduling - Memory Management - Input-Output Management - File System – Interprocess Communication. iOS and Android: Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer - File System.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Discuss the various synchronization, scheduling and memory management issues
- Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system
- Discuss the various resource management techniques for distributed systems
- Identify the different features of real time and mobile operating systems
- Install and use available open source kernel

REFERENCES:

1. Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, “Operating System Concepts- Essentials”, ninth Edition, John Wiley & Sons, 2013.
2. MukeshSinghal, NiranjanG. Shivaratri, “Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems”, Tata McGraw-Hill,First Edition, 1994.
3. Love Robert,” Linux Kernel Development”, Pearson Education India, Third Edition, 2018.
4. Neil Smyth, “iPhoneiOS 4 Development Essentials – Xcode”, Fourth Edition, Payload media, 2011.
5. Rajib Mall, “Real-Time Systems: Theory and Practice”, Pearson Education India, First Edition2006.
6. Daniel P Bovet and Marco Cesati, “Understanding the Linux kernel”, 3rd edition, O’Reilly, 2005.

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COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		√		√		√						√		
CO2			√	√								√		
CO3				√	√							√		
CO4			√		√							√		

CO5	√	√	√	√	√						√	√	√	√

MC5020 DIGITAL IMAGE PROCESSING L T P C
3 0 0 3

OBJECTIVES:

- Learn digital image fundamentals.
- Be exposed to simple image processing techniques.
- Learn to represent image enhancement in the spatial and frequency domain..
- Be familiar with image restoration and segmentation techniques.

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Elements of visual perception, Electromagnetic Spectrum-overview, Image Sensing and Image Acquisition Systems, Sampling and Quantization, Image Formation, Image Geometry, Relationship between pixels, Basic concepts of distance transform, Color Image fundamentals-RGB-HIS Models, Different color models-conversion

UNIT II IMAGE TRANSFORMS 9

Unitary Image Transforms-1D Discrete Fourier Transform (DFT),Properties of DFT, 2D transforms – 2D DFT, Discrete Cosine Transform, Hadamard, Walsh and PCA.

UNIT III IMAGE ENHANCEMENT 9

Spatial Domain: Gray Level transformations, contrast stretching operation, Histogram Equalization and Specifications, Basics of Spatial Filtering-smoothing and sharpening spatial filters. Frequency domain: smoothing and sharpening frequency domain filters, Ideal, Butterworth and Gaussian filters.

UNIT IV IMAGE RESTORATION 9

Degradation Models-continuous and discrete form, Estimation of degradation models: Observation, Experimentation, Mathematical Modeling of Noise models, Restoration Techniques: Inverse Filtering, Minimum Mean Square (Wiener) filtering, Constrained Least Square Filter and Adaptive filters.

UNIT V MORPHOLOGICAL IMAGE PROCESSING AND SEGMENTATION 9

Basic Morphological operators-erosion, dilation, opening and closing-Basic Morphological Reconstruction Algorithms. Segmentation: point, line, edge detection, Region based segmentation, Region Splitting and Merging Technique, Thresholding Techniques, Applications of image processing.

TOTAL: 45 PERIODS

OUTCOMES:

Up on completion of the course, the students will be able to

- Learn how images are formed, sampled, quantized and represented digitally
- Understand and analyze the different image transform techniques
- Understand how the images are enhanced to improve subjective perception to spatial domain and frequency domain.
- Apply image restoration techniques

- Analyze the fundamental concepts of Morphological Image Processing and Segmentation techniques.

REFERENCES:

1. Rafael C.Gonzalez and Richard E.Woods, "Digital Image Processing", 4th Edition, Pearson Education, New Delhi, 2018
2. Jain Anil K.,"Fundamentals of Digital Image Processing", 1st Edition, Prentice Hall of India, New Delhi, 2002.
3. Kenneth R.Castleman, "Digital Image Processing", 1st Edition, Prentice Hall of India, New Delhi, 2006.
4. John C.Russ, "The Image Processing Handbook", 5thEdition, Prentice Hall, New Jersey, 2002.
5. Willliam K Pratt, "Digital Image Processing", 3rd Edition, John Willey,2002.
6. Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", First Edition, PHI Learning Pvt. Ltd., 2011.

Mapping of COs with POs and PSOs														
COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1												
CO2	1	3												
CO3	1	1												
CO4			2	1										
CO5	1	3												

MC5021 COMPILER OPTIMIZATION TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:

- To understand the optimization techniques used in compiler design.
- To be aware of the various computer architectures that support parallelism.
- To become familiar with the theoretical background needed for code optimization.
- To understand the techniques used for identifying parallelism in a sequential program.
- To learn the various optimization algorithms.

UNIT I INTRODUCTION 9

Language Processors - The Structure of a Compiler – The Evolution of Programming Languages - The Science of Building a Compiler – Applications of Compiler Technology Programming Language Basics - The Lexical Analyzer Generator -Parser Generator - Overview of Basic Blocks and Flow Graphs - Optimization of Basic Blocks - Principle Sources of Optimization.

UNIT II INSTRUCTION-LEVEL PARALLELISM 9

Processor Architectures – Code-Scheduling Constraints – Basic-Block Scheduling –Global Code Scheduling – Software Pipelining.

UNIT III OPTIMIZING FOR PARALLELISM AND LOCALITY-THEORY 9

Basic Concepts – Matrix-Multiply: An Example - Iteration Spaces - Affine Array Indexes – Data Reuse Array data dependence Analysis.

UNIT IV OPTIMIZING FOR PARALLELISM AND LOCALITY APPLICATION 9

Finding Synchronization - Free Parallelism – Synchronization between Parallel Loops – Pipelining – Locality Optimizations – Other Uses of Affine Transforms.

UNIT V INTERPROCEDURAL ANALYSIS 9

Basic Concepts – Need for Interprocedural Analysis – A Logical Representation of Data Flow – A Simple Pointer-Analysis Algorithm – Context Insensitive Interprocedural Analysis - Context - Sensitive Pointer-Analysis - Datalog Implementation by Binary Decision Diagrams.

TOTAL: 45 PERIODS

OUTCOMES:

On completion of the course the students should be able to:

- Identify the various sources of optimization
- identify the constraints and architectures of parallel execution of instructions
- identify the sources of optimization of parallel execution of instructions
- apply the process of optimization using various techniques
- Implement optimization techniques

REFERENCES:

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, “Compilers: Principles, Techniques and Tools”, Second Edition, Pearson Education, 2008.

2. Randy Allen, Ken Kennedy, “Optimizing Compilers for Modern Architectures: A Dependence-based Approach”, Morgan Kaufmann Publishers, First Edition, 2002.

3. Steven S. Muchnick, “Advanced Compiler Design and Implementation”, Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint2003.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO 1		√	√	√								√	√	
CO 2		√	√								√	√	√	
CO 3	√	√	√									√	√	√
CO 4	√	√	√									√	√	
CO 5	√	√	√	√	√						√	√	√	

MC5022 C# AND .NET PROGRAMMING L T P C
3 0 0 3

OBJECTIVES:

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

UNIT I C# LANGUAGE BASICS 9

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

UNIT II C# ADVANCED FEATURES 9

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

UNIT III BASE CLASS LIBRARIES AND DATA MANIPULATION 9

Diagnostics Tasks – Threads and Synchronization – Manipulating XML – SAX and DOM – Manipulating files and the Registry – Transactions – Data access with ADO.NET: Introduction, LINQ to Entities and the ADO.NET Entity Framework, Querying a Database with LINQ – Creating the ADO.NET Entity Data Model Class Library, Creating a Windows Forms Project – Data Bindings between Controls and the Entity Data Model – Dynamically Binding Query Results.

UNIT IV WINDOW AND WEB BASED APPLICATIONS 9

Window Based Applications – Core ASP.NET – ASP.NET Web Forms – Server Controls, Data Binding – ASP.NET State Management, Tracing, Caching, Error Handling, Security, Deployment, User and Custom Controls – Windows Communication Foundation (WCF) – Introduction to Web Services.

UNIT V .NET COMPACT FRAMEWORK 9

Reflection – .Net Remoting-.Net Security – Localization – Peer-to-Peer Networking – Building P2P Applications – .Net Compact Framework – Compact Edition DataStores – Testing and Debugging – Optimizing performance – Packaging and Deployment.

TOTAL: 45 PERIODS

OUTCOMES:

Up on completion of the course, the student will be able to:

- Understand the difference between .NET and Java framework.
- Work with the basic and advanced features of C# language.
- Create applications using various data providers.
- Create web application using ASP.NET.
- Create mobile application using .NET compact framework.

REFERENCES:

1. Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner, “Professional C# and .NET 4.5”, Wiley, First Edition2012
2. Andrew Troelsen, “Pro C# 5.0 and the .NET 4.5 Framework”, Apress publication, First Edition2012
3. Ian Gariffiths, Mathew Adams, Jesse Liberty, “Programming C# 4.0”, O‘Reilly, Sixth Edition, 2010
4. Andy Wigley, Daniel Moth, “Peter Foot, —Mobile Development Handbook”, Microsoft Press,2nd Edition, 2011
5. Herbert Schildt, “C# - The Complete Reference”, Tata McGraw Hill, FirstEdition2010.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	√	√	√	√	√	√	√	√	√			√	√	√
CO 2	√	√	√	√	√	√	√	√	√	√	√	√	√	√
CO 3	√	√	√	√	√				√			√	√	√
CO 4	√	√	√	√	√				√			√	√	√
CO 5	√	√	√	√	√		√		√	√	√	√	√	√

MC5023 WIRELESS NETWORKING L T P C
3 0 0 3

OBJECTIVES:

The student should be made:

- To understand the concept about Wireless networks, protocol stack and standards
- To understand and analyse the network layer solutions for Wireless networks
- To study about fundamentals of 3G Services, its protocols and applications
- To learn about evolution of 4G Networks, its architecture and applications
- To explore the architecture of 5G, 5G Modulation Schemes and to analyse the concept of MIMO and other research areas in 5G

UNIT I WIRELESS LAN 9

Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum, IEEE802.11: System architecture, protocol architecture, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, WPAN – IEEE 802.15.4, Wireless USB, Zigbee, 6LoWPAN, WirelessHART- IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX

UNIT II MOBILE NETWORK LAYER 9

Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet- Mobile IP session initiation protocol - mobile ad-hoc network: Routing: Destination Sequence distance vector, Dynamic source routing, IoT: CoAP. TCP enhancements for wireless protocols

UNIT III 3G OVERVIEW 9

Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3G-MSC, 3G-SGSN, 3G-GGSN, 3GPP Architecture, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High speed Downlink packet access (HSDPA)- LTE network architecture and protocol, User equipment, CDMA2000 overview- Radio and Network components, Network structure, Radio Network, TD-CDMA, TD – SCDMA

UNIT IV 4G NETWORKS 9

Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Cognitive Radio, IMS Architecture, LTE, Advanced Broadband Wireless Access and Services, MVNO.

UNIT V 5G NETWORKS 9

Introduction to 5G, vision and challenges, 5G NR – New Radio – air interface of 5G, radio access, Ultra-Dense Network Architecture and Technologies for 5G- Generalized frequency division multicarrier (GFDM)- Principles, Transceiver Block diagram-MIMO in LTE, Theoretical background, Single user MIMO, Multi-user MIMO, Capacity of massive MIMO: a summary, Basic forms of massive MIMO implementation.

TOTAL: 45 PERIODS

OUTCOMES: outcomes to be changed with respect to contents

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

- Conversant with the latest 3G/4G networks and its architecture
- Design and implement wireless network environment for any application using latest wireless protocols and standards
- Ability to select the suitable network depending on the availability and requirement
- Implement different type of applications for smart phones and mobile devices with latest network strategies

REFERENCES:

1. Jochen Schiller, Mobile Communications, Second Edition, Pearson Education 2012.
2. Vijay Garg, —Wireless Communications and networking‖, First Edition, Elsevier 2007.
3. AfifOsseiran, Jose.F.Monserrat and Patrick Marsch, "5G Mobile and Wireless Communications Technology", Cambridge University Press, First Edition2016.
4. Clint Smith, Daniel Collins, “Wireless Networks”, 3rd Edition, McGraw-Hill Education, 2014.
5. Anurag Kumar, D.Manjunath, Joy kuri, —Wireless Networking, First Edition, Elsevier 2011.
6. Xiang, W; Zheng, K; Shen, X.S; "5G Mobile Communications”, Springer, First Edition2016
7. Saad Z Asif, “5G Mobile Communication,Concepts and Challenges", First EditionCRC Press
8. Thomas L. Marzetta, Erik G. Larsson, Hong Yang,HienQuoc Ngo, "Fundamentals of Massive MIMO", Cambridge University Press, First Edition2018.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	√	√		√	√				√			√	√	
CO 2		√	√		√						√	√	√	
CO 3	√	√	√										√	√
CO 4	√	√	√			√							√	
CO 5	√	√	√	√					√		√		√	

MC5024 WEB DESIGN L T P C
3 0 0 3

OBJECTIVES:

- To understand the concepts and architecture of the World Wide Web.
- To understand and practice markup languages
- To understand and practice embedded dynamic scripting on client-side Internet
- Programming
- To understand and practice web development techniques on client-side.
- The objective is to enable the students to understand the Organizational Behaviour, and Organizational Change and dynamic of groups.

UNIT I INTRODUCTION TO WWW 9

Understanding the working of Internet-Web Application Architecture-Brief history of Internet-Web Standards – W3C-Technologies involved in Web development – Protocols-Basic Principles involved in developing a website-Five Golden Rules of Web Designing.

UNIT II UI DESIGN 9

HTML Documents-Understanding markup languages-Structure of HTML Documents-Markup Tags-Basic markup tags-Working with Text-Working with Images-Hyperlinks -Images-Tables-List-SVG-Advanced HTML- Iframes-HTML5 Video and Audio tags

Cascading Style Sheet: Need for CSS - Importance of separating document structuring and styling-Basic CSS selectors and properties-CSS properties for text (Color, font, weight, align, etc.) and working with colors-Selecting with classes, IDs, tags-CSS Specificity-Ways of linking CSS to HTML-CSS Pseudo selectors-Understanding the box model - Margins, padding and border – Inline and block elements -Structuring pages using Semantic Tags

UNIT III WEB PAGE LAYOUTS WITH CSS3 9

Positioning with CSS – Positions, Floats, z-index-Layouts with Flexbox –Responsive web design with media queries-Advanced CSS Effects – Gradients, opacity, box-shadow-CSS3 Animations – Transforms and Transitions-CSS Frameworks – Bootstrap

UNIT IV JAVA SCRIPT 9

Basic JavaScript syntax-JavaScript Objects and JSON-Understanding the DOM-JavaScript Events and Input validation-Modifying CSS of elements using JavaScript-JavaScript Local Storage and Session Storage-Cross domain data transfer with AJAX-Using JQuery to add interactivity-JQuery Selectors-JQuery Events-Modifying CSS with JQuery -Adding and removing elements with JQuery-AJAX with JQuery-Animations with JQuery (hide, show, animate, fade methods, Slide Method)

UNIT V SERVER-SIDE PROGRAMMING WITH PHP 9

PHP basic syntax-PHP Variables and basic data structures-Using PHP to manage form submissions-File Handling -Cookies and Sessions with PHP-Working with WAMP and PHPMYADMIN-Establishing connectivity with MySQL using PHP

.**TOTAL: 45 PERIODS**

OUTCOMES:

- Create a basic website using HTML and Cascading Style Sheets.
- Create websites with complex layouts
- Add interactivity to websites using simple scripts
- Design rich client presentation using AJAX.
- Add business logic to websites using PHP and databases

REFERENCES:

1. David Flanagan, "JavaScript: The Definitive Guide", 7th Edition, O'Reilly Publications,2020
2. Danny Goodman, "Dynamic HTML: The Definitive Reference: A Comprehensive Resource for XHTML, CSS, DOM, JavaScript" , O'Reilly Publications, 3rd Edition,2007
3. Robin Nixon; "Learning PHP, MySQL, JavaScript & CSS: A Step-by-Step Guide to Creating Dynamic Websites", O'Reilly Publications, 2nd Edition,2018
4. Keith J Grant; "CSS in Depth", Manning Publications. 1st edition,2018
5. Elizabeth Castrol, "HTML5 & CSS3 Visual Quick start Guide", Peachpit Press, 7th Edition, 2012.
6. Harvey & Paul Deitel& Associates, Harvey Deitel and Abbey Deitel, "Internet and World Wide Web - How to Program", Fifth Edition, Pearson Education, 2012
7. https://developer.mozilla.org/en-US/
8. https://learn.shayhowe.com/

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	√				√									√
CO 2		√	√	√									√	
CO 3						√	√							√
CO 4				√	√								√	
CO 5							√				√			

MC5025 NETWORK PROGRAMMING AND SECURITY L T P C

3 0 0 3

OBJECTIVES:

- To understand the basics of Network Programming
- To be familiar with building network applications
- To design and implement client server Applications using TCP and UDP Sockets
- To expose with various socket options
- To get aware of Network security for Network Programming

UNIT I INTRODUCTION 9

TCP/IP Layer Model – Multicast, broadcast and Any cast - Socket address Structures – Byte ordering functions – address conversion functions – Elementary TCP Sockets – socket, connect, bind, listen, accept, read, write , close functions – Iterative Server – Concurrent Server

UNIT II ELEMENTARY TCP SOCKETS 9

TCP Echo Server – TCP Echo Client – Posix Signal handling – Server with multiple clients – boundary conditions: Server process Crashes, Server host Crashes, Server Crashes and reboots, Server Shutdown

UNIT III SOCKET OPTIONS AND MULTIPLEXING 9

Socket options – getsocket and setsocket functions – generic socket options – IP socket options – ICMP socket options – TCP socket options I/O multiplexing – I/O Models – select function – shutdown function – TCP echo Server (with multiplexing) – poll function – TCP echo Client (with Multiplexing)

UNIT IV ELEMENTARY UDP SOCKETS 9

UDP echo Server – UDP echo Client – Multiplexing TCP and UDP sockets – Domain name system – gethostbyname function – Ipv6 support in DNS – gethostbyadr function – getservbyname and getservbyport functions.

UNIT V NETWORK SECURITY 9

SSL - SSL Architecture, SSL Protocols, SSL Message , Secure Electronic Transaction (SET). TLS –TLS Protocols,DTLS Protocols, PKI – Fundamentals, Standards and Applications

TOTAL: 45 PERIODS

REFERENCE BOOKS:

1. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff ,"Unix Network Programming, Volume 1: The Sockets Networking API", Third Edition, ISBN:0-13-141155-1, Addison Wesley Pearson Education,2004
2. Behrouz A Forouzan,DebdeepMukhopadhyay "Cryptography and Network Security" ,Second Edition, ISBN -13:978-0-07—070208-0 Tata McGraw Hill Education Private Limited 2010
3. William Stallings, "Cryptographic and network security Principles and Practices",Fourth Edition, Publisher Prentice Hall, November 2005
4. Andre Perez, "Network Security", First Edition, Publisher John Wiley & Sons, 2014
5. Gary R. Wright , W. Richard Stevens, "TCP/IP Illustrated: The Implementation" , ISBN 0-201-63354-X , Vol. 2, 1st Edition , Addison Wesley Professional, January 2008
6. Michael J. Donahoo, Kenneth L. Calvert "TCP/IP Sockets in C: Practical Guide for Programmers ", Morgan Kaufmann Publishers 2nd Edition. 2009
7. Lewis Van Winkle ,"Hands-On Network Programming with C: Learn socket programming in C and write secure and optimized network code" ,ISBN -978-1-78934-986-3, Packt Publishing 2019 First Edition.

OUTCOMES:

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

- Design and implement the client/server programs using variety of protocols
- Understand the key protocols which support Internet
- Demonstrate advanced knowledge of programming interfaces for network communication

- Use the basic tools for design and testing of network programs in Unix environment.
- Identify some of the factors driving the need for network security
-

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	√	√	√	√				√	√			√	√	√
CO 2	√	√					√					√	√	
CO 3	√	√	√	√		√				√	√	√	√	√
CO 4	√	√	√		√						√	√	√	√
CO 5	√		√		√	√	√	√	√	√			√	√

MC5026 MICROSERVICES AND DEVOPS L T P C
3 0 0 3

OBJECTIVES:

- To introduce Microservices and Containers. .
- To understand the key concepts and principles of DevOps
- To be familiar with most common DevOps tools
- To explain the business benefits of DevOps and continuous delivery.
- To recall specific DevOps methodologies and frameworks

UNIT I INTRODUCTION TO MICROSERVICES 9

Definition of Microservices – Characteristics - Microservices and Containers – Interacting with Other Services – Monitoring and Securing the Services – Containerized Services – Deploying on Cloud

UNIT II MICROSERVICES ARCHITECTURE 9

Monolithic architecture- Microservice architectural style- Benefits - Drawbacks of Microservice architectural style - decomposing monolithic applications into Microservices.

UNIT III BASICS OF DEVOPS 9

History of DevOps- DevOps and software development life cycle- water fall model – agile model –DevOps life cycle – DevOps tools: distributed version control tool –**Git**- automation testing tools – **Selenium -** reports generation – T**estNG -** User Acceptance Testing – **Jenkins**.

UNIT IV MICROSERVICES IN DEVOPS ENVIRONMENT 9

Evolution of Microservices and DevOps – Benefits of combining DevOps and Microservices- working of DevOps and Microservices in Cloud environment - DevOps Pipeline representation for a NodeJS based Microservices

UNIT V VELOCITYAND CONTINUOUS DELIVERY 9

Velocity - Delivery Pipeline- test stack - Small/Unit Test – medium /integration testing – system testing- Job of Development and DevOps - Job of Test and DevOps – Job of Op and Devops- Infrastructure and the job of Ops.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of this course, the students will be able to:

- Understand the Microservices and containers.

- apply Microservices in DevOps
- Understand about DevOps and the common tools used in DevOps.
- Develop and integrate projects using DevOps
- Deploy and monitor projects using DevOps.

REFERENCES:

1. NamitTanasseri, RahulRai, Microservices with Azure, 1st Edition, Packt Publishing, UK, 2017
2. Eberhard Wolff, Microservices: Flexible Software Architecture, 1st Edition, Pearson Education, 2017
3. James A Scott, A Practical Guide to Microservices and Containers, MapR Data Technologies e – book. https://mapr.com/ebook/microservices-and-containers/assets/microservices-and-containers.pdf
4. Joyner Joseph, Devops for Beginners, First Edition, MihailsKonoplovs publisher, 2015.
5. Gene Kim, Kevin Behr, George Spafford, The Phoenix Project, A Novel about IT, DevOps, 5th Edition, IT Revolution Press, 2018 .
6. Michael Hüttermann, DevOps for Developers, 1st Edition, APress, e-book, 2012.

Mapping of COs with POs and PSOs														
COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	√	√												
CO2	√	√												
CO3	√	√												
CO4			√	√										
CO5	√	√												

MC5027 SOCIAL NETWORK ANALYTICS L T P C
3 0 0 3

OBJECTIVES:

- To gain knowledge about social networks, its structure and their data sources.
- To study about the knowledge representation technologies for social network analysis.
- To analyse the data left behind in social networks.
- To gain knowledge about the community maintained social media resources.
- To learn about the visualization of social networks.

UNIT I INTRODUCTION TO SEMANTIC WEB 9

The development of Semantic Web – Emergence of the Social Web – The Development of Social Network Analysis – Basic Graph Theoretical Concepts of Social Network Analysis – Electronic Sources for Network Analysis – Electronic Discussion Networks, Blogs and Online Communities, Web-based Networks.

UNIT II KNOWLEDGE REPRESENTATION ON THE SEMANTIC WEB 9

Ontology-based knowledge Representation – Ontology languages for the Semantic Web: RDF and OWL–Modeling Social Network Data – Network Data Representation, Ontological Representation of Social Individuals and Relationships –Aggregating and Reasoning with Social Network Data.

UNIT III SOCIAL NETWORK MINING 9

Detecting Communities in Social Network – Evaluating Communities –Methods for Community Detection – Applications of Community Mining Algorithms – Tools for detecting communities – Application: Mining Facebook - Exploring Facebook's social Graph API – Analyzing social graph connections

UNIT IV COMMUNITY MAINTAINED SOCIAL MEDIA RESOURCES 9

Community Maintained Resources – Supporting technologies for community maintained resources– User motivations-Location based social interaction – location technology– mobile location sharing – Social Information Sharing and social filtering – Automated recommender system.

UNIT V VISUALIZATION OF SOCIAL NETWORKS 9

Visualization of Social Networks - Node-Edge Diagrams – Random Layout – Force-Directed Layout – Tree Layout – Matrix Representations –Matrix and Node-Link Diagrams – Hybrid Representations – Visualizing Online Social Networks.

TOTAL: 45 PERIODS

OUTCOMES:

Up on completion of the course, the students will be able to:

- Explain the basic principles behind network analysis algorithms.
- Model and represent knowledge for social semantic Web.
- Use extraction and mining tools for analyzing Social networks.
- Discuss about community maintained social media resources.
- Develop personalized visualization for Social networks.

REFERENCES:

1. Matthew A. Russell,"Mining the Social Web: Data Mining Facebook, Twitter, LinkedIn, Google+, Githuband more", O'REILLY, Third Edition, 2018.
2. CharuAggarwal, "Social Network Data Analytics," Springer, First Edition, 2014
3. Jennifer Golbeck, "Analyzing the social web", Waltham, MA: Morgan Kaufmann (Elsevier), First Edition, 2013.
4. BorkoFurht, "Handbook of Social Network Technologies and Applications", Springer, First Edition, 2010
5. Peter Mika, "Social Networks and the Semantic Web", Springer, First Edition, 2007
6. Stanley Wasserman and Katherine Faust, "Social network analysis: methods and applications", Cambridge University Press, First Edition, 1999.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	√												√	
CO 2	√	√		√										√

CO 3	√	√		√										√
CO 4			√				√		√	√	√		√	
CO 5	√	√		√	√	√	√			√		√		√

MC5028 BIO INSPIRED COMPUTING L T P C
3 0 0 3

OBJECTIVES:

- To Learn bio-inspired theorem and algorithms
- To Understand random walk and simulated annealing
- To Learn genetic algorithm and differential evolution
- To Learn swarm optimization and ant colony for feature selection
- To understand bio-inspired application in various fields

UNIT I INTRODUCTION 9

Introduction to algorithm - Newton ' s method - optimization algorithm - No-Free-Lunch Theorems - Nature-Inspired Metaheuristics -Analysis of Algorithms -Nature Inspires Algorithms -Parameter tuning and parameter control.

UNIT II RANDOM WALK AND ANEALING 9

Random variables - Isotropic random walks - Levy distribution and flights - Markov chains - step sizes and search efficiency - Modality and intermittent search strategy - importance of randomization- Eagle strategy-Annealing and Boltzmann Distribution - parameters -SA algorithm - Stochastic Tunneling.

UNIT III GENETIC ALOGORITHMS AND DIFFERENTIAL EVOLUTION 9

Introduction to genetic algorithms and - role of genetic operators - choice of parameters - GA varients - schema theorem - convergence analysis - introduction to differential evolution - varients - choice of parameters - convergence analysis - implementation.

UNIT IV SWARM OPTIMIZATION AND FIREFLY ALGORITHM 9

Swarm intelligence - PSO algorithm - accelerated PSO - implementation - convergence analysis - binary PSO - The Firefly algorithm - algorithm analysis - implementation - variants- Ant colony optimization toward feature selection.

UNIT V APPLICATIONS OF BIO INSPIRED COMPUTING 9

Improved Weighted Thresholded Histogram Equalization Algorithm for Digital Image Contrast Enhancement Using Bat Algorithm - Ground Glass Opacity Nodules Detection and Segmentation using Snake Model - Mobile Object Tracking Using Cuckoo Search- Bio inspired algorithms in cloud computing- Wireless Sensor Networks using Bio inspired Algorithms

TOTAL: 45 PERIODS

OUTCOMES:

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

- Implement and apply bio-inspired algorithms
- Explain random walk and simulated annealing
- Implement and apply genetic algorithms

- Explain swarm intelligence and ant colony for feature selection
- Apply bio-inspired techniques in various fields.

REFERENCES:

1. Eiben,A.E.Smith,James E, "Introduction to Evolutionary Computing", Springer 2nd Edition2015.
2. Helio J.C. Barbosa, "Ant Colony Optimization - Techniques and Applications", IntechFirst Edition,2013
3. Xin-She Yang , Jaao Paulo papa, "Bio-Inspired Computing and Applications in Image Processing",Elsevier First Edition, 2016
4. Xin-She Yang, "Nature Inspired Optimization Algorithm",Elsevier First Edition 2014
5. Yang ,Cui,XIao,Gandomi,Karamanoglu,"Swarm Intelligence and Bio-Inspired Computing", Elsevier First Edition 2013

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	√	√	√	√	√				√			√	√	√
CO 2	√	√	√	√	√				√			√		√
CO 3	√	√	√	√	√				√			√		√
CO 4	√	√	√	√	√		√		√	√	√	√	√	√
CO 5	√	√	√	√	√	√	√		√	√		√		√

MC5029 INFORMATION RETRIEVAL TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:

- To understand the basics of information retrieval with pertinence to modeling, query operations and indexing
- To get an understanding of machine learning techniques for text classification and clustering.
- To understand the various applications of information retrieval giving emphasis to multimedia IR, web search
- To understand the concepts of digital libraries

UNIT I INTRODUCTION: MOTIVATION 9

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

UNIT II MODELING 9

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

UNIT III INDEXING 9

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

UNIT IV CLASSIFICATION AND CLUSTERING 9

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

UNIT V SEARCHING THE WEB 9

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

TOTAL: 45 PERIODS

OUTCOMES:

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

- Build an Information Retrieval system using the available tools.
- Identify and design the various components of an Information Retrieval system.
- Model an information retrieval system
- Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval.
- Design an efficient search engine and analyze the Web content structure.

REFERENCES:

1. Implementing and Evaluating Search Engines‖, The MIT Press, Cambridge, Massachusetts London, England, First Edition2010
2. Ricardo Baeza – Yates, BerthierRibeiro – Neto, —Modern Information Retrieval: The concepts and Technology behind Search‖ (ACM Press Books), Second Edition, 2011.
3. Stefan Buttcher, Charles L. A. Clarke, Gordon V. Cormack, —Information RetrievalFirst Edition 2010
4. Manning Christopher D., Raghavan Prabhakar & SchutzeHinrich, " Introduction to Information Retrieval", Cambridge University Press, Online Edition,2009

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	√	√	√	√	√				√			√	√	√
CO 2	√	√	√	√	√				√			√	√	√
CO 3	√	√	√	√	√				√			√	√	√
CO 4	√	√	√	√	√		√		√	√	√	√	√	√
CO 5	√	√	√	√	√				√	√		√	√	√

MC5030 SOFTWARE ARCHITECTURE L T P C
3 0 0 3

OBJECTIVES:

- Understand software architectural requirements and drivers
- Be exposed to architectural styles and views
- Be familiar with architectures for emerging technologies

UNIT I INTRODUCTION AND ARCHITECTURAL DRIVERS 9

Introduction – Software architecture - Architectural structures – Influence of software architecture on organization - both business and technical – Architecture Business Cycle-Functional requirements – Technical constraints – Quality Attributes.

UNIT II QUALITY ATTRIBUTE WORKSHOP 9

Quality Attribute Workshop – Documenting Quality Attributes – Six part scenarios – Case studies.

UNIT III ARCHITECTURAL VIEWS 9

Introduction – Standard Definitions for views – Structures and views – Representing views-available notations – Standard views – 4+1 view of RUP, Siemens 4 views, SEI's perspectives and views – Case studies

UNIT IV ARCHITECTURAL STYLES 9

Introduction – Data flow styles – Call-return styles – Shared Information styles – Event styles – Case studies for each style.

UNIT V DOCUMENTING THE ARCHITECTURE 9

Good practices – Documenting the Views using UML – Merits and Demerits of using visual languages – Need for formal languages – Architectural Description Languages – ACME – Case studies. Special topics: SOA and Web services – Cloud Computing – Adaptive structures

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain influence of software architecture on business and technical activities
- Summarize quality attribute workshop
- Identify key architectural structures
- Use styles and views to specify architecture
- Design document for a given architecture

REFERENCES:

1. Len Bass, Paul Clements, and Rick Kazman, "Software Architectures Principles and Practices", 2n Edition, Addison-Wesley, 2003.
2. Anthony J Lattanze, "Architecting Software Intensive System. A Practitioner's Guide", 1st Edition, Auerbach Publications, 2010.
3. Paul Clements, Felix Bachmann, Len Bass, David Garlan, James Ivers, Reed Little, Paulo Merson, Robert Nord, and Judith Stafford, "Documenting Software Architectures. Views and Beyond", 2ndEdition, Addison-Wesley, 2010
4. Paul Clements, Rick Kazman, and Mark Klein, "Evaluating software architectures: Methods and case studies.",1st Edition, Addison-Wesley, 2001.
5. Mark Hansen, "SOA Using Java Web Services", 1st Edition, Prentice Hall, 2007
6. David Garlan, Bradley Schmerl, and Shang-Wen Cheng, "Software Architecture-Based Self-Adaptation," 31-56. Mieso K Denko, Laurence Tianruo Yang, and Yan

Zang (eds.), "Autonomic Computing and Networking".1st Edition, Springer Verlag 2009.

Mapping of COs with POs and PSOs														
COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		√	√											
CO2	√	√												
CO3	√	√												
CO4	√	√												
CO5	√	√	√											

MC5031 DIGITAL FORENSICS L T P C
3 0 0 3

OBJECTIVES:

- To learn the security issues network layer and transport layer.
- To be exposed to security issues of the application layer.
- To be familiar with forensics tools.
- To analyze and validate forensics data.
- To perform digital forensic analysis based on the investigator's position.

UNIT I INTRODUCTION 9

Digital Forensics – Uses- Digital Forensics Process – Locard's Exchange Principle – Scientific Method – Role of Forensic examiner in Judicial System – Key technical concepts – Bits, bytes and numbering schemes- File extension and file signatures – Storage and memory- computing environment

UNIT II ANTI-FORENSICS & LEGAL 9

Introduction – Hiding data – Password attacks – Additional resources – Stegnography – Data destruction. Legal: Fourth Amendment – Criminal law-searches without a warrant – searching with a warrant- Electronic discovery-Expert testimony.

UNIT III EVIDENCE COLLECTION 9

Evidence Collection – Collection option – Obstacles – Types of Evidence – The rules of Evidence – General Procedure – Collection and archiving – Methods of collection – Artifacts – Collection steps – Controlling Contamination: The Chain of Custody Duplication and Preservation of Digital Evidence: Preserving the digital Crime Scene – Computer Evidence processing steps - Legal Aspects of Collecting and Preserving Computer Forensic Evidence - Computer Image Verification and Authentication.

UNIT IV COMPUTER FORENSICS 9

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud.Types of CF techniques – Incident and incident response methodology – Forensic duplication and investigation. Preparation for IR: Creating response tool kit and IR team. – Forensics Technology and Systems – Understanding Computer Investigation – Data Acquisition.

UNIT V NETWORK FORENSICS & MOBILE DEVICE FORENSICS 9

Introduction – Network fundamentals – Network Security tools – Network evidence and investigations. Mobile device forensics: Cellular Network – Cell phone evidence – Cell phone forensic tools- Global Positioning systems.

TOTAL: 45 PERIODS

OUTCOME:

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

- Explain digital forensic process and role of forensic examiner.
- Explore Legal amendments.
- Demonstrate evidence collection
- Explore computer forensics, network forensics and mobile device forensics.
- Make Use forensics tools.

REFERENCES:

1. John Sammons, The Basics of Digital Forensics The Primer for Getting Started in Digital Forensics, Second Edition, Syngress, 2015.
2. Cory Altheide and Harlan Carvey, —Digital Forensics with Open Source Tools, 1st Edition, Elsevier publication, April 2011.
3. Nihad A. Hassan, Digital Forensics Basics: A Practical Guide Using Windows OS, 1st Edition, A Press, 2019
4. ThmasJ.Holt, Adam M.Bossler, K.C.Seigfried – Spellar, Cybercrime and Digital Forensics An Introduction, 1st Edition, Taylor and Francis,New York, 2015.
5. Darren R. Hayes, A Practical Guide to Digital Forensics Investigations, 2nd Edition , Pearson Education, 2020.

Mapping of COs with POs and PSOs														
COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	√	√						√						
CO2	√	√						√						
CO3	√	√			√									
CO4	√	√	√	√										
CO5	√	√						√						

MC5032 DATA MINING AND DATA WAREHOUSING TECHNIQUES L T P C

3 0 0 3

OBJECTIVES:

- To gain knowledge on data mining and the need for pre-processing.
- To characterize the kinds of patterns that can be discovered by association rule mining.
- To implement classification techniques on large datasets.
- To analyze various clustering techniques in real world applications.

- To get exposed to the concepts of data warehousing architecture and implementation.

UNIT I DATA MINING & DATA PREPROCESSING 9

Data Mining–Concepts , DBMS versus Data mining , kinds of Data, Applications, Issues and Challenges–Need for Data Pre-processing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.

UNIT II ASSOCIATION RULE MINING AND CLASSIFICATION BASICS 9

Introduction to Association rules – Association Rule Mining – Mining Frequent Itemsets with and without Candidate Generation – Mining Various Kinds of Association Rules - Classification versus Prediction – Data Preparation for Classification and Prediction.

UNIT III CLASSIFICATION AND PREDICTION TECHNIQUES 9

Classification by Decision Tree – Bayesian Classification – Rule Based Classification – Bayesian Belief Networks – Classification by Back Propagation – Support Vector Machines – K-Nearest Neighbor Algorithm –Linear Regression, Nonlinear Regression, Other Regression-Based Methods

UNIT IV CLUSTERING TECHNIQUES 9

Cluster Analysis – Partitioning Methods: k-Means and k- Mediods – Hierarchical Methods: Agglomerative and Divisive – Density–Based Method: DBSCAN –Model Based Clustering Methods: Fuzzy clusters and Expectation-Maximization Algorithm – Clustering High-Dimensional Data: Biclustering – Outlier Analysis.

UNIT V DATA WAREHOUSE 9

Need for Data Warehouse – Database versus Data Warehouse – Multidimensional Data Model – Schemas for Multidimensional Databases – OLAP operations – OLAP versus OLTP – Data Warehouse Architecture – Extraction, Transformation and Loading (ETL).

TOTAL: 45 PERIODS

OUTCOMES:

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

1. Identify data mining techniques in building intelligent model.
2. Illustrate association mining techniques on transactional databases.
3. Apply classification and clustering techniques in real world applications.
4. Evaluate various mining techniques on complex data objects.
5. Design, create and maintain data warehouses.

REFERENCES:

1. Daniel T. Larose, Chantal D. Larose, "Data mining and Predictive analytics," Second Edition, Wiley Publication, 2015

2. G. K. Gupta, “Introduction to Data Mining with Case Studies”, Eastern Economy Edition, Prentice Hall of India, Third Edition, 2014

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	√	√											√	
CO 2		√											√	
CO 3	√	√	√		√	√			√					√

CO 4	√	√		√	√				√					√
CO 5	√	√			√	√	√		√	√	√	√		√

MC5033 DATA VISUALIZATION TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:

- To understand the categories of data quality principles.
- To describe data through visual representation.
- To provide basic knowledge about how large datasets are represented into visual graphics and easily understand about the complex relationships within the data.
- To design effective visualization techniques for any different problems.

UNIT I INTRODUCTION 9

Visualization – visualization process – role of cognition – Pseudocode conventions – Scatter plot - Data foundation : Types of data - Structure within and between records - Data preprocessing – Human perceptions and information processing.

UNIT II VISUALIZATION FOUNDATIONS 9

Semiology of graphical Symbols – Eight Visual Variables – Historical Perspective- Visualization Techniques for spatial data – One-dimensional data- two dimensional data – Three dimensional data- dynamic data – combining techniques- Visualization of Geospatial data – Visualization of Point, line, area data.

UNIT III DESIGNING EFFECTIVE VISUALIZATION 9

Steps in Designing Visualization – problems in Designing Effective Visualization – Comparing and evaluating visualization techniques – Visualization Systems.

UNIT IV INFORMATION DASHBOARD DESIGN 9

Characteristics of dashboards – Key goals in visual design process – Dashboard display media – Designing dashboards for usability – Meaningful organization – Maintaining consistency – Aesthetics of dashboards – Testing for usability – Case Studies: Sales dashboard, Marketing analysis dashboard.

UNIT V VISUALIZATION SYSTEMS 9

Systems based on Data type-systems based on Analysis type – Text analysis and visualization – Modern integrated visualization systems – toolkit-Research directions in visualization – issues of cognition, perception and reasoning –issues of evaluation - issues of Hardware.

TOTAL: 45 PERIODS

OUTCOME:

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

- Describe principles of visual perception
- Apply visualization techniques for various data analysis tasks – numerical data
- Apply visualization techniques for various data analysis tasks – Non numerical data
- Design effective visualization techniques for different problems
- Design information dashboard.

REFERENCES:

1. Matthew O. Ward , Georges Grinstein , Daniel Keim “Interactive Data Visualization: Foundations, Techniques, and Applications”, CRC Press; 2nd edition, 2015
2. 2Stephen Few, "Now you see it: Simple Visualization Techniques for Quantitative Analysis", 1st Edition, Analytics Press, 2009.
3. Stephen Few, "Information Dashboard Design: The Effective Visual Communication of Data",1st Edition, O'Reilly,2006.
4. Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", 1st Edition, O'Reilly, 2008.

Mapping of COs with POs and PSOs														
COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	√	√												
CO2	√	√	√											
CO3	√	√	√											
CO4	√	√	√											
CO5	√	√	√											

MC5034 OPERATIONS RESEARCH L T P C
3 0 0 3

OBJECTIVES:

- To provide the concept and an understanding of basic concepts in Operations Research techniques for Analysis and Modeling in ComputerApplications.
- To understand , develop and solve mathematical modelof linear programming problems
- To understand , develop and solve mathematical model of Transport and assignment problems
- To Understand network modeling for planning and scheduling the projectactivities

UNIT I LINEAR PROGRAMMING MODELS 9

Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables: big-M method, degeneracy and unbound solutions.

UNIT II TRANSPORTATION AND ASSIGNMENT MODELS 9

Formulation - Methods for finding basic Feasible Solution - Optimality Test - MODI method - Degeneracy in Transportation Problem -Unbalanced Transportation Problem. Assignment Method: Mathematical formulation of assignment models – Hungarian Algorithm – Variants of the Assignment problem

UNITIII SCHEDULING BY PERT AND CPM 9

Introduction - Rules to frame a Network - Fulkerson’s Rule to numbering of events - Activity, Times - Critical Path Computation - Slack and Float - PERT- Steps and computing variance, Merits and demerits of PERT, CPM- Time estimating & Limitations, Comparison between PERT & CPM.

UNIT IV QUEUEING MODELS **9**

Characteristics of Queueing Models–Poisson Queues-(M /M/1):(FIFO/∞/∞), (M / M / 1) : (FIFO / N / ∞), (M / M / C) : (FIFO / ∞ / ∞), (M / M / C) : (FIFO / N / ∞)models.

UNIT V GAME THEORY **9**

Competitive game, rectangular game, saddle point, minimax (maximin) method of optimal strategies- value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand and apply linear programming to solve operational problem with constraints
- Apply transportation and assignment models to find optimal solution
- To prepare project scheduling using PERT andCPM
- Identify and analyze appropriate queuing model to reduce the waiting time in queue.
- To choose the best strategy using decision making methods under game theory.

REFERENCES:

1. Taha H.A., “Operations Research: An Introduction”, 10th Edition, Prentice Hall of India, New Delhi, 2017
2. KantiSwarup, P.K. Gupta, Man Mohan, “Operations Research”, 15th Revised Edition, S. Chand& Sons Education Publications, New Delhi, 2017
3. Ronald L Rardin, Optimization In Operations Research, 2nd Edition, Pearson Education, India, 2018
4. Jatinder Kumar, Optimization Techniques in Operations Research, LAP LAMBERT Academic Publishing, 2015
5. D.S.Hira and P.K.Gupta, Operations Research, 5th Edition, S.Chand& Sons, 2015.

Mapping of COs with POs and PSOs

COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	√	√	√	√										
CO2	√	√	√	√	√									
CO3	√	√	√	√										
CO4	√	√	√	√		√								
CO5	√	√	√	√										

MC5035 PROFESSIONAL ETHICS IN IT **L T P C**

3 0 0 3

OBJECTIVES:

- To understand the concepts of computer ethics in work environment.
- To understand the threats in computing environment
- To Understand the intricacies of accessibility issues

- To ensure safe exits when designing the software projects

UNIT I INTRODUCTION TO ETHICS 9

Definition of Ethics- Right, Good, Just- The Rational Basis of Ethics -Theories of Right: Intuitionist vs. End-Based vs. Duty-Based -Rights, Duties, Obligations -Theory of Value - Conflicting Principles and Priorities -The Importance of Integrity -The Difference Between Morals, Ethics, and Laws -Ethics in the Business World - Corporate Social Responsibility - Creating an Ethical Work Environment -Including Ethical Considerations in Decision Making

UNIT II ETHICS IN INFORMATION TECHNOLOGY, INTERNET CRIME 9

IT Professionals - Are IT Workers Professionals- Professional Relationships That Must Be Managed -Professional Codes of Ethics - Professional Organizations - Certification - IT Professional Ethics, Three Codes of Ethics, Management Conflicts. The RevetonRansomware Attacks -IT Security Incidents: A Major Concern - Why Computer Incidents Are So Prevalent -Types of Exploits -Types of Perpetrators-Federal Laws for Prosecuting Computer Attacks-Implementing Trustworthy Computing -Risk Assessment - Establishing a Security Policy -Educating Employees and Contract Workers

UNIT III FREEDOM OF EXPRESSION, PRIVACY 9

First Amendment Rights -Obscene Speech-Defamation -Freedom of Expression: Key Issues -Controlling Access to Information on the Internet -Strategic Lawsuit Against Public Participation (SLAPP)-Anonymity on the Internet-Hate Speech- Privacy Protection and the Law- Information Privacy- Privacy Laws, Applications, and Court Rulings-Key Privacy and Anonymity Issues- Data Breaches -Electronic Discovery-Consumer Profiling- Workplace Monitoring -Advanced Surveillance Technology

UNIT IV FREEDOM OF EXPRESSION, INTELLECTUAL PROPERTY RIGHTS 9

Intellectual Property Rights-Copyrights-Copyright Term - Eligible Works -Fair Use Doctrine - Software Copyright Protection –Copyright Laws and the internet-Copyright and Piracy– Patents- -Software Patents -Cross-Licensing Agreements -Trade Secrets-Trade Secret Laws -Employees and Trade Secrets-Key Intellectual Property Issues-Plagiarism -Reverse Engineering-Open Source Code- Competitive Intelligence -Trademark Infringement -Cyber squatting

UNIT V SOCIAL NETWORKING ETHICS AND ETIQUETTES 9

Social Networking Web Site- Business Applications of Online Social Networking-Social Network Advertising-The Use of Social Networks in the Hiring Process-Social Networking Ethical Issues –Cyber bullying- Online Virtual Worlds-Crime in Virtual Worlds-Educational and Business Uses of Virtual Worlds

TOTAL: 45 PERIODS

OUTCOMES:

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

- Helps to examine situations and to internalize the need for applying ethical principles, values to tackle with various situations.
- Develop a responsible attitude towards the use of computer as well as the technology.

- Able to envision the societal impact on the products/ projects they develop in their career
- Understanding the code of ethics and standards of computer professionals.
- Analyze the professional responsibility and empowering access to information in the work place.

REFERENCES:

1. Caroline Whitback," Ethics in Engineering Practice and Research ", Cambridge University Press, 2nd Edition2011.
2. George Reynolds, "Ethics in Information Technology", Cengage Learning, 6th Edition2018.
3. Barger, Robert. (2008). Computer ethics: A case-based approach.Cambridge University Press 1st Edition.
4. John Weckert and Douglas Adeney, Computer and Information Ethics, Greenwood Press,FirstEdition1997.
5. Penny Duquenoy, Simon Jones and Barry G Blundell, "Ethical, legal and professional issues in computing", Middlesex University Press, First Edition2008.
6. Sara Baase, "A Gift of Fire: Social, Legal, and Ethical Issues for Computing and the Internet", 3rd Edition, Prentice Hall, 2008.
7. http://www.infosectoday.com/Articles/Intro_Computer_Ethics.html

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1						√		√	√	√				√
CO 2						√		√	√	√				
CO 3						√		√	√	√				
CO 4						√		√	√	√				√
CO 5						√		√	√	√				

MC5036 MARKETING MANAGEMENT L T P C
3 0 0 3

OBJECTIVE:

- To provide basic knowledge of concepts, principles, tools and techniques of Marketing.
- To provide an exposure to the students pertaining to marketing strategies, which they are expected to possess when they enter the industry as practitioners.
- To give them an understanding of the various marketing Strategies used in consumer and industrial marketing.

UNIT I INTRODUCTION TO MARKETING MANAGEMENT 9

Introduction - Market and Marketing - the Exchange Process- Core Concepts of Marketing - Functions of Marketing - Importance of Marketing - Marketing Orientations -Marketing Mix- The Traditional 4Ps - The Modern Components of the Mix - The Additional 3Ps - Developing an Effective Marketing Mix.

UNIT II MARKETING ENVIRONMENT 9

Introduction - Environmental Scanning - Analysing the Organization's Micro Environment - Company's Macro Environment, Differences between Micro and Macro Environment - Techniques of Environment Scanning - Marketing organization - Marketing Research and the Marketing Information System, Types and Components.

UNIT III CONSUMER AND BUSINESS BUYER BEHAVIOUR 9

Introduction - Characteristics - Types of Buying Decision Behaviour - Consumer Buying Decision Process - - Buying Motives - Buyer Behaviour Models - Characteristics of Business Markets - Differences between Consumer and Business Buyer Behaviour - Buying Situations in Industrial/Business Market - Buying Roles in Industrial Marketing - Factors that Influence Business Buyers - Steps in Business Buying Process

UNIT IV SEGMENTATION, TARGETING AND POSITIONING 9

Introduction - Concept of Market Segmentation - Benefits of Market Segmentation - Requisites of Effective Market Segmentation - The Process of Market Segmentation - Bases for Segmenting Consumer Markets - Targeting (T) - Market Positioning (P)

UNIT V INTERNATIONAL MARKETING MANAGEMENT & RECENT TRENDS 9

Introduction - Nature of International Marketing - International Marketing Concept – International Market Entry Strategies - Approaches to International Marketing - Cause related marketing - Ethics in marketing –Online marketing trends.

TOTAL: 45 PERIODS

OUTCOMES:

- Knowledge of basic understanding in solving marketing related problems.
- Awareness of marketing management process, strategies and the marketing mix elements.
- Clear understanding of functional area of marketing
- Demonstrating conceptual knowledge and analytical skills in analyzing the marketing environment.
- Develop skills in recent trends in global marketing.

REFERENCES:

1. Sherlekar, "Marketing Management ", S.A, Himalaya Publishing House, Thirteenth Edition2016.
2. Philip Kortler and Kevin Lane Keller, ". Marketing Management ", PHI 15th Edition, 2015
3. S.H.H. Kazmi, ". Marketing Management,", Excel Books India, 2ndEdition, 2013
4. C. B Gupta & N Rajan Nair, "Marketing Management text and Case " 17th Edition 2016
5. KS Chandrasekar, "Marketing management-Text and Cases", Tata McGraw Hill, First edition, 2010.
6. V S Ramaswamy& S Namkumari, "Marketing management Global Perspective, Indian Context" , Macmillan Publishers India, 5th Edition, 2015

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	√	√	√	√										√

CO 2				√	√							√	
CO 3									√	√	√		
CO 4	√	√	√								√	√	√
CO 5	√					√							

MC5037 ORGANIZATIONAL BEHAVIOR L T P C
3 0 0 3

OBJECTIVE:

- The objective is to enable the students to understand the Organizational Behavior, and Organizational Change and dynamic of groups.

UNIT I ORGANISATIONAL BEHAVIOUR 9

Organization Behaviour – Definition – Scope and Application in Management – Contributions of Other Disciplines to OB. Emerging Issues in Organizational Behaviour- Organizational behaviour models

UNIT II INDIVIDUAL PROCESSES 9

Personality – types – Factors influencing personality– Theories. Emotions - Theories – Emotional Intelligence- Learning – Types of learners – The learning process – Learning theories.

Perceptions – Importance – Factors influencing perception- Attitudes – Nature of Attitudes Components of Attitudes Formation of Attitude Benefits of Positive Attitude Functions of Attitudes– Measurement-Motivation – Importance – Types – Theories.

UNIT III LEADERSHIP AND POWER 9

Meaning – Importance – Leadership styles – Theories – Leaders Vs Managers – Sources of power – Power centers – Power and Politics.

UNIT IV GROUP DYNAMICS 9

Meaning – Types of Groups – Functions of Small Groups – Group Size Status – Managerial Implications – Group Behaviour – Group Norms – Cohesiveness – Group Thinking

UNIT V ORGANISATIONAL CHANGE AND DEVELOPMENT 9

Organizational Change: Meaning – Nature of Work Change – Need for Change – Change Process – Types of Change – Factors Influencing Change – Resistance to Change – Overcoming Resistance – Organizational Development: Meaning and Different Types of OD Interventions.

TOTAL: 45 PERIODS

OUTCOMES:

On completion of the course should be able to:

- Students will have a better understanding of human behavior in organization.
- They will know the framework for managing individual and group performance.
- Characteristics of attitudes and components of attitudes — A brief discussion

- List the determinants of personality
- List the characteristics of various leadership styles.

REFERENCES:

1. K. Aswathappa, "Organizational behaviour", Himalaya Publishing House Pvt. Ltd. 11thEdition.
2. Stephen P. Robins, "Organizational Behavior", PHI Learning / Pearson Education, Edition 17, 2016 (Global edition)
3. Fred Luthans, "Organizational Behavior", McGraw Hill, 12th Edition
4. Nelson, Quick, Khandelwal. "ORGB – An innovative approach to learning and teaching". Cengage, 2nd edition 2012
5. Ivancevich, Konopaske&Maheson, "Organizational Behaviour& Management", Tata McGraw Hill, 7th edition, 2008
6. Robert Kreitner and Angelo Kinicki, "Organizational Behaviour", Tata McGraw Hill, 10th Edition, 2016

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1			√	√			√							
CO 2		√		√									√	
CO 3								√				√		√
CO 4							√			√				√
CO 5									√		√		√	

MC5038 BUSINESS DATA ANALYTICS L T P C
3 0 0 3

OBJECTIVES:

- To understand the basics of business analytics and its life cycle.
- To gain knowledge about fundamental business analytics.
- To learn modeling for uncertainty and statistical inference.
- To understand analytics using Hadoop and Map Reduce frameworks.
- To acquire insight on other analytical frameworks.

UNIT I OVERVIEW OF BUSINESS ANALYTICS 9

Introduction – Drivers for Business Analytics – Applications of Business Analytics: Marketing and Sales, Human Resource, Healthcare, Product Design, Service Design, Customer Service and Support – Skills Required for a Business Analyst – Framework for Business Analytics Life Cycle for Business Analytics Process.

UNIT II ESSENTIALS OF BUSINESS ANALYTICS 9

Descriptive Statistics – Using Data – Types of Data – Data Distribution Metrics: Frequency, Mean, Median, Mode, Range, Variance, Standard Deviation, Percentile, Quartile, z-Score, Covariance, Correlation – Data Visualization: Tables, Charts, Line Charts, Bar and Column Chart, Bubble Chart, Heat Map – Data Dashboards.

UNIT III MODELING UNCERTAINTY AND STATISTICAL INFERENCE 9

Modeling Uncertainty: Events and Probabilities – Conditional Probability – Random Variables – Discrete Probability Distributions – Continuous Probability Distribution – Statistical Inference: Data Sampling – Selecting a Sample – Point Estimation – Sampling Distributions – Interval Estimation – Hypothesis Testing.

UNIT IV ANALYTICS USING HADOOP AND MAPREDUCE FRAMEWORK 9

Introducing Hadoop – RDBMS versus Hadoop – Hadoop Overview – HDFS (Hadoop Distributed File System) – Processing Data with Hadoop – Introduction to MapReduce – Features of MapReduce – Algorithms Using Map-Reduce: Matrix-Vector Multiplication, Relational Algebra Operations, Grouping and Aggregation – Extensions to MapReduce

UNIT V OTHER DATA ANALYTICAL FRAMEWORKS 9

Overview of Application development Languages for Hadoop – PigLatin – Hive – Hive Query Language (HQL) – Introduction to Pentaho, JAQL – Introduction to Apache: Sqoop, Drill and Spark, Cloudera Impala – Introduction to NoSQL Databases – Hbase and MongoDB.

TOTAL: 45 PERIODS

OUTCOMES:

On completion of the course, the student will be able to:

- Identify the real world business problems and model with analytical solutions.
- Solve analytical problem with relevant mathematics background knowledge.
- Convert any real world decision making problem to hypothesis and apply suitable statistical testing.
- Write and Demonstrate simple applications involving analytics using Hadoop and MapReduce
- Use open source frameworks for modeling and storing data.

REFERENCES:

1. U. Dinesh Kumar, “Business Analytics: The Science of Data-Driven Decision Making”, Wiley, First Edition, 2017.
2. Umesh R Hodeghatta, UmeshaNayak, “Business Analytics Using R – A Practical Approach”, Apress, First Edition2017.
3. Jeffrey D. Camm, James J. Cochran, Michael J. Fry, Jeffrey W. Ohlmann, David R. Anderson, “Essentials of Business Analytics”, Cengage Learning, second Edition, 2016.
4. Rui Miguel Forte, “Mastering Predictive Analytics with R”, Packt Publication, First Edition2015.
5. VigneshPrajapati, “Big Data Analytics with R and Hadoop”, Packt Publishing, First Edition2013.
6. AnandRajaraman, Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press,First Edition 2012.
7. A. Ohri, “R for Business Analytics”, Springer, FirstEdition, 2012

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2

CO 1	√	√	√	√	√				√	√		√	√	√
CO 2	√	√	√	√	√				√	√		√	√	√
CO 3	√	√	√	√	√				√	√		√	√	√
CO 4	√	√	√	√	√				√	√		√	√	√
CO 5	√	√	√	√	√				√	√	√	√	√	√

MC5039 CRYPTOCURRENCY AND BLOCK CHAIN TECHNOLOGIES L T P C
3 0 0 3

Objectives:

- To understand the basics of Blockchain
- To understand the basicsofCryptocurrency
- To understand the working of digital tokens and wallets
- To understand the working of contracts
- To understand the working of block chain platforms

UNIT I OVERVIEW OF BLOCKCHAIN: **9**

Why Blockchain - The Structure of Blockchain - Data Structure of Blockchain - Data Distribution in Blockchain - Block Validation. **Block Validators:** Proof of Work – Proof of Stake - Proof of Activity - Proof of Elapsed Time - Proof of Burn.

UNIT II CRYPTOCURRENCY **9**

Overview. **Bitcoin:** Bitcoin Working - Bitcoin Transactions - Bitcoin Mining - Value of Bitcoin - Community, Politics and Regulations – Advantages – Disadvantages. **Ethereum:** Overview – Decentralized Application. **Components of Ethereum:** Smart contracts – Ether - Ethereum Clients - Ethereum Virtual Machine – Etherscripter.

UNIT III HYPERLEDGER **9**

Introduction**. Digital Tokens:** Overview **-** Initial Coin Offering – OmiseGO – EOS – Tether. **MetaMask:** Wallet Seed - MetaMask Transactions. **Mist:** Overview **-** Mist wallet. **Truffle**: Features of Truffle – Development Truffle boxes - Community truffle box.

UNIT IV SOLIDITY **9**

Smart Contracts - Contract and Interfaces - **Hyperledger Fabric:** Introduction - Fabric v/s Ethereum - HyperledgerIroha - Features of Iroha.**HyperledgerSawtooth:** Components of sawtooth - Proof of Elapsed time.

UNIT V BLOCKCHAIN PLATFORMS **9**

Multichain - HydraChain**. Future Blockchain:** IOTA **–** Corda - Chain Core.**Blockchain Framework:** CoCo Framework – Tierion – BigchainDB.

TOTAL:45 PERIODS

OUTCOME:

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

- describe the Basics of Block chain Technology concepts and its applications
- know about the implementation of Crypto currency
- identify the different ways to achieve Block chain Technology
- Illustrate how to design and build smart contracts using various platforms
- understand about the future of Block chain technology

REFERENCES:

1. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 1st Edition, 2017.
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. 1st Edition, Princeton University Press, 2016.
3. Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 1st Edition, 2015.
4 https://www.blockchainexpert.uk/book/blockchain-book.pdf

MOOC Website references (Example website references are only given; it's not an exhaustive list)

1. www.coursera.org
    a. Blockchain
    b. Blockchain and cryptocurrency explained
    c. Blockchain revolution
    d. Bitcoin and Cryptocurrency technologies
    e. Blockchain basics
    f. Introduction to Blockchain
    g. Introduction to Blockchain technologies
    h. Blockchain foundations and use cases
2. www.udemy.com
    a. Build a blockchain and cryptocurrency from scratch
    b. The Basics of Blockchain
    c. Blockchain advanced level
    d. Learn Blockchain technology and cryptocurrency in Java
    e. Full Cryptocurrency courses: Ethereum, bitcoin and blockchain

Mapping of COs with POs and PSOs														
COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	√	√												
CO2	√	√												
CO3	√	√												
CO4	√	√												
CO5	√	√												

MC5040 **ADVANCES IN NETWORKING** **L T P C**
3 0 0 3

OBJECTIVES:

The student should be made:

- To understand the theme underlying IPv6 Structure and addressing methods
- To understand and analyse the protocols for IPv6 Implementation
- To identify and provide solutions for QoS and Security Issues with IPv6
- To learn about Software Defined concepts, architectures, protocols and applications
- To explore the significance of Network Function Virtualization

UNIT I IPv6 STRUCTURE AND ADDRESSING 9

IPv4 Address Depletion- IPv6 Transition Issues-IPv6 Structure: IPv6 Header, Extension Headers: Hop-by-Hop Options Header, Destination Options Header, Routing Header, Fragment Header, AH, ESP- IPv6 Addresses: Unicast, Anycast, Multicast – Address Autoconfiguration

UNIT II IPv6 NETWORKING 9

IPv6 Internet Control Message Protocol (ICMPv6): ICMPv6 Messages, Fragmentation and Path MTU- IPv6 Neighbor Discovery- IPv6 Routing: RIPng, EIGRP for IPv6,OSPFv3 - Mobile IPv6

UNIT III QoS, PROVISIONING AND SECURITY WITH IPv6 9

QoS in IPv6 Protocols: Differentiated Services and IPv6, IPv6 Flows, Explicit Congestion Notification in IPv6 –Provisioning: Stateless DHCPv6,Stateful DHCPv6, DNS Extensions for IPv6- Security with IPv6: IP Security Protocol (IPsec)Basics, IPv6 Security Elements, Interaction of IPsec with IPv6 Elements

UNIT IV SOFTWARE DEFINED NETWORKING 9

Genesis of SDN – Separation of Control Plane and Data Plane – Distributed Control Plane – IP and MPLS – Characteristics of SDN – Operation – Devices – Controller – OpenFlow Specification

UNIT V NETWORK FUNCTION VIRTUALIZATION 9

Building SDN Framework – Network Functions Virtualization – Introduction –Virtualization and Data Plane I/O – Service Locations and Chaining – Applications – Use Cases of SDNs: Data Centers, Overlays, Big Data and Network Function Virtualization

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand the fundamentals of IPv6 and IPv6 Protocols
- Analyze the need for separation of data and control plane
- Understand the functionality of NFV
- Be Conversant with the latest networks and its architecture
- Gain an in-depth coverage of various networking technologies

REFERENCES:

1. Rick Graziani,“IPv6 Fundamentals: A Straightforward Approach to Understanding IPv6” Second Edition, Cisco Press, 2017
2. Peter Loshin, “IPv6:Theory,Protocoland Practice” Second Edition, Morgan Kaufmann Publishers, 2004
3. William Stallings, “Foundations of Modern Networking – SDN, NFC, QoE, IoT and Cloud” Third Edition, Pearson Publications, 2019.
4. Oswald Coker, SiamakAzodolmolky, “Software-Defined Networking with OpenFlow”, Second Edition, Packt Publishing, 2017.
5. Paul Goransson, Chuck Black, “Software Defined Networks: A Comprehensive Approach”, Morgan Kaufmann Publisher, First Edition 2014.
6. Thomas D. Nadeau, Ken Gray, “SDN: Software Defined Networks, an Authoritative Review of Network Programmability Technologies”, O'Reilly Media, First Edition August 2013.

CO	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	√	√				√							√	
CO 2	√	√	√	√		√						√	√	
CO 3	√	√				√				√		√	√	√
CO 4	√	√	√			√						√	√	
CO 5	√	√	√	√	√	√	√			√		√	√	

MC5041 SOFT COMPUTING TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:

- To gain knowledge of soft computing theories and its fundamentals.
- To design a soft computing system required to address a computational task.
- To learn and apply artificial neural networks, fuzzy sets and fuzzy logic and genetic algorithms in problem solving and use of heuristics based on human experience.
- To introduce the ideas of fuzzy sets, fuzzy logic and to become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems.
- To familiarize with genetic algorithms and other random search procedures while seeking global optimum in self – learning situations.

UNIT I FUZZY COMPUTING 9

Basic Concepts of Fuzzy Logic, Fuzzy Sets and Crisp Sets, Fuzzy Set Theory and Operations, Properties of Fuzzy Sets, Fuzzy and Crisp Relations, Fuzzy to Crisp Conversion Membership Functions, Interference in Fuzzy Logic, Fuzzy If – Then Rules, Fuzzy Implications and Fuzzy Algorithms, Fuzzifications and Defuzzificataions, Fuzzy Controller, Industrial Applications.

UNIT II FUNDAMENTALS OF NEURAL NETWORKS 9

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

UNIT III BACKPROPAGATION NETWORKS 9

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

UNIT IV COMPETETIVE NEURAL NETWORKS 9

Kohenen's Self Organizing Map – SOM Architecture, learning procedure – Application; Learning Vector Quantization – learning by LVQ; Adaptive Resonance Theory – Learning procedure – Applications.

UNIT V GENETIC ALGORITHM 9

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

TOTAL: 45 PERIODS

OUTCOMES:

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

- Identify and describe soft computing techniques and their roles in building intelligent machines.
- Recognize the feasibility of applying a soft computing methodology for a particular problem.
- Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.
- Apply genetic algorithms to optimization problems.
- Design neural networks to pattern classification and regression problems using soft computing approach.

REFERENCES:

1. S. Rajasekaran and G.A. VijayalakshmiPai, “Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications”, Prentice Hall of India, 2003.
2. J.S.R. Jang, C.T. Sun and E. Mizutani, “Neuro – Fuzzy and Soft Computing”, Pearson Education, ,2004
3. S. N. Sivanandam, S. N. Deepa, “Principles of Soft Computing”, Second Edition, Wiley, 2007.
4. SimonHaykin, “Neural Networks”, Prentice Hall, 2nd Edition,1999.
5. Timothy Ross, “Fuzzy Logic with Engineering Applications”, Wiley Publications,4th Edition 2016.
6. David E. Goldberg, “Genetic Algorithms in Search, Optimization and Machine Learning”, Pearson Education, First Edition,2008.

Mapping of COs with POs and PSOs														
COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
PSOCO1	2	1											1	
CO2	3	2	1										2	
CO3	3	2											2	
CO4	3	2											2	
CO5	3	2											2	

MC5042 DEEP LEARNING L T P C
3 0 0 3

OBJECTIVES:

- To understand how to represent the high-dimensional data, such as images, text and data.
- To explain convolution neural network
- To introduce major deep learning algorithms and their applications to solve real world problems.
- To explore about optimization and generalization in Deep learning
- To understand about deep reinforcement learning

UNIT I NEURAL NETWORK 9

Building Intelligence Machine-Expressing Linear Perceptron as Neurons-Feed Forward Neural Netwoks - Activation function. Supervised and Unsupervised Learning:Single Layer Perceptron – Perceptron Learning Algorithm – Least Mean Square Learning Algorithm - Multilayer Perceptron – Back Propagation Algorithm – XOR problem – Limitations of Back Propagation Algorithm- Implementing Neural Networks in TensorFlow.

UNIT II CONVOLUTION NEURAL NETWORK 9

Introduction-Filter and Feature Maps-Full Description of CNN-Max Pooling- Full Architectural Description of CNN-Image Preprocessing Pipeline Enable More Roburst Models-Accelerating Training with Batch Normalization-Visualizing Learning with Convolution Network-Leveraging and Learning Convolution Filters - Predefined Convolutional Filters Network (PCFNet)- Transfer Learning with Convolutional Neural Networks.

UNIT III DEEP NETWORKS 9

History of Deep Learning- A Probabilistic Theory of Deep Learning- Backpropagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks - Convolutional Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning

UNIT IV OPTIMIZATION AND GENERALIZATION 9

Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning.

UNIT V DEEP REINFORCEMENT LEARNING 9

Markov Decision Processes-Explore versus Exploit-Policy versus Value Learning-Pole-Cart with Policy Gradients-Q Learning and Deep Q Networks-Improving and Moving Beyond DQN

TOTAL: 45 PERIODS

OUTCOME:

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

- Describe the fundamental concepts of Neural Networks
- Apply Convolution Neural Network techniques to solve problems in image processing
- Summarize the characteristics of deep Learning
- Comprehend the Optimization and Generalization in Deep Learning
- Interpret the concepts of Deep Reinforcement Learning to solve real world problems.

REFERENCES

1. Nikhil Buduma, Nicholas Locascio, “Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms”, First Edition, O'ReillyMedia, 2017.
2. SudharsanRavichandiran, Hands on Deep Learning Algorithms with Python, FirstEdition, Packt Publishing Limited, 2019.
3. François Chollet, Deep Learning with Python, First Edition,Manning Publications Company, 2017.
4. Ian Goodfellow, YoshuaBengio and Aaron Courville, Deep Learning, First editionMIT Press, London, 2016

Mapping of COs with POs and PSOs														
COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
PSOCO1	2	1											1	
CO2	3	2	1										2	
CO3	3	2											2	
CO4	3	2											2	
CO5	3	2											2	

MC5043 BIG DATA PROCESSING L T P C

3 0 0 3

OBJECTIVES:

- To know the fundamental concepts of big data and analytics.
- To explore tools and practices for working with big data
- To learn about stream computing.
- To know about the research that requires the integration of large amounts of data.

UNIT I INTRODUCTION TO BIG DATA 9

Evolution of Big data – Best Practices for Big data Analytics – Big data characteristics – Validating – The Promotion of the Value of Big Data – Big Data Use Cases- Characteristics of Big Data Applications – Perception and Quantification of Value -Understanding Big Data

Storage – A General Overview of High-Performance Architecture – HDFS – MapReduce and YARN – Map Reduce Programming Model

UNIT II CLUSTERING AND CLASSIFICATION 9

Advanced Analytical Theory and Methods: Overview of Clustering – K-means – Use Cases – Overview of the Method – Determining the Number of Clusters – Diagnostics – Reasons to Choose and Cautions .- Classification: Decision Trees – Overview of a Decision Tree – The General Algorithm – Decision Tree Algorithms – Evaluating a Decision Tree – Decision Trees in R – Naïve Bayes – Bayes' Theorem – Naïve Bayes Classifier.

UNIT III ASSOCIATION AND RECOMMENDATION SYSTEM 9

Advanced Analytical Theory and Methods: Association Rules – Overview – Apriori Algorithm – Evaluation of Candidate Rules – Applications of Association Rules – Finding Association& finding similarity – Recommendation System: Collaborative Recommendation- Content Based Recommendation – Knowledge Based Recommendation- Hybrid Recommendation Approaches.

UNIT IV STREAM MEMORY 9

Introduction to Streams Concepts – Stream Data Model and Architecture – Stream Computing,

Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating

moments – Counting oneness in a Window – Decaying Window – Real time Analytics Platform(RTAP) applications – Case Studies – Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics

UNIT V NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION 9

NoSQL Databases : Schema-less Models‖: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores – Tabular Stores – Object Data Stores – Graph Databases Hive – Sharding –-Hbase – Analyzing big data with twitter – Big data for E-Commerce Big data for blogs – Review of Basic Data Analytic Methods using R.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Work with big data tools and its analysis techniques
- Analyze data by utilizing clustering and classification algorithms
- Learn and apply different mining algorithms and recommendation systems for large volumes of data
- Perform analytics on data streams
- Learn NoSQL databases and management.

REFERENCES:

1. Jure LeskovecAnandRajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2nd Edition2016.
2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/El sevier Publishers, First Edition2013.

3. EMC Education Services, “Data Science and Big Data Analytics: Discovering, Analyzing,Visualizing and Presenting Data”, Wiley publishers, First Edition, 2015.
4. Bart Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications”, Wiley Publishers,First Edition 2014.
5. DietmarJannach and Markus Zanker, “Recommender Systems: An Introduction”, Cambridge University Press, First Edition2010.
6. Kim H. Pries and Robert Dunnigan, “Big Data Analytics: A Practical Guide for Managers “CRC Press,First Edition2015.

MOOC REFERENCES:

1. **www.swayam.gov.in:** Big Data Computing
2. **www.coursera.org:**Big Data Essentials: HDFS, MapReduce and Spark RDD
3. **www.udemy.com:** Big Data and Hadop: Interactive Intense Course
4. **www.edx.org:** Big Data Fundamentals, Processing Big Data with Hadoop in Azure HDInsight

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	√	√	√	√	√				√	√		√	√	√
CO 2	√	√	√	√	√				√	√		√	√	√
CO 3	√	√	√	√	√				√	√		√	√	√
CO 4	√	√	√	√	√				√	√		√	√	√
CO 5	√	√	√	√	√				√	√	√	√	√	√

MC5044 NATURAL LANGUAGE PROCESSING L T P C
3 0 0 3

OBJECTIVES:

- To learn the fundamentals of natural language processing
- To understand word level and syntactic analysis.
- To understand the role of semantics of sentences and pragmatics
- To get knowledge about the machine translation.

UNIT I INTRODUCTION OF BASIC TEXT PROCESSING 9

Overview: NLP-Language - Basics of Text Processing – Spelling Correction – Weight Edit Distance- other Variations – Noisy Channel Model for spelling correction –N-Gram Language Models – Evaluation of Language models- Basic Smoothing.

UNIT II LANGUAGE MODELLING AND SMOOTHING 9

Language modeling – smoothing models – Computational Morphology – Finite state Methods for morphology – Introduction to POS tagging – Hidden Markov model for POS tagging – Models for sequential parsing – MaxEnt- CRF.

UNIT III SYTAX, PARSING, SEMANTICS 9

Syntax – Parsing – CKY-PCFGs – Inside and outside probabilities - Dependency grammar and parsing – Transition based Parsing – Formulation – Learning. MST Based Parsing -

Distributional model for semantics – Word Embeddings - Lexical Semantics-wordNet – Word Sense Disambiguation – Novel word sense detection.

UNIT IV TOPIC MODELS AND INFORMATION EXTRACTION 9

Topic Model- Latent Dirichlet Allocation – Gibbs sampling for LDA – Formulation and Application – LDA Variants- Entity Linking - Information extraction – Relation extraction- Distant Supervision

UNIT V TEXT SUMMARIZATION & TEXT CLASSIFICATION 9

Optimization Based models for summarization – Evaluation- Text classification – sentiment analysis - Affective lexicon **-**Learning affective lexicons - computing with affective lexicons

TOTAL: 45 PERIODS

OUTCOMES:

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

- To tag a given text with basic Language features
- To design an innovative application using NLP components
- To implement a rule based system to tackle morphology/syntax of a language
- To design a tag set to be used for statistical processing for real-time applications
- To apply NLG and machine translation

REFERENCES:

1. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, 3rd Edition,Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, OReilly Media, 2009.
3. Breck Baldwin, Language Processing with Java and LingPipe Cookbook, 1st Edition, Atlantic Publisher, 2015.
4. Richard M Reese, Natural Language Processing with Java, 2rd Edition, OReilly Media, 2015.
5. NitinIndurkhya and Fred J. Damerau, —Handbook of Natural Language Processing, 2rd Edition, Chapman and Hall/CRC Press, 2010.

Mapping of COs with POs and PSOs														
COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
PSOCO1	2	1											2	
CO2	2	1											2	
CO3	2	1											2	
CO4	2	1											2	
CO5	2	1											2	

MA5102 MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE L T P C
3 0 0 3

OBJECTIVES:

- To introduce Mathematical Logic and their rules for validating arguments and programmes.
- To introduce counting principles for solving combinatorial problems.
- To give exposure to Graph models and their utility in connectivity problems.
- To introduce abstract notion of Algebraic structures for studying cryptographic and its related areas.
- To introduce Boolean algebra as a special algebraic structure for understanding logical circuit problems.

UNIT I LOGIC AND PROOFS 9

Propositional Logic – Propositional Equivalences – Predicates and Quantifiers – Nested Quantifiers – Rules of Inference – Introduction to Proofs – Proof Methods and Strategy.

UNIT II COMBINATORICS 9

Mathematical Induction – Strong Induction and Well Ordering – The Basics of Counting - The Pigeonhole Principle – Permutations and Combinations – Recurrence Relations Solving Linear Recurrence Relations Using Generating Functions – Inclusion – Exclusion – Principle and Its Applications.

UNIT III GRAPHS 9

Graphs and Graph Models – Graph Terminology and Special Types of Graphs – Matrix Representation of Graphs and Graph Isomorphism – Connectivity – Euler and Hamilton Paths.

UNIT IV ALGEBRAIC STRUCTURES 9

Groups – Subgroups – Homomorphisms – Normal Subgroup and Coset – Lagrange‘s Theorem – Definitions and Examples of Rings and Fields.

UNIT V LATTICES AND BOOLEAN ALGEBRA 9

Partial Ordering – Posets – Lattices as Posets – Properties of Lattices – Lattices as Algebraic Systems – Sub Lattices – Direct Product And Homomorphism – Some Special Lattices – Boolean Algebra.

TOTAL: 45 PERIODS

REFERENCE BOOKS:

1. Kenneth H.Rosen, “Discrete Mathematics and its Applications”, Tata Mc Graw Hill Pub. Co.Ltd., Seventh Edition, Special Indian Edition, New Delhi, 2011.
2. Tremblay J.P. and Manohar R, “Discrete Mathematical Structures with Applications to Computer Science”, Tata McGraw Hill Pub. Co. Ltd, 30th Reprint, New Delhi, 2011.
3. Ralph. P. Grimaldi, “Discrete and Combinatorial Mathematics: An Applied Introduction”, Pearson Education, 3rd Edition, New Delhi, 2014.
4. ThomasKoshy, “Discrete Mathematics with Applications”, 2nd Edition, Elsevier Publications, Boston, 2006.
5. SeymourLipschutz and Mark Lipson,”Discrete Mathematics”, Schaum‘s Outlines, Tata McGraw Hill Pub. Co. Ltd., Third Edition, New Delhi, 2013.

OUTCOMES:

Upon completion of the module the student should able to:

- Apply Mathematical Logic to validate logical arguments and programmes.

- Apply combinatorial counting principles to solve application problems.
- Apply graph model and graph techniques for solving network other connectivity related problems.
- Apply algebraic ideas in developing cryptograph techniques for solving network security problems.
- Apply Boolean laws in developing and simplifying logical circuits.

BX5001 PROBLEM SOLVING AND PROGRAMMING IN C L T P C
3 0 2 4

OBJECTIVES:

- To understand the basic concepts of problem solving approaches and to develop the algorithms
- Apply the techniques of structured (functional) decomposition to break a program into smaller pieces and describe the mechanics of parameter passing.
- To design, implements, test, and apply the basic C programming concepts.

UNIT I INTRODUCTION TO COMPUTER PROBLEM SOLVING 15

Introduction – The Problem Solving aspect – Top down design – Implementation of algorithm – Program Verification – The efficiency of algorithms – The analysis of algorithms – Fundamental Algorithms

UNIT II PROGRAMMING AND ALGORITHMS 15

Programs and Programming – building blocks for simple programs -pseudo code representation – flow charts - Programming Languages - compiler –Interpreter, Loader and Linker - Program execution – Classification of Programming Language - Structured Programming Concept – Illustrated Problems: Algorithm to check whether a given number is Armstrong numberor not- Find factorial of a number.

UNIT III BASICS OF 'C', INPUT / OUTPUT & CONTROL STATEMENTS 15

Introduction- Identifier – Keywords - Variables – Constants – I/O Statements - Operators - Initialization –Expressions – Expression Evaluation – Lvalues and Rvalues – Type Conversion in C –Formatted input and output functions - Specifying Test Condition for Selection and Iteration- Conditional Execution - and Selection – Iteration and Repetitive Execution- go to Statement – Nested Loops- Continue and break statements. Programs to be implemented:

1. Write a program to find whether the given year is leap year or Not? (Hint: not every centurion year is a leap. For example 1700, 1800 and 1900 is not a leap year)
2. Write a program to perform the Calculator operations, namely, addition, subtraction, multiplication, division and square of a number.

UNIT IV ARRAYS, STRINGS, FUNCTIONS AND POINTERS 15

Array – One dimensional Character Arrays- Multidimensional Arrays- Arrays of Strings – Two dimensional character array – functions - parameter passing mechanism scope – storage classes – recursion - comparing iteration and recursion- pointers – pointer operators - uses of pointers- arrays and pointers – pointers and strings - pointer indirection pointers to functions - Dynamic memory allocation.

1. Write a program in C to get the largest element of an array using the function.
2. Display all prime numbers between two intervals using functions.
3. Reverse a sentence using recursion.

4. Write a C program to concatenate two strings.
5. Find the frequency of a character in a string.

UNIT V USER-DEFINED DATATYPES & FILES 15

Structures – initialization - nested structures – structures and arrays – structures and pointers - union– type def and enumeration types - bit fields - File Management in C – Files and Streams – File handling functions – Sequential access file- Random access file – Command line arguments.

1. Write a C program to Store Student Information in Structure and Display it.
2. The annual examination is conducted for 10 students for five subjects.
3. Write a program to read the data and determine the following:
   (a) Total marks obtained by each student.
   (b) The highest marks in each subject and the marks of the student who secured it.
   (c) The student who obtained the highest total marks.

TOTAL: 75PERIODS

OUTCOMES:

- Able to design a computational solution for a given problem.
- Able to break a problem into logical modules that can be solved (programmed).
- Able to transform a problem solution into programs involving programming constructs.
- To write programs using structures, strings, arrays, pointer and files for solving complex computational problem.
- Able to introduce modularity using functions and pointers which permit ad hoc runtime polymorphism.

REFERENCES:

1. Deitel and Deitel, “C How to Program”, Pearson Education. 2013, 7th Edition
2. Byron S Gottfried, —Programming with C, Schaums Outlines, Second Edition, Tata McGraw-Hill, 2006.
3. Brian W. Kernighan and Dennis M. Ritchie, “The C programming Language”, Edition? 2nd edition 2015, Pearson Education India
4. How to solve it by Computer, R. G. Dromey, Pearson education, Fifth Edition, 2007.
5. Kamthane, A.N., “Programming with ANSI and Turbo C”, Pearson Education, Delhi, 3rdEdition, 2015.
6. Mastering C- by K R Venugopal, Sudeep R Prasad McGraw Hill Education (India) Private Limited; Second edition 2015.
7. PradipDey, ManasGhosh, —Computer Fundamentals and Programming in C, Second Edition, Oxford University Press, 2013.

BX5002 DIGITAL LOGIC AND COMPUTER ORGANISATION L T P C

3 0 0 3

OBJECTIVES:

- To become familiar with Boolean algebra
- To study the different types of combinational and sequential circuits
- To comprehend the basis operations that happen in a CPU
- To learn the data path and control path implementation
- To become familiar with the memory hierarchy design and I/O design

UNIT I DIGITAL FUNDAMENTALS 8

Number Systems and Conversions – Boolean Algebra an Simplifications – Minimization of Boolean Functions – Karnaugh Map, QuineMcClusky Method. Logic Gates – NAND NOR implementation.

UNIT II COMBINATIONAL AND SEQUENTIAL CIRCUITS 10

Design of Circuits –Adder /Subtracter – Encoder – Decoder – MUX /DEMUX – Comparators, Flip flops – Triggering – Master – Slave Flip Flop – State Diagram and Minimization – Counters - Registers

UNIT III BASIC STRUCTURE OF COMPUTER 9

Functional Units - Basic Operational Concepts – Bus structures – Performance and Metrics – instruction and instruction sequencing – Hardware Software Interface – Addressing modes – Instruction Sets – RISC and CISC – ALU Design – Fixed point and Floating point operations

UNIT IV PROCESSOR DESIGN 9

Processor basics –CPU Organization – Data Path Design – Control Design – Basic concepts – Hardwired control – Micro Programmed control – Pipe control – Hazards super scale operations

UNIT V MEMORY AND I/O SYSTEMS 9

Memory technology – Memory Systems- Virtual Memory – Caches – Design Methods – Associative memories – Input /output system – Programmed I/O – DMA and interrupts – I/O devices and Interfaces

TOTAL: 45 PERIODS

OUTCOMES:

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

- Simplify using laws of Boolean algebra and Karnaugh map method
- Design various combinational and sequential circuits
- Differentiate between various addressing modes
- Differentiate between the various mapping policies used in cache memories
- Discuss the various types of I/O transfers

REFERENCES:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky and NaraigManjikian, “Computer Organization and Embedded Systems”, 6thEdition, Tata McGraw Hill, 2012.
2. Carl Hamacher, Zvonkovranesic and SafwatZaky, fifth edition, “Computer Organisation” 5th Edition, Tata Mc Graw Hill, 2002.
3. Charles H. Roth, Jr., “Fundamentals of Logic Design”, Jaico Publishing House, Mumbai, 4thEdition 1992.
4. David A. Patterson and John L. Hennessy, “Computer Organization and Design: The Hardware/Software Interface”,2ndEdition, Morgan Kaufmann , 2002.Morris Mano “Digital Design”, Printice Hall of India 1997
5. John P. Hayes, “Computer Architecture and Organization”, 3rdEdition, Tata McGraw Hill, 1998 6. William Stallings,“Computer Organization & Architecture – Designing for Performance” 6th Edition, Pearson Education, 2003.

BX5003 OPERATING SYSTEMS L T P C
3 0 0 3

OBJECTIVES

- To be familiar with the basic concepts and functions of Operating Systems
- To understand Processes and Threads
- To analyze Scheduling algorithms
- To gain expertise in various Memory Management schemes
- To expose with various I/O Management and File systems

UNIT I OS OVERVIEW 9

Instruction Execution-Memory Hierarchy-Direct Memory Access- Types of Operating Systems- Operating Systems Services-Operation on Processes-Co-operating processes-System Calls-System Programs-Evolution of OS-OS Structure.

UNIT II PROCESS SYNCHRONIZATION 9

Processes-Process Concept-Process Synchronization-Critical Regions - Critical Section Problem – InterProcess Communication-Synchronization Hardware-Mutex Locks – Semaphores-Classical problems of Synchronization – Monitors – Threads – Overview-Multithreading Models-Threading Issues.

UNIT III PROCESS SCHEDULING 9

Process Scheduling-Scheduling mechanisms-Strategy selection-Pre emptive and Non pre emptive strategies-Scheduling criteria-Scheduling Algorithms-Multiprocessor Scheduling.

UNIT IV STORAGE MANAGEMENT 9

Main Memory – Background-Mapping Address space to Memory space – Swapping-Contiguous Memory allocation-Memory Allocation Strategies – Paging – Segmentation-Virtual Memory-Page Replacement – Thrashing.

UNIT V FILE SYSTEMS AND I/O SYSTEMS 9

Disk structures-Disk Scheduling and Management-File System Interface-File Concepts-Access Methods-Directory Structures-Directory Organization–Filesystem Mounting–Filesharing and Protection–Filesystem Implementation-Allocation Methods-Free space Management-Efficiency and Performance – Recovery.

TOTAL:45 PERIODS

OUTCOMES:

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

- Deliver the main concepts, structure and functions of Operating Systems
- Implement the algorithms in Process management and solving the issues of IPC
- Analyze various Scheduling Algorithms
- Demonstrate the mapping between Physical memory and Virtual memory
- Understand the functionality of File systems in OS perspective

REFERENCE BOOKS:

1. Abraham Silberschatz Peter B Galvin&G.Gagne, ”Operating Systems Concepts”, NinthEdition,AddisionWesley Publishing Co.,2012.
2. Andrew S.Tanenbaum, “Modern operating Systems”, Fourth Edition, Pearson Education, 2016.
3. William Stallings, “Operating Systems: Internals and Design Principles”,Seventh Edition, PrenticeHall, 2011.

4. H M Deitel, P J Deitel& D R Choffnes, “Operating Systems” ,ThirdEdition, Pearson Education,2011.
5. D M Dhamdhere, “Operating Systems: A Concept-based Approach”, Second Edition, TataMcGraw-Hill Education, 2007.

BX5004 DATA STRUCTURES AND ALGORITHMS L T P C
3 0 0 3

OBJECTIVES:

- Be familiar with basic techniques of algorithm analysis.
  - Be exposed to the concept of ADTs.
  - Learn linear data structures-List, Stack and Queue.
  - Learn nonlinear data structures-Tree and Graphs.
  - Be exposed to sorting, searching and hashing algorithms

UNIT I INTRODUCTION 9

Introduction - Abstract Data Types (ADT) – Arrays and its representation –Structures – Fundamentals of algorithmic problem solving – Important problem types – Fundamentals of the analysis of algorithm – analysis frame work – Asymptotic notations, Properties, Recurrence Relation.

UNIT II LINEAR DATA STRUCTURES – LIST 9

List ADT - Array-based Implementation - Linked list implementation - Singly Linked Lists – Circularly linked lists – Doubly Linked Lists - Applications of linked list – Polynomial Addition.

UNIT III LINEAR DATA STRUCTURES - STACK, QUEUE 9

Stack ADT – Operations on Stack - Applications of stack – Infix to postfix conversion – evaluation of expression - Queue ADT – Operations on Queue - Circular Queue - Applications of Queue.

UNIT IV NON LINEAR DATA STRUCTURES - TREES AND GRAPHS 9

Trees and its representation – left child right sibling data structures for general trees- Binary Tree – Binary tree traversals –- Binary Search Tree - Graphs and its representation - Graph Traversals - Depth-first traversal – breadth-first traversal-Application of graphs.

UNIT V SORTING, SEARCHING AND HASH TECHNIQUES 9

Sorting algorithms: Insertion sort - Bubble sort - Quick sort - Merge sort - Searching: Linear search –Binary Search - Hashing: Hash Functions – Separate Chaining – Open Addressing – Rehashing.

TOTAL: 45 PERIODS

OUTCOMES:

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

- analyze algorithms and determines their time complexity.
- understand the concepts of data types, data structures and linear structures
- apply data structures to solve various problems
- understand non-linear data structures
- apply different Sorting, Searching and Hashing algorithms.

REFERENCES:

1. A.K. Sharma, “Data Structures using C”, 2nd Edition, Pearson Education Asia, 2013
2. AnanyLevitin “Introduction to the Design and Analysis of Algorithms” 3rd Edition, Pearson Education 2012
3. E. Horowitz, Anderson-Freed and S.Sahni, “Fundamentals of Data structures in C”, 2nd Edition,University Press, 2007
4. E.Balagursamy,” Data Structures using C”, Tata McGraw Hill 2015 Reprint
5. M. A. Weiss, “Data Structures and Algorithm Analysis in C”, 3rd Edition, Pearson Education Asia, 2013.

BX5005 PROGRAMMING AND DATA STRUCTURES USING C LABORATORY

L T P C
0 0 4 2

OBJECTIVES:

To develop skills in design and implementation of data structures and their applications

- To learn and implement linear, non linear and tree data structures
- To study, implement and analyze the sorting technique.

LIST OF EXPERIMENTS

1. Array- Insertion and Deletion
2. Application using array of structures
3. Array Implementation of Stack
4. Array Implementation of Queue
5. Infix to postfix conversion
6. Singly Linked List operations
7. Polynomial manipulation- addition, subtraction
8. Binary Tree Traversal
9. Quick Sort
10. Binary Search

TOTAL: 60 PERIODS

OUTCOMES:

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

- Work with basic data structures that are suitable for the problems to be solved efficiently.
- Implement stack & queue techniques for related problems
- Implement prefix and post fix conversion
- Design and implement linear, and tree and its applications
- Design sorting technique, its algorithm design and analysis.

BX5006 DATABASE MANAGEMENT SYSTEMS L T P C

3 0 0 3

OBJECTIVES:

- To understand the fundamentals of data models and conceptualize and depict a database system using ER diagram.
- To make a study of SQL and relational database design.

- To know about data storage techniques and query processing.
- To impart knowledge in transaction processing, concurrency control techniques and recovery procedures.

UNIT I INTRODUCTION 9

File systems versus Database systems – Data Models – DBMS Architecture – Data Independence – Data Modeling using Entity – Relationship Model – Enhanced E-R Modeling.

UNIT II RELATIONAL MODEL AND QUERY EVALUATION 9

Relational Model Concepts – Relational Algebra – SQL – Basic Queries – Complex SQL Queries – Views – Constraints – Relational Calculus – Tuple Relational Calculus – Domain Relational Calculus

UNIT III DATABASE DESIGN & APPLICATION DEVELOPMENT 9

Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

UNIT IV TRANSACTION PROCESSING 9

Transaction Processing – Properties of Transactions - Serializability – Transaction support in SQL - Locking Techniques – Time Stamp ordering – Validation Techniques – Granularity of Data Items – Recovery concepts – Shadow paging – Log Based Recovery.

UNIT V FILES AND INDEXING 9

File operations – Hashing Techniques – Indexing – Single level and Multi-level Indexes – B+ tree – Static Hashing - Indexes on Multiple Keys.

TOTAL: 45 PERIODS

OUTCOMES:

- Understand the basic concepts of the database and data models.
- Design a database using ER diagrams and map ER into Relations and normalize the relations
- Acquire the knowledge of query evaluation to monitor the performance of the DBMS.
- Develop a simple database applications using normalization.
- Acquire the knowledge about different special purpose databases and to critique how they differ from traditional database systems.

REFERENCES:

1. Abraham Silberschatz, Henry F.Korth and S.Sundarshan “Database System Concepts”, Seventh Edition, McGraw Hill, 2017.
2. RamezElamassri and ShankantBNavathe, “Fundamentals of Database Systems”, Seventh Edition, Pearson Education Delhi, 2017.
3. RaghuRamakrishnan, ―Database Management Systems‖, Fourth Edition, McGrawHill College Publications, 2015.
4. Lee Chao, “Database Development and Management”, Auerbach Publications, 1st edition, 2010
5. Carlos Coronel, Peter Rob, and Stephen Morris, “Database Principles Fundamentals of Design, Implementation, and Management –10th Edition”, Course Technology, Cengage Learning, 2013.
6. C.J. Date, “An Introduction to Database Systems”, Eighth Edition, Pearson Education Delhi, 2003.

BX5007 JAVA PROGRAMMING L T P C

3 00 3

OBJECTIVES:

- To provide an overview of working principles of internet, web related functionalities
- To understand and apply the fundamentals core java, packages, database connectivity for computing
- To enhance the knowledge to server side programming.
- To Understand the OOPS concept & how to apply in programming.

UNIT I JAVA FUNDAMENTALS 9

Java features – Java Platform – Java Fundamentals – Expressions, Operators, and Control Structures – Classes, Methods – Inheritance - Packages and Interfaces – Boxing, Unboxing – Variable-Length Arguments (Varargs), Exception Handling.

UNIT II COLLECTIONS AND ADVANCE FEATURES 9

Utility Packages- Introduction to collection –Hierarchy of Collection framework – Generics, Array list, LL, HashSet, Treeset, HashMap – Comparators – Java annotations – Premain method.

UNIT III ADVANCED JAVAPROGRAMMING 9

Input Output Packages – Inner Classes – Java Database Connectivity - Introduction JDBC Drivers - JDBC connectivity with MySQL/Oracle -Prepared Statement & Result Set – JDBC Stored procedures invocation - Servlets - RMI – Swing Fundamentals - Swing Classes.

UNIT IV OVERVIEW OF DATA RETRIEVAL & ENTERPRISE APPLICATION DEVELOPMENT 9

Tiered Application development - Java Servers, containers –Web Container – Creating Web Application using JSP/Servlets – Web Frameworks Introduction to Spring/ Play Framework – ORM Layer – Introduction to Hibernate.

UNIT V JAVA INTERNALS AND NETWORKING 9

Java jar Files-Introspection – Garbage collection – Architecture and design – GC Cleanup process, Invoking GC, Generation in GC - Networking Basics Java and the Net – Inet Address – TCP/IP Client Sockets – URL –URL Connection – TCP/IP Server Sockets – A Caching Proxy HTTP Server – Datagrams.

TOTAL: 45 PERIODS

OUTCOMES:

1. Implement Java programs.
2. Make use of hierarchy of Java classes to provide a solution to a given set of requirements found in the Java API

3. Use the frameworks JSP, Hibernate, Spring
4. Design and implement server side programs using Servlets and JSP
5. Make use of networking concepts in Java

REFERENCES:

1. R. Nageswara Rao, "Core Java: An Inte**grated Approa**ch", DreamTech Press, Edition 2016
2. Amritendu De, "Spring 4 and Hibernate 4: Agile Java Design and Development", McGraw-Hill Education, Illustrated Edition,2015
3. Herbert Schildt, The Complete Reference – Java 2, Ninth Edition, Tata McGrawHill, 2014
4. Joyce Farrell, "Java Programming", Cengage Learning, Seventh Edition, 2014
5. John Dean, Raymond Dean, "Introduction to Programming with JAVA – A Problem Solving Approach", Tata Mc Graw Hill, Second Edition, 2014.
6. Mahesh P. Matha, "Core Java A Comprehensive Study", Prentice Hall of India, First Edition, 2011

BX5008 SOFTWARE ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To provide an insight into software life cycle and various software process models
- To estimate the resources for developing the application and to prepare the schedule
- .To know the various designing concepts and notations for modeling the software.
- To prepare the test cases for the project, apply various testing techniques, strategies and metrics to evaluate the software.
- To construct software with high quality and reliability.

UNIT I INTRODUCTION 9

Software Engineering Paradigms – Waterfall Life Cycle Model – Spiral Model – Prototype Model – Agile Process Model – Unified Process Model - Planning – Software Project Scheduling – SRS - Case Study: Project Plan and SRS

UNIT II SOFTWARE DESIGN 9

Designing Concepts - Abstraction – Modularity – Software Architecture – Cohesion – Coupling – Dataflow Oriented Design - Jackson System Development - Real time and Distributed System Design – Designing for Reuse — Case Study : Design for any Application Oriented Project.

UNIT III SOFTWARE TESTING AND MAINTENANCE 9

Software Testing Fundamentals – Software Testing Strategies – Black Box Testing – White Box Testing – System Testing – Object Orientation Testing – State Based Testing - Testing Tools – Test Case Management – Types of Maintenance – Case Study: Testing Techniques.

UNIT IV SOFTWARE METRICS 9

Scope – Classification of metrics – Measuring Process and Product attributes – Direct and Indirect measures – Cost Estimation - Reliability – Software Quality Assurance – Standards – Case Study for COCOMO model.

UNIT V SCM & WEB ENGINEERING 9

Need for SCM – Version Control – SCM process – Software Configuration Items – Taxonomy – Re Engineering – Reverse Engineering - Web Engineering - CASE Repository – Features.

TOTAL: 45 PERIODS

OUTCOMES:

- Able to understand the problem domain to choose process models and to develop SRS
- Able to model software projects using appropriate design notations
- Able to measure the product and process performance using various metrics
- Able to evaluate the system with various testing techniques and strategies
- Able to analyze, design, verify, validate, implement, and maintain software systems.

REFERENCES

1. Roger S. Pressman, “Software Engineering: A Practitioner Approach”, Seventh Edition, Tata McGraw – Hill International Edition, 2010
2. Richard Fairley, “Software Engineering Concepts”, Tata McGraw Hill Edition, 2008
3. Ali Behforroz, Frederick J.Hudson, “Software Engineering Fundamentals”, Oxford Indian Reprint, First Edition, 2012.
4. Sommerville, “Software Engineering”, Tenth Edition, Pearson, 2016.
5. PankajJalote, “An Integrated approach to Software Engineering”, Third Edition, NarosaPublications, 2011.

BX5009 BASICS OF COMPUTER NETWORKS L T P C

3 0 0 3

OBJECTIVES:

- To understand networking concepts and basic communication model
- To understand network architectures and components required for data communication.
- To analyze the function and design strategy of physical, data link, network layer and transport layer
- To acquire basic knowledge of various application protocol for internet security issues and services.

UNIT I NETWORK FUNDAMENTALS 9

Uses of Networks – Categories of Networks -Communication model –Data transmission concepts and terminology – Protocol architecture – Protocols – OSI – TCP/IP – LAN Topology - Transmission media .

UNIT II DATA LINK LAYER 9

Data link control - Flow Control – Error Detection and Error Correction - MAC – Ethernet, Token ring, Wireless LAN MAC – Blue Tooth – Bridges.

UNIT III NETWORK LAYER 9

Network layer – Switching concepts – Circuit switching – Packet switching –IP —- Datagrams —IP addresses- IPV6– ICMP – Routing Protocols – Distance Vector – Link State- BGP.

UNIT IV TRANSPORT LAYER 9

Transport layer –service –Connection establishment – Flow control – Transmission control protocol – Congestion control and avoidance – User datagram protocol. -Transport for Real Time Applications (RTP).

UNIT V APPLICATIONS AND SECURITY 9

Applications - DNS- SMTP – WWW –SNMP- Security –threats and services - DES- RSA.

TOTAL : 45 PERIODS

OUTCOMES:

- Able to trace the flow of information from one node to another node in the network
- Able to Identify the components required to build different types of networks
- Able to understand the functionalities needed for data communication into layers
- Able to choose the required functionality at each layer for given application
- Able to understand the working principles of various application protocols and fundamentals of security issues and services available.

REFERENCES:

1. Larry L. Peterson & Bruce S. Davie, “Computer Networks – A systems Approach”, Fifth Edition, Morgan Kaufmann, 2012.
2. James F. Kurose, Keith W. Ross, “Computer Networking: A Top-down Approach, Pearson Education, Limited, sixth edition, 2012.
3. AndrewS.Tannenbaum, David J. Wetherall, “Computer Networks” Fifth Edition, Pearson Education 2011.
4. Forouzan, “Data Communication and Networking”, Fifth Edition , TMH 2012.
5. William Stallings, —Data and Computer Communications‖, Tenth Edition, Pearson Education, 2013.

BX5010 JAVA PROGRAMMING LABORATORY L T P C

0 0 4 2

OBJECTIVES:

To develop skills in design and implementation of object oriented concepts and networking applications

- To learn and implement class, interface and package
- To study, implement and analyze the client server and remote programming.

LIST OF EXPERIMENTS

1. Write Java programs by making use of class, interface, package, etc for the following Different types of inheritance study
   # Uses of 'this' keyword
   # Polymorphism
   # Creation of user specific packages
   # Creation of jar files and using them
   # User specific exception handling
2. Writing window based GUI applications using frames and applets such as Calculator application, Fahrenheit to Centigrade conversion etc.
3. Application of threads examples
4. Create an Application to search Phone Number using contact Name Using Hash Map.
5. Create an Application which finds the Duplicates in E-mail using Set Interface.
6. Writing an RMI application to access a remote method
7. Writing a Servlet program with database connectivity for a web based application such as students result status checking, PNR number enquiry etc.

TOTAL: 60 PERIODS

OUTCOMES:

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

- Work with basic Object Oriented programming concepts that are suitable for the problems to be solved efficiently.
- Implement frames and applets for related problems
- Implement prefix and post fix conversion
- Design and implement Threads in Java
- Design Remote method invocation

BX5011 DATABASE PROGRAMMING LABORATORY L T P C
0 0 4 2

OBJECTIVES:

- To understand the concepts of DBMS.
- To familiarize with SQL queries.
- To write stored procedures in DBMS.
- To learn front end tools to integrate with databases.

LIST OF EXPERIMENTS:

1. Creation of base tables and views

2. Data Manipulation INSERT, DELETE and UPDATE in Tables. SELECT, Sub Queries

3. Data Control Commands

4. High level language extensions – PL/SQLOr Transact SQL – Packages

5. Use of Cursors, Procedures and Functions

6. Embedded SQL or Database Connectivity

7. Oracle or SQL Server Triggers – Block Level – Form Level Triggers

8. Working with Forms, Menus and ReportWriters for a application project in any domain

9. Develop a database application using Java/ Django/PHP/.NET as Front end

TOTAL: 60 PERIODS

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

- Design and Implement databases
- Formulate complex queries using SQL
- Implement procedures, Cursors and Function
- Implement Triggers
- Design and Implement applications that have GUI and access databases for backend connectivity

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