



JAI SHRIRAM ENGINEERING COLLEGE, TIRUPPUR – 638 660

(An Autonomous Institution)

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

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## REGULATION 2024

# M. E. COMPUTER SCIENCE AND ENGINEERING

## CHOICE BASED CREDIT SYSTEM

## CURRICULUM FOR SEMESTERS I TO IV

&

## SYLLABUS FOR SEMESTERS I TO IV

  
Prof. A. GOKILAVANI, B.Tech., M.E.,  
Head of the Department  
Computer Science and Engineering  
Jai Shriram Engineering College  
Avinashipalayam, Tirupur - 638 660.



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CURRICULUM FOR SEMESTERS I TO IV

SEMESTER – I

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1.	24PMA102	Applied Probability and Statistics for Computer Science Engineers	FC	3	1	0	4
2.	24PRM101	Research Methodology and IPR	RM	2	0	0	2
3.	24PCS101	Advanced Data Structures and Algorithms	PC	3	0	0	3
4.	24PCS102	Network Technologies	PC	3	0	0	3
5.	24PCS103	Principles of Programming Languages	PC	3	0	0	3
6.		Audit Course – I*	AC	2	0	0	0
<b>THEORY CUM PRACTICAL</b>							
7.	24PCSI101	Database Practices	PC	3	0	2	4
<b>PRACTICALS</b>							
8.	24PCS111	Advanced Data Structures and Algorithms Laboratory	PC	0	0	4	2
<b>Total Credits</b>				<b>19</b>	<b>1</b>	<b>6</b>	<b>21</b>

SEMESTER – II

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
<b>THEORY</b>							
1.	24PCS201	Multicore Architecture and Programming	PC	3	0	0	3
2.	24PCS202	Advanced Software Engineering	PC	3	0	0	3
3.		Professional Elective I	PE	-	-	-	3
4.		Professional Elective II	PE	-	-	-	3
5.		Audit Course – II*	AC	2	0	0	0
<b>THEORY CUM PRACTICAL</b>							
6.	24PCSI204	Machine Learning	PC	3	0	2	4
<b>PRACTICAL</b>							
7.	24PCS211	Multicore Architecture and Programming Laboratory	PC	0	0	4	2
8.	24PCS212	Advanced Software Engineering Laboratory	PC	0	0	4	2
9.	24PCS213	Term Paper Writing and seminar	EE	0	0	2	1
<b>Total Credits</b>				<b>11</b>	<b>0</b>	<b>12</b>	<b>21</b>

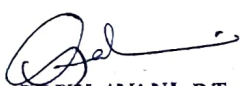
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S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
<b>THEORY</b>							
1.	24PCS301	Security Practices	PC	3	0	0	3
2.		Open Elective I	OE	3	0	0	3
3.		Professional Elective III	PE	3	0	0	3
<b>PRACTICAL</b>							
4.	24PCS311	Project Work I	EE	0	0	12	6
<b>Total Credits</b>				<b>9</b>	<b>0</b>	<b>14</b>	<b>15</b>

## SEMESTER – IV

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
<b>PRACTICAL</b>							
1.	24PCS411	Project Work II	EE	0	0	24	12
<b>Total Credits</b>				<b>0</b>	<b>0</b>	<b>24</b>	<b>12</b>


Total Credits: 69

  
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PROFESSIONAL ELECTIVES

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S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
<b>PROFESSIONAL ELECTIVE I</b>							
1.	24PCSP201	Human Computer Interaction	PE	3	0	0	3
2.	24PCSP202	Performance Analysis of Computer Systems	PE	3	0	0	3
3.	24PCSP203	Mobile and Pervasive Computing	PE	3	0	0	3
4.	24PCSP204	Web Services and API Design	PE	3	0	0	3
5.	24PCSP205	Cloud Computing Technologies	PE	3	0	0	3
<b>PROFESSIONAL ELECTIVE II</b>							
1.	24PCSP206	Big Data Mining and Analytics	PE	3	0	0	3
2.	24PCSP207	Information Retrieval Techniques	PE	3	0	0	3
3.	24PCSP208	Software Quality Assurance	PE	3	0	0	3
4.	24PCSP209	Cognitive Computing	PE	3	0	0	3
5.	24PCSP210	Compiler Optimization Techniques	PE	3	0	0	3
<b>PROFESSIONAL ELECTIVE III</b>							
1.	24PCSP301	Natural Language Processing	PE	3	0	0	3
2.	24PCSP302	Web Analytics	PE	3	0	0	3
3.	24PCSP303	Deep Learning	PE	3	0	0	3
4.	24PCSP304	Formal Models of Software System	PE	3	0	0	3
5.	24PCSP305	High Performance Computing for Big Data	PE	3	0	0	3

  
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**LIST OF OPEN ELECTIVES**


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S. No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1.	24PCEO01	Environmental Sustainability	OE	3	0	0	3
2.	24PCEO02	Vibration and Noise Control Strategies	OE	3	0	0	3
3.	24PCEO03	Integrated Water Resources Management	OE	3	0	0	3
4.	24PCEO04	Environmental Impact Assessment	OE	3	0	0	3
5.	24PECO01	IoT for Smart Systems	OE	3	0	0	3
6.	24PCSO02	Internet of Things and Cloud	OE	3	0	0	3
7.	24PCSO03	Machine Learning and Deep Learning	OE	3	0	0	3
8.	24PEEO01	Electric Vehicle Technology	OE	3	0	0	3
9.	24PEEO02	Renewable Energy Technology	OE	3	0	0	3
10.	24PECO02	Biomedical Signal Processing	OE	3	0	0	3
11.	24PECO03	Robotics	OE	3	0	0	3
12.	24PMBO01	Sustainable Management	OE	3	0	0	3
13.	24PMBO02	Micro and Small Business Management	OE	3	0	0	3
14.	24PMEO01	Nanocomposite Materials	OE	3	0	0	3
15.	24PMEO02	Additive Manufacturing	OE	3	0	0	3

**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.	24PAC001	English for Research Paper Writing	2	0	0	0
2.	24PAC002	Disaster Management	2	0	0	0
3.	24PAC003	Constitution of India	2	0	0	0
4.	24PAC004	நற்றமிழ் இலக்கியம்	2	0	0	0

  
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**CREDITS SUMMARY**


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S. No	Course Components	Credits per Semester				Total Credits
		I	II	III	IV	
1.	FC	04	00	00	00	04
2.	PC	15	14	03	00	32
3.	PE	00	06	03	00	09
4.	RM	02	00	00	00	02
5.	OE	00	00	03	00	03
6.	EE	00	01	06	12	19
7.	Non Credit /Audit Course	√	√	00	00	00
<b>Total Credits</b>		<b>21</b>	<b>21</b>	<b>15</b>	<b>12</b>	<b>69</b>

Total Credits for the entire Programme: 69

**COMPARISON OF CREDIT SUMMARY**

S. No	Course Components	AICTE Recommendation		Anna University Curriculum R2021		JSREC Autonomous Curriculum R2024	
		Credits	% Credits	Credits	% Credits	Credits	% Credits
1	Foundation Course(FC)	00	0%	04	5%	04	6%
2	Professional Core (PC)	16	24%	34	45%	32	46%
3	Professional Electives (PE)	19	29%	13	17%	09	13%
4	Research Methodology & IPR Course(RM)	02	3%	02	3%	02	3%
5	Open Electives (OE)	03	5%	03	4%	03	4%
6	Employment Enhancement Course (EE)	26	39%	19	25%	19	27%
7	Non Credit /Audit Course(AC)	00	0%	00	0%	00	0%
<b>TOTAL CREDITS</b>		<b>66</b>	<b>100%</b>	<b>75</b>	<b>100%</b>	<b>69</b>	<b>100%</b>

  
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## REGULATIONS 2024

# M. E. COMPUTER SCIENCE AND ENGINEERING CHOICE BASED CREDIT SYSTEM SYLLABUS FOR I SEMESTER

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Head of the Department  
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Avinashipalayam, Tirupur - 638 660.

24PMA102	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.

<b>UNIT-I</b>	<b>LINEAR ALGEBRA</b>	<b>12</b>
Vector spaces – norms – Inner Products – Eigen values using QR transformations – QR factorization – generalized eigenvectors – Canonical forms – singular value decomposition and applications – pseudo inverse – least square approximations.		

<b>UNIT-II</b>	<b>PROBABILITY AND RANDOM VARIABLES</b>	<b>12</b>
Probability – Axioms of probability – Conditional probability – Baye’s 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.		

<b>UNIT-III</b>	<b>TWO DIMENSIONAL RANDOM VARIABLES</b>	<b>12</b>
Joint distributions – Marginal and conditional distributions – Functions of two-dimensional random variables – Regression curve – Correlation		

<b>UNIT-IV</b>	<b>TESTING OF HYPOTHESIS</b>	<b>12</b>
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.		

  
**HEAD OF THE DEPARTMENT**  
 Dept. of Science & Humanities,  
 Jay Shriram Engineering College  
 Dharapuram Road, Avinashipalayam,  
 TIRUPUR -636 660, Tamilnadu.

<b>UNIT-V</b>	<b>MULTIVARIATE ANALYSIS</b>	<b>12</b>
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		

L: 45	T: 15	P: 00	Total : 60 Periods
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<b>REFERENCES</b>
<ol style="list-style-type: none"> <li>1. Dallas E Johnson, “Applied multivariate methods for data Analysis”, Thomson and Duxbury press, Singapore, 1998.</li> <li>2. Richard A.Johnson and Dean W. Wichern, “Applied multivariate statistical Analysis”, Pearson Education, Fifth Edition, 6<sup>th</sup> Edition, NewDelhi,2013.</li> <li>3. Bronson, R.,”Matrix Operation” Schaum’s outline series, Tata McGraw Hill, NewYork, 2011.</li> <li>4. OliverC.Ibe, “Fundamentals of Applied probability and Random Processes”, Academic Press, Boston, 2014.</li> <li>5. Johnson R.A. and Gupta C.B., “Miller and Freund’s Probability and Statistics for Engineers”, Pearson India Education, Asia, 9 Edition, New Delhi,2017</li> </ol>

<b>COURSE OUTCOMES</b>
At the end of the course students should be able to
CO1: Apply the concepts of Linear Algebra to solve practical problems
CO2: Use the ideas of probability and random variables in solving engineering problems.
CO3: Be familiar with some of the commonly encountered two dimensional random variables and be equipped for a possible extension to multivariate analysis.
CO4: Use statistical tests in testing hypotheses on data.
CO5: Develop critical thinking based on empirical evidence and the scientific approach to Knowledge development.

  
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24PRM101	RESEARCH METHODOLOGY AND IPR (Common to M.E-A, E, M.E-CSE, M.E-SE)	L	T	P	C
		2	0	0	2

### COURSE OBJECTIVES

- To design and implement various research methodologies
- To Apply appropriate data collection methods and design effective measurement tools
- To analyze complex data using multivariate techniques, test hypotheses, and present research findings clearly through written reports and oral presentations
- To Understand and apply key concepts, processes, and international frameworks related to Intellectual Property Rights.
- To understand the patent process, including the stages of application, examination, and grant, and demonstrate knowledge of fundamental patenting principles

<b>UNIT-I</b>	<b>RESEARCH DESIGN</b>	<b>6</b>
Overview of research process and design, Use of Secondary and exploratory data to answer the research question, Qualitative research, Observation studies, Experiments and Surveys.		

<b>UNIT-II</b>	<b>DATA COLLECTION AND SOURCES</b>	<b>6</b>
Measurements, Measurement Scales, Questionnaires and Instruments, Sampling and methods. Data - Preparing, Exploring, examining and displaying.		

<b>UNIT-III</b>	<b>DATA ANALYSIS AND REPORTING</b>	<b>6</b>
Overview of Multivariate analysis, Hypotheses testing and Measures of Association. Presenting Insights and findings using written reports and oral presentation.		

<b>UNIT-IV</b>	<b>INTELLECTUAL PROPERTY RIGHTS</b>	<b>6</b>
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.		

<b>UNIT-V</b>	<b>PATENTS</b>	<b>6</b>
Patents- Objectives and Benefits of Patents, Concept, Features of Patent, Inventive step, Specification, Types of Patent application, process E-filing, Examination of patent, Grant of patent, Revocation, Equitable Assignments, licences of related patents, patent agents, Registrations of patent agents		

L:30	T:0	P:0	T: 30 PERIODS
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*P. Megaladevi*

**Dr. P. MEGALADEVI** MBA, M.Com., Ph.D.,  
DEAN - School of Management Studies  
**Jai Shriram Engineering College**  
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Tirupur-638 660. Tamil Nadu, India.



24PCS101	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.		

  
**Prof. A. GOKHAVANI, B.Tech., M.E.;45**    **T:0**    **P:0**    **T: 45 PERIODS**  
 Head of the Department  
 Computer Science and Engineering  
 Jai Shriram Engineering College  
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## REFERENCES

1. S.Sridhar," Design and Analysis of Algorithms", Oxford University Press, First Edition,2014.
2. Adam Drozdex, "Data Structures and algorithms in C++", Cengage Learning, 4<sup>th</sup>Edition, 2013.
3. T.H. Cormen, C.E.Leiserson, R.L. Rivest andC.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, 2013.
5. E. Horowitz, S. Sahni and S. Rajasekaran, "Fundamentals of Computer Algorithms",University Press, 2nd Edition, 2010.
6. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms",Pearson Education, Reprint 2009.

## COURSE OUTCOMES

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

CO1: Design data structures and algorithms to solve computing problems.

CO 2: 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.



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24PCS102	NETWORK TECHNOLOGIES	L	T	P	C
		3	0	0	3

<b>COURSE OBJECTIVES</b>	
<ul style="list-style-type: none"> <li>• To understand the basic concepts of networks</li> <li>• To explore various technologies in the wireless domain</li> <li>• To study about 4G and 5G cellular networks</li> <li>• To learn about Network Function Virtualization</li> <li>• To understand the paradigm of Software defined networks</li> </ul>	

<b>UNIT-I</b>	<b>NETWORKING CONCEPTS</b>	<b>9</b>
Peer To Peer Vs Client-Server Networks - Network Devices - Network Terminology - Network Speeds - Network throughput, delay - Osi Model - Packets, Frames, And Headers - Collision And Broadcast Domains - LAN Vs WAN - Network Adapter - Hub - Switch - Router - Firewall, IP addressing		

<b>UNIT-II</b>	<b>WIRELESS NETWORKS</b>	<b>9</b>
Wireless access techniques- IEEE 802.11a, 802.11g, 802.11e, 802.11n/ac/ax/ay/ba/be, QoS - Bluetooth - Protocol Stack - Security - Profiles - zigbee		

<b>UNIT-III</b>	<b>MOBILE DATA NETWORKS</b>	<b>9</b>
4G Networks and Composite Radio Environment - Protocol Boosters - Hybrid 4G Wireless Networks Protocols - Green Wireless Networks - Physical Layer and Multiple Access - Channel Modelling for 4G - Concepts of 5G - channel access -air interface -Cognitive Radio- spectrum management - C-RAN architecture - Vehicular communications-protocol - Network slicing - MIMO, mmWave, Introduction to 6G.		

<b>UNIT-IV</b>	<b>SOFTWARE DEFINED NETWORKS</b>	<b>9</b>
SDN Architecture - Characteristics of Software-Defined Networking. SDN- and NFV- Related Standards - SDN Data Plane - Data Plane Functions. Data Plane Protocols - OpenFlow Logical Network Device - Flow Table Structure - Flow Table Pipeline - The Use of Multiple Tables - Group Table - OpenFlow Protocol - SDN Control Plane Architecture. Control Plane Functions - Southbound Interface - Northbound Interface - Routing - ITU-T Model- OpenDaylight - OpenDaylight Architecture - OpenDaylight Helium - SDN Application Plane Architecture - Northbound Interface - Network Services Abstraction Layer - Network Applications - User Interface.		

<b>UNIT-V</b>	<b>NETWORK FUNCTIONS VIRTUALIZATION</b>	<b>9</b>
Motivation-Virtual Machines -NFV benefits-requirements - architecture- NFV Infrastructure - Virtualized Network Functions - NFV Management and Orchestration- NFV Use Cases- NFV and SDN -Network virtualization - <del>VI</del> AN and VPN		

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L:45

T:0

P:0

T: 45PERIODS

## REFERENCES

1. James Bernstein, "Networking made Easy", 2018. (UNIT 1)
2. HoudaLabioud, Costantino de Santis, Hossam Afifi "Wi-Fi, Bluetooth, Zigbee and WiMax", Springer 2010 ( UNIT 2 )
3. Erik Dahlman, Stefan Parkvall, Johan Skold, 4G: LTE/LTE-Advanced for MobileBroadband, Academic Press, 2013 ( UNIT 3)
4. Saad Z. Asif "5G Mobile Communications Concepts and Technologies" CRC press – 2019 (UNIT 3)
5. William Stallings "Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud" 1st Edition, Pearson Education, 2016.( Unit 4 and 5 )
6. Thomas D.Nadeau and Ken Gray, SDN – Software Defined Networks, O'Reilly Publishers, 2013.
7. Guy Pujolle, "Software Networks", Second Edition, Wiley-ISTE, 2020

## COURSE OUTCOMES

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


CO1: Explain basic networking concepts, devices, models and addressing.

CO2: Compare different wireless networking standards and protocols.

CO3: Describe the evolution and key features of mobile data networks.

CO4: Analyze SDN architecture and develop SDN-based applications.

CO5: Analyze the concepts, architecture and applications Of Network Functions Virtualization.

  
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24PCS103	PRINCIPLES OF PROGRAMMING LANGUAGES	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To understand and describe syntax and semantics of programming languages
- To understand data, data types, and basic statements
- To understand call-return architecture and ways of implementing them
- To understand object-orientation, concurrency, and event handling in programming languages
- To develop programs in non-procedural programming paradigms


<b>UNIT-I</b>	<b>SYNTAX AND SEMANTICS</b>	<b>9</b>
Evolution of programming languages – describing syntax – context – free grammars –attribute grammars – describing semantics – lexical analysis – parsing – recursive-descent – bottom-up parsing.		

<b>UNIT-II</b>	<b>DATA, DATA TYPES, AND BASIC STATEMENTS</b>	<b>9</b>
Names – variables – binding – type checking – scope – scope rules – lifetime and garbage collection –primitive data types–strings–array types– associative arrays–record types– union types – pointers and references – Arithmetic expressions – overloaded operators – type conversions – relational and boolean expressions – assignment statements – mixed- mode assignments – control structures – selection – iterations – branching – guarded statements.		

<b>UNIT-III</b>	<b>SUBPROGRAMS AND IMPLEMENTATIONS</b>	<b>9</b>
Subprograms – design issues – local referencing – parameter passing – overloaded methods – generic methods – design issues for functions – semantics of call and return – implementing simple subprograms – stack and dynamic local variables – nested subprograms – blocks – dynamic scoping		

<b>UNIT-IV</b>	<b>OBJECT-ORIENTATION, CONCURRENCY, AND EVENT HANDLING</b>	<b>9</b>
Object-orientation – design issues for OOP languages – implementation of object-oriented constructs – concurrency – semaphores – monitors – message passing – threads – statement level concurrency – exception handling – event handling		

<b>UNIT-V</b>	<b>FUNCTIONAL AND LOGIC PROGRAMMING LANGUAGES</b>	<b>9</b>
Introduction to lambda calculus – fundamentals of functional programming languages – Programming with Scheme – Programming with ML – Introduction to logic and logic programming – Programming with Prolog – multi-paradigm languages.		

  
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L:45	T:0	P:0	T: 45 PERIODS
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## REFERENCES

1. Robert W. Sebesta, "Concepts of Programming Languages", Eleventh Edition, AddisonWesley,2012
2. W. F. Clocksin and C. S. Mellish, "Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003
3. Michael L.Scott, "Programming Language Pragmatics", Fourth Edition, Morgan Kaufmann,2015
4. KentDybvig, "The Scheme programming language",Fourth Edition,MITPress, 2009
5. Richard A. O'Keefe, "The craft of Prolog", MIT Press, 2009
6. W.F.Clocksin and C.S.Mellish,"Programming in Prolog:Using the ISO Standard", Fifth Edition, Springer,2011

## COURSE OUTCOMES

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

CO1: Describe syntax and semantics of programming languages

CO2: Explain data, data types, and basic statements of programming languages

CO3: Design and implement subprogram constructs

CO4: Apply object-oriented, concurrency, and event handling programming constructs

CO5: Develop Programs in Scheme, ML, and Prolog and Understand and adopt new programming language


  
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24PCSI101	DATABASE PRACTICES	L	T	P	C
		3	0	2	4

**COURSE OBJECTIVES:**

- Describe the fundamental elements of relational database management systems and explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
- Understand query processing in a distributed database system
- Understand the basics of XML and create well-formed and valid XML documents.
- Distinguish the different types of NoSQL databases
- To understand the different models involved in database security and their applications in real time world to protect the database and information associated with them.


<b>UNIT-I</b>	<b>RELATIONAL DATA MODEL</b>	<b>9</b>
Entity Relationship Model – Relational Data Model – Mapping Entity Relationship Model to Relational Model – Relational Algebra – Structured Query Language – Database Normalization.		
<b>Suggested Activities:</b>		
Data Definition Language		
<ul style="list-style-type: none"> <li>• Create, Alter and Drop</li> <li>• Enforce Primary Key, Foreign Key, Check, Unique and Not Null Constraints</li> <li>• Creating Views</li> </ul>		
<b>Data Manipulation Language</b>		
<ul style="list-style-type: none"> <li>• Insert, Delete, Update</li> <li>• Cartesian Product, Equi Join, Left Outer Join, Right Outer Join and Full Outer Join</li> <li>• Aggregate Functions</li> <li>• Set Operations</li> <li>• Nested Queries</li> </ul>		

<b>UNIT-II</b>	<b>DISTRIBUTED DATABASES, ACTIVE DATABASES AND OPEN DATABASE CONNECTIVITY</b>	<b>9</b>
Distributed Database Architecture – Distributed Data Storage – Distributed Transactions – Distributed Query Processing – Distributed Transaction Management – Event Condition Action Model – Design and Implementation Issues for Active Databases – Open Database Connectivity.		
<b>Suggested Activities:</b>		
<ul style="list-style-type: none"> <li>• Distributed Database Design and Implementation</li> <li>• Row Level and Statement Level Triggers</li> </ul>		
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<b>UNIT-III</b>	<b>XML DATABASES</b>	<b>9</b>
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		
<b>Suggested Activities:</b> <ul style="list-style-type: none"> <li>• Creating XML Documents, Document Type Definition and XML Schema Using a Relational Database to store the XML documents as text</li> <li>• Using a Relational Database to store the XML documents as data elements Creating or publishing customized XML documents from pre-existing relationaldatabases</li> <li>• Extracting XML Documents from Relational Databases</li> <li>• XML Querying</li> </ul>		

<b>UNIT-IV</b>	<b>NOSQL DATABASES AND BIG DATA STORAGE SYSTEMS</b>	<b>9</b>
NoSQL – Categories of NoSQL Systems – CAP Theorem – Document-Based NoSQL Systems and MongoDB – MongoDB Data Model – MongoDB Distributed Systems Characteristics – NoSQL Key-Value Stores – DynamoDB Overview – Voldemort Key-Value Distributed Data Store – Wide Column NoSQL Systems – Hbase Data Model – Hbase Crud Operations – Hbase Storage and Distributed System Concepts – NoSQL Graph Databases and Neo4j – Cypher Query Language of Neo4j – Big Data – MapReduce - Hadoop – YARN.		
<b>Suggested Activities:</b> <ul style="list-style-type: none"> <li>• Creating Databases using MongoDB, DynamoDB, Voldemort Key-Value Distributed Data Store Hbase and Neo4j.</li> <li>• Writing simple queries to access databases created using MongoDB, DynamoDB, Voldemort Key-Value Distributed Data Store Hbase and Neo4j.</li> </ul>		

<b>UNIT-V</b>	<b>DATABASE SECURITY</b>	<b>9</b>
Database Security Issues – Discretionary Access Control Based on Granting and Revoking Privileges – Mandatory Access Control and Role-Based Access Control for Multilevel Security – SQL Injection – Statistical Database Security – Flow Control – Encryption and Public Key Infrastructures – Preserving Data Privacy – Challenges to Maintaining Database Security – Database Survivability – Oracle Label-Based Security.		
<b>Suggested Activities:</b> <ul style="list-style-type: none"> <li>• Implementing Access Control in Relational Databases</li> </ul>		

  
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L:45	T:0	P:30	T: 75 PERIODS
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## REFERENCES

1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education 2016.
2. Henry F. Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", Seventh Edition, McGraw Hill, 2020.
3. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems, Eighth Edition, Pearson Education, 2006
4. Raghu Ramakrishnan , Johannes Gehrke "Database Management Systems", Fourth Edition, McGraw Hill Education, 2017.
5. Harrison, Guy, "Next Generation Databases, NoSQL and Big Data" , First Edition, Apress publishers, 2015
6. Thomas Cannolly and Carolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management". Sixth Edition, Pearson Education, 2015.

## COURSE OUTCOMES

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

- CO1: Convert the ER-model to relational tables, populate relational databases and formulate SQL queries on data.
- CO 2: Write well-formed XML documents
- CO3: Apply methods and techniques for distributed query processing.
- CO4: Design and Implement secure database systems
- CO5: Use the data control, definition, and manipulation languages of the NoSQL databases

  
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24PCS111	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.


S.No.	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

L:0	P:60	T:0	TOTAL: 60 PERIODS
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**COURSE OUTCOMES:**

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

- CO1: Design and implement basic and advanced data structures  
CO2: Design algorithms using graph structures  
CO3: Design and develop efficient algorithms with minimum complexity using design techniques  
CO4: Apply mathematical abstraction to design and solve problems using algorithms.  
CO5: Use ADTs and libraries to design efficient algorithms.

  
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**JAI SHRIRAM ENGINEERING COLLEGE, TIRUPPUR – 638 660**

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## **REGULATIONS 2024**

# **M. E. COMPUTER SCIENCE AND ENGINEERING CHOICE BASED CREDIT SYSTEM SYLLABUS FOR II SEMESTER**

  
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24PCS201	MULTICORE ARCHITECTURE AND PROGRAMMING	L	T	P	C
		3	0	0	3

<b>COURSE OBJECTIVES</b>					
<ul style="list-style-type: none"> <li>To understand the need for multi-core processors, and their architecture</li> <li>To understand the challenges in parallel and multithreaded programming</li> <li>To learn about shared memory programming and distributed memory programming with OpenMP and MPI</li> <li>To learn about the various parallel programming paradigms</li> <li>To develop multicore programs and design parallel solutions</li> </ul>					

<b>UNIT-I</b>	<b>MULTI-CORE PROCESSORS</b>	<b>9</b>
Single core to Multi-core architectures – SIMD and MIMD systems – Interconnection networks – Symmetric and Distributed Shared Memory Architectures – Cache coherence – Performance Issues – Parallel program design.		

<b>UNIT-II</b>	<b>PARALLEL PROGRAM CHALLENGES</b>	<b>9</b>
Performance – Scalability – Synchronization and data sharing – Data races – Synchronization primitives (mutexes, locks, semaphores, barriers) – deadlocks and live locks – communication between threads (condition variables, signals, message queues and pipes).		

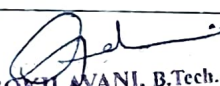
<b>UNIT-III</b>	<b>SHARED MEMORY PROGRAMMING WITH OpenMP</b>	<b>9</b>
OpenMP Execution Model – Memory Model – OpenMP Directives – Work-sharing Constructs – Library functions – Handling Data and Functional Parallelism – Handling Loops – Performance Considerations.		

<b>UNIT-IV</b>	<b>DISTRIBUTED MEMORY PROGRAMMING WITH MPI</b>	<b>9</b>
MPI program execution – MPI constructs – libraries – MPI send and receive – Point-to-point and Collective communication – MPI derived data types – Performance evaluation		

<b>UNIT-V</b>	<b>PARALLEL PROGRAM DEVELOPMENT</b>	<b>9</b>
Case studies – n-Body solvers – Tree Search – OpenMP and MPI implementations and Comparison.		

L:45	T:0	P:0	<b>TOTAL: 45 PERIODS</b>
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<b>REFERENCES</b>					
1. Peter S. Pacheco, "An Introduction to Parallel Programming, Morgan-Kaufman/Elsevier, 2021.					
2. Darryl Gove, "Multicore Application Programming for Windows, Linux, and Oracle Solaris, Pearson, 2011 (unit 2)					

  
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3. Michael J Quinn, "Parallel programming in C with MPI and OpenMP, Tata McGraw Hill, 2003.
4. Victor Alessandrini, Shared Memory Application Programming, 1st Edition, Concepts and Strategies in Multicore Application Programming, Morgan Kaufmann, 2015.
5. Yan Solihin, Fundamentals of Parallel Multicore Architecture, CRC Press, 2015.

### **COURSE OUTCOMES**

At the end of the course students should be able to


CO1: Describe multicore architectures and identify their characteristics and challenges

CO 2: Identify the issues in programming parallel processors

CO3: Write programs using OpenMP and MPI

CO4: Design parallel programming solutions to common problems

CO5: Compare and contrast programming for serial processors and programming for parallel processors



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24PCS202	ADVANCED SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

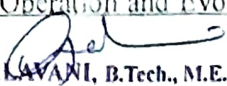
- To learn the rationale for software development process models.
- To understand the importance of architectural design of software.
- To understand the five important dimensions of dependability: availability, reliability, safety, security and resilience.
- To know the basic notions of a web service, web service standards, and service oriented architecture.
- To understand the different stages of testing from testing during development of a software system.

<b>UNIT-I</b>	<b>SOFTWARE PROCESS &amp; MODELING</b>	<b>9</b>
Prescriptive Process Models – Agility and Process – Scrum – XP – Kanban – DevOps – Prototype Construction – Prototype Evaluation – Prototype Evolution – Modelling – Principles – Requirements Engineering – Scenario-based Modelling – Class-based Modelling – Functional Modelling – Behavioural Modelling.		

<b>UNIT-II</b>	<b>SOFTWARE DESIGN</b>	<b>9</b>
Design Concepts – Design Model – Software Architecture – Architectural Styles – Architectural Design – Component-Level Design – User Experience Design – Design for Mobility – PatternBased Design.		

<b>UNIT-III</b>	<b>SYSTEM DEPENDABILITY AND SECURITY</b>	<b>9</b>
Dependable Systems – Dependability Properties – Socio technical Systems – Redundancy and Diversity – Dependable Processes – Formal Methods and Dependability – Reliability Engineering – Availability and Reliability – Reliability Requirements – Fault-tolerant Architectures – Programming for Reliability – Reliability Measurement – Safety Engineering – Safety-critical Systems – Safety Requirements – Safety Engineering Processes – Safety Cases – Security Engineering – Security and Dependability – Safety and Organizations – Security Requirements – Secure System Design – Security Testing and Assurance – Resilience Engineering – Cyber security – Socio technical Resilience – Resilient Systems Design		

<b>UNIT-IV</b>	<b>SERVICE-ORIENTED SOFTWARE ENGINEERING, SYSTEMS ENGINEERING AND REAL-TIME SOFTWARE ENGINEERING</b>	<b>9</b>
Service-oriented Architecture – RESTful Services – Service Engineering – Service Composition – Systems Engineering – Sociotechnical Systems – Conceptual Design – System Procurement – System Development – System Operation and Evolution – Real-time Software		

  
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Engineering – Embedded System Design – Architectural Patterns for Real-time Software – Timing Analysis – Real-time Operating Systems.

<b>UNIT-V</b>	<b>SOFTWARE TESTING AND SOFTWARE CONFIGURATION MANAGEMENT</b>	<b>9</b>
Software Testing Strategy – Unit Testing – Integration Testing – Validation Testing – System Testing – Debugging – White-Box Testing – Basis Path Testing – Control Structure Testing – Black-Box Testing – Software Configuration Management (SCM) – SCM Repository – SCM Process – Configuration Management for Web and Mobile Apps		

<b>L:45</b>	<b>T:0</b>	<b>P:0</b>	<b>TOTAL: 45 PERIODS</b>
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### REFERENCES

1. Software Engineering: A Practitioner's Approach, 9th Edition. Roger Pressman and Bruce Maxim, McGraw-Hill 2023.
2. Software Engineering, 10th Edition, Ian Somerville, Pearson Education Asia 2016.
3. Software Architecture In Practice, 3 rd Edition, Len Bass, Paul Clements and Rick Kazman, Pearson India 2018
4. An integrated approach to Software Engineering, 3rd Edition, Pankaj Jalote, Narosa Publishing House, 2018
5. Fundamentals of Software Engineering, 5th Edition, Rajib Mall, PHI Learning Private Ltd, 2018

### COURSE OUTCOMES

At the end of the course students should be able to


**CO1:** Identify appropriate process models based on the Project requirements.

**CO 2:** Explain the importance of having a good Software Architecture.

**CO3:** Describe the five important dimensions of dependability.

**CO4:** Elaborate the basic notions of a web service, web service standards, and service-oriented architecture.

**CO5:** Describe multicore architectures and identify their characteristics and challenges.

  
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24PCSI204	MACHINE LEARNING	L	T	P	C
		3	0	2	4

### COURSE OBJECTIVES

- To understand the concepts and mathematical foundations of machine learning and types of problems tackled by machine learning.
- To explore the different supervised learning techniques including ensemble methods.
- To learn different aspects of unsupervised learning and reinforcement learning.
- To learn the role of probabilistic methods for machine learning.
- To understand the concepts of Neural networks and deep learning.


<b>UNIT-I</b>	<b>INTRODUCTION AND MATHEMATICAL FOUNDATIONS</b>	<b>9</b>
What is Machine Learning? Need –History – Definitions – Applications - Advantages, Disadvantages & Challenges -Types of Machine Learning Problems – Mathematical Foundations - Linear Algebra & Analytical Geometry -Probability and Statistics- Bayesian Conditional Probability -Vector Calculus & Optimization - Decision Theory - Information theory		

<b>UNIT-II</b>	<b>SUPERVISED LEARNING</b>	<b>9</b>
Introduction-Discriminative and Generative Models -Linear Regression - Least Squares - Under-fitting / Overfitting -Cross-Validation – Lasso Regression- Classification - Logistic Regression- Gradient Linear Models -Support Vector Machines –Kernel Methods -Instance based Methods - K-Nearest Neighbors - Tree based Methods –Decision Trees –ID3 – CART - Ensemble Methods –Random Forest - Evaluation of Classification Algorithms		

<b>UNIT-III</b>	<b>UNSUPERVISED LEARNING AND REINFORCEMENT LEARNING</b>	<b>9</b>
Introduction - Clustering Algorithms -K – Means – Hierarchical Clustering - Cluster Validity - Dimensionality Reduction –Principal Component Analysis -- Recommendation Systems - EM algorithm. Reinforcement Learning – Elements -Model based Learning – Temporal Difference Learning		

<b>UNIT-IV</b>	<b>PROBABILISTIC METHODS FOR LEARNING</b>	<b>9</b>
Introduction -Naïve Bayes Algorithm -Maximum Likelihood -Maximum Apriori -Bayesian Belief Networks -Probabilistic Modelling of Problems -Inference in Bayesian Belief Networks – Probability Density Estimation - Sequence Models – Markov Models – Hidden Markov Models		

<b>UNIT-V</b>	<b>NEURAL NETWORKS AND DEEP LEARNING</b>	<b>9</b>
Neural Networks – Biological Motivation- Perceptron – Multi-layer Perceptron – Feed		

  
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Forward Network – Back Propagation-Activation and Loss Functions- Limitations of Machine Learning – Deep Learning– Convolution Neural Networks – Recurrent Neural Networks – Use cases

L:45 T: 0 P: 30 TOTAL: 75PERIODS


S.No	List of Experiments
1.	Implement a Linear Regression with a Real Dataset ( <a href="https://www.kaggle.com/harrywang/housing">https://www.kaggle.com/harrywang/housing</a> ). Experiment with different features in building a model. Tune the model's hyperparameters.
2.	Implement a binary classification model. That is, answers a binary question such as "Are houses in this neighborhood above a certain price?"(use data from exercise 1). Modify the classification threshold and determine how that modification influences the model. Experiment with different classification metrics to determine your model's effectiveness.
3.	Classification with Nearest Neighbors. In this question, you will use the scikit-learn's KNN classifier to classify real vs. fake news headlines. The aim of this question is for you to read the scikit-learn API and get comfortable with training/validation splits. Use California Housing Dataset
4.	In this exercise, you'll experiment with validation sets and test sets using the dataset. Split a training set into a smaller training set and a validation set. Analyze deltas between training set and validation set results. Test the trained model with a test set to determine whether your trained model is overfitting. Detect and fix a common training problem.
5.	Implement the k-means algorithm using <a href="https://archive.ics.uci.edu/ml/datasets/Codon+usage">https://archive.ics.uci.edu/ml/datasets/Codon+usage</a> dataset
6.	Implement the Naïve Bayes Classifier using <a href="https://archive.ics.uci.edu/ml/datasets/Gait+Classification">https://archive.ics.uci.edu/ml/datasets/Gait+Classification</a> dataset
7.	Project - (in Pairs) Your project must implement one or more machine learning algorithms and apply them to some data. <ol style="list-style-type: none"> <li>Your project may be a comparison of several existing algorithms, or it may propose a new algorithm in which case you still must compare it to at least one other approach.</li> <li>You can either pick a project of your own design, or you can choose from the set of pre-defined projects.</li> <li>You are free to use any third-party ideas or code that you wish as long as it is publicly available.</li> <li>You must properly provide references to any work that is not your own in the write-up. e. Project proposal You must turn in a brief project proposal. Your project proposal should describe the idea behind your project. You should also briefly describe software you will need to write, and papers (2-3) you plan to read.</li> </ol>
8.	List of Projects (datasets available) <ol style="list-style-type: none"> <li>Sentiment Analysis of Product Reviews</li> <li>Stock Prediction</li> </ol>

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	<ol style="list-style-type: none"> <li>3. Sales Forecasting</li> <li>4. Music Recommendation</li> <li>5. Handwriting Digit Classification</li> <li>6. Fake News Detection</li> <li>7. Sports Prediction</li> <li>8. Object Detection</li> <li>9. Disease Prediction</li> </ol>
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<b>REFERENCES</b>
<ol style="list-style-type: none"> <li>1. Stephen Marsland, "Machine Learning: An Algorithmic Perspective", Chapman &amp; Hall/CRC, 2nd Edition, 2014.</li> <li>2. Kevin Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012</li> <li>3. Ethem Alpaydin, "Introduction to Machine Learning", Third Edition, Adaptive Computation and Machine Learning Series, MIT Press, 2014</li> <li>4. Tom M Mitchell, "Machine Learning", McGraw Hill Education, 2013.</li> <li>5. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", First Edition, Cambridge University Press, 2012.</li> <li>6. Shai Shalev-Shwartz and Shai Ben-David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge University Press, 2015</li> <li>7. Christopher Bishop, "Pattern Recognition and Machine Learning", Springer, 2007.</li> <li>8. Hal Daumé III, "A Course in Machine Learning", 2017 (freely available online)</li> <li>9. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer, 2009 (freely available online)</li> <li>10. Aurélien Géron , Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems 2nd Edition, o'reilly, (2017)</li> </ol>

<b>COURSE OUTCOMES</b>
<p>At the end of the course students should be able to</p> <p>CO1: Describe the problems for each type of machine learning.</p> <p>CO2: Design a Decision tree and Random forest for an application.</p> <p>CO3: Implement and analyze probabilistic and clustering algorithms for various applications.</p> <p>CO4: Design HMMs for sequence models and justify suitable ML applications.</p> <p>CO5: Analyze neural networks, deep learning architectures, and their practical use cases.</p>

  
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24PCS211	MULTICORE ARCHITECTURE AND PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

### COURSE OBJECTIVES

- To understand parallel computing models and differentiates between shared-memory and distributed-memory systems
- To apply OpenMP directives to develop parallel programs for shared-memory architectures
- To implement message-passing programs using MPI to enable communication in distributed-memory systems
- To analyze and optimize the performance of parallel algorithms, including load balancing and scalability

S.No.	List of Experiments
1.	Write a simple Program to demonstrate an OpenMP Fork-Join Parallelism.
2.	Create a program that computes a simple matrix-vector multiplication $b=Ax$ , either in C/C++. Use OpenMP directives to make it run in parallel.
3.	Create a program that computes the sum of all the elements in an array A (C/C++) or a program that finds the largest number in an array A. Use OpenMP directives to make it run in parallel.
4.	Implement a program Parallel Random Number Generators using Monte Carlo Methods in OpenMP.
5.	Write a simple Program demonstrating Message-Passing logic using OpenMP.
6.	Implement the All-Pairs Shortest-Path Problem (Floyd's Algorithm) Using OpenMP.
7.	Write a Program to demonstrate MPI-broadcast-and-collective-communication in C.
8.	Write a Program to demonstrate MPI-scatter-gather-and-all gather in C.
9.	Write a Program to demonstrate MPI-send-and-receive in C.
10.	Write a Program to demonstrate by performing-parallel-rank-with-MPI in C

L:0	P:45	T:0	TOTAL: 45 PERIODS
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### COURSE OUTCOMES

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

CO1: Create simple programs using OpenMP

CO2: Implement Parallel Algorithms using OpenMP

CO3: Implement the shortest-path solutions using OpenMP

CO4: Implement MPI-Collaborative communication using C.

CO5: Develop and test distributed and parallel programs on Multicore Platforms.

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24PCS212	ADVANCED SOFTWARE ENGINEERING LABORATORY	L	T	P	C
		0	0	4	2

### COURSE OBJECTIVES

- To impart state-of-the-art knowledge on Software Engineering and UML
- Present case studies to demonstrate practical applications of different concepts.
- Provide a scope to students where they can solve small, real-life problems.

S.No.	List of Exercises
1.	Write a Problem Statement to define a title of the project with bounded scope of project
2.	Select relevant process model to define activities and related task set for assigned project
3.	Prepare broad SRS (Software Requirement Specification) for the above selected projects
4.	Prepare USE Cases and Draw Use Case Diagram using modeling Tool.
5.	Develop the activity diagram to represent flow from one activity to another for software development
6.	Develop data Designs using DFD Decision Table & ER Diagram.
7.	Draw class diagram, sequence diagram, Collaboration Diagram, State Transition Diagram for the assigned project
8.	Write Test Cases to Validate requirements of assigned project from SRS Document.
9.	Evaluate Size of the project using function point metric for the assigned project.
10.	Estimate cost of the project using COCOMO and COCOMOII for the assigned project
11.	Use CPM/PERT for scheduling the assigned project
12.	Use timeline Charts or Gantt Charts to track progress of the assigned project.

L:0	P:60	T:0	T: 60 PERIODS
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### COURSE OUTCOMES

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


CO1: Produce the requirements and use cases for the client project

CO2: Design the project plan including assessments of the project, the schedule, available resources, and risk management.

CO3: Implement the software based on the requirement specification

CO4: Analyse the cost of the project

CO5: Prepare and Analyse the progress of the project

  
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24PCS213	TERM PAPER WRITING AND SEMINAR	L	T	P	C
		0	0	2	1

**COURSE OBJECTIVES:**

- Develop their scientific and technical reading and writing skills that they need to understand and construct research articles


**List of Exercises**

In this course, students will develop their scientific and technical reading and writing skills that they need to understand and construct research articles. A term paper requires a student to obtain information from a variety of sources (i.e., Journals, dictionaries, reference books) and then place it in logically developed ideas. The work involves the following steps:


1. Selecting a subject, narrowing the subject into a topic
2. Stating an objective.
3. Collecting the relevant bibliography (atleast 15 journal papers)
4. Preparing a working outline.
5. Studying the papers and understanding the authors contributions and critically analysing each paper.
6. Preparing a working outline
7. Linking the papers and preparing a draft of the paper.
8. Preparing conclusions based on the reading of all the papers.
9. Writing the Final Paper and giving final Presentation

Please keep a file where the work carried out by you is maintained. Activities to be carried out  
Please keep a file where the work carried out by you is maintained. Activities to be carried out.

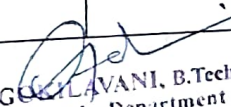
Activity	Instructio ns	Submission week	Evaluation
Selection of area of interest and Topic Stating an Objective	You are requested to select an area of interest, topic and state an objective	2 <sup>nd</sup> week	3 % Based on clarity of thought, current relevance and clarity in writing
Collecting	1. List 1 Special Interest Groups or	3 <sup>rd</sup> week	3%

  
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Information about your area & topic	professional society 2. List 2 journals 3. List 2 conferences, symposia or Worksh ops 4. List 1 thesis title 5. List 3 web presences (mailing lists, forums, news sites) 6. List 3 authors who publish regularly in your area 7. Attach a call for papers		(the selected information must be area specific and of international and national standard)
Collection of Journal papers in the topic in the context of the objective – collect 20 & then filter	You have to provide a complete list references you will be using- Based on objective -Search various digital libraries and <ul style="list-style-type: none"> <li>• When picking papers to read - try to:</li> <li>• Pick papers that are related to each other in some ways and/or that are in the same field so that you can write a meaningful survey out of</li> <li>• Favour papers from well-journals and conferences,</li> <li>• Favour “first” or papers in the field (as indicated in other people’s survey paper),</li> <li>• Favour more recent papers, Pick a recent survey of the field so you can quickly gain an overview,</li> <li>• Find relationships with respect to other and to your topic (classification</li> <li>• Mark in the hard copy of whether complete or section/sections of the paper are being considered</li> </ul>	4 <sup>th</sup> week	6% (the list of standard papers and reason for selection)
Reading and notes for first 5 papers	Reading Paper Process <ul style="list-style-type: none"> <li>• For each paper form a Table answering the following questions:              What is the main topic of the article?              • What was/were the main issue(s) the</li> </ul>	5 <sup>th</sup> week	8% ( the table given should indicate your understanding of the paper and the evaluation is based


  
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	<ul style="list-style-type: none"> <li>• Why did the author claim it was important?</li> <li>• How does the work build on other's work, in the author's opinion?</li> <li>• What simplifying assumptions does the author claim to be making?</li> <li>• What did the author do?</li> <li>• How did the author claim they were going to evaluate their work and compare it to others?</li> <li>• What did the author say were the limitations of their research?</li> <li>• What did the author say were the important directions for future research? Conclude with limitations/issues not addressed by the paper ( from the perspective</li> </ul>		on your conclusions about each paper)
Reading and notes for next 5 papers	Repeat Reading Paper Process	6 <sup>th</sup> week	8 % (the table given should indicate your understanding of the paper and the evaluation is based on your conclusions about each paper)
Reading and notes for final 5 papers	Repeat Reading Paper Process	7 <sup>th</sup> week	8% (the table given should indicate your understanding of the paper and the evaluation is based on your conclusions about each paper)
Draft outline 1 and Linking papers	Prepare a draft Outline, your survey goals, along with a classification / categorization diagram	8 <sup>th</sup> week	8% (this component will be evaluated based on the linking and

  
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			classification among the papers)
Abstract	Prepare a draft abstract and give a presentation	9 <sup>th</sup> week	6% (Clarity, purpose and conclusion) 6% Presentation & Viva Voce
Introduction Background	Write an introduction and background sections	10 <sup>th</sup> week	5% ( clarity)
Sections of the paper	Write the sections of your paper based on the classification / categorization diagram in keeping with the goals of your survey	11 <sup>th</sup> week	10% (this component will be evaluated based on the linking and classification among the papers)
Your conclusions	Write your conclusions and future work	12 <sup>th</sup> week	5% (conclusions – clarity and your ideas)
Final Draft	Complete the final draft of your paper	13 <sup>th</sup> week	10% (formatting, English, Clarity and linking) 4% Plagiarism Check Report
Seminar	A brief 15 slides on your paper	14 <sup>th</sup> & 15 <sup>th</sup> week	10% (based on presentation and Viva-voce)

L:0	P:30	T:0	T: 30 PERIODS
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## **COURSE OUTCOMES**

At the end of the course students should be able to


CO1: Develop advanced skills in locating, analyzing, and synthesizing academic research from a variety of sources, including peer-reviewed journal articles, books, and conference papers.

CO2: Organize and present their ideas through clear, coherent, and well-structured academic papers

CO3: Develop the ability to critically evaluate academic works, identify research gaps, and challenge or build upon existing research findings

CO4: Designing presentation slides, articulating research findings clearly, and answering questions during presentations confidently

CO5: Develop an in-depth understanding of a specific area of study, enabling them to contribute meaningfully to academic or professional discussions in that field

  
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Recognized by UGC & Accredited by NAAC and NBA (CSE and ECE)



## **REGULATIONS 2024**

# **M. E. COMPUTER SCIENCE AND ENGINEERING CHOICE BASED CREDIT SYSTEM SYLLABUS FOR III SEMESTER**

  
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24PCS301	SECURITY PRACTICES	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To learn the core fundamentals of system and web security concepts
- To understand the security concepts related to networks
- To deploy the security essentials in IT Sector
- To be exposed to the concepts of Cyber Security and cloud security
- To perform a detailed study of Privacy and Storage security and related Issues

<b>UNIT-I</b>	<b>SYSTEM SECURITY</b>	<b>9</b>
Model of network security – Security attacks, services and mechanisms – OSI security architecture - A Cryptography primer- Intrusion detection system- Intrusion Prevention system - Security web applications- Case study: OWASP - Top 10 Web Application Security Risks.		

<b>UNIT-II</b>	<b>NETWORK SECURITY</b>	<b>9</b>
Internet Security - Intranet security- Local Area Network Security - Wireless Network Security - Wireless Sensor Network Security- Cellular Network Security - Mobile security - IOT security - Case Study - Kali Linux.		

<b>UNIT-III</b>	<b>SECURITY MANAGEMENT</b>	<b>9</b>
Information security essentials for IT Managers- Security Management System - Policy Driven System Management- IT Security - Online Identity and User Management System. Case study: Metasploit		

<b>UNIT-IV</b>	<b>CYBER SECURITY AND CLOUD SECURITY</b>	<b>9</b>
Cyber Forensics- Disk Forensics – Network Forensics – Wireless Forensics – Database Forensics – Malware Forensics – Mobile Forensics – Email Forensics- Best security practices for automate- Cloud infrastructure management – Establishing trust in IaaS, PaaS, and SaaS Cloud types. Case study: DVWA		

<b>UNIT-V</b>	<b>PRIVACY AND STORAGE SECURITY</b>	<b>9</b>
Privacy on the Internet - Privacy Enhancing Technologies - Personal privacy Policies - Detection of Conflicts in security policies- privacy and security in environment monitoring systems. Storage Area Network Security - Storage Area Network Security Devices - Risk management - Physical Security Essentials		

<b>L:45</b>	<b>T:0</b>	<b>P:0</b>	<b>Total: 45 PERIODS</b>
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### TEXT BOOKS

1. Computer Security Principles and Practice by William Stallings and Lawrie Brown (2018).
2. Information Security Principles and Practice by Mark Stanislav and Jason Andress (2021)

### REFERENCES


1. John R. Vacca, Computer and Information Security Handbook, Third Edition, Elsevier 2017
2. Michael E. Whitman, Herbert J. Mattord, Principles of Information Security, Seventh Edition, Cengage Learning, 2022

3. Richard E. Smith, Elementary Information Security, Third Edition, Jones and Bartlett Learning, 2019
4. Mayor, K.K.Mookhey, Jacopo Cervini, Fairuzan Roslan, Kevin Beaver, Metasploit Toolkit for Penetration Testing, Exploit Development and Vulnerability Research, Syngress publications, Elsevier, 2007. ISBN : 978-1-59749-074-0
5. John Sammons, "The Basics of Digital Forensics- The Primer for Getting Started in Digital Forensics", Syngress, 2012
6. Cory Altheide and Harlan Carvey, "Digital Forensics with Open Source Tools", 2011 Syngress, ISBN: 9781597495875.
7. Siani Pearson, George Yee "Privacy and Security for Cloud Computing" Computer Communications and Networks, Springer, 2013.


### **COURSE OUTCOMES**

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

- CO1: Explain the core fundamentals of system security
- CO2: Apply the security concepts to wired and wireless networks
- CO3: Implement and Manage the security essentials in IT Sector
- CO4: Explain the concepts of Cyber Security and Cyber forensics.
- CO5: Describe and create awareness about Privacy and Storage security Issues.

  
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# Professional Electives – I



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24PCSP201	HUMAN COMPUTER INTERACTION	L	T	P	C
		3	0	0	3


<b>COURSE OBJECTIVES</b>
<ul style="list-style-type: none"> <li>To learn the foundations of Human Computer Interaction</li> <li>Understanding Interaction Styles and to become familiar with the design technologies for individuals and persons with disabilities.</li> <li>To understand the process of Evaluation of Interaction Design.</li> <li>To clarify the significance of task analysis for ubiquitous computing</li> <li>To get insight on web and mobile interaction.</li> </ul>

<b>UNIT-I</b>	<b>FOUNDATIONS OF HCI</b>	<b>9</b>
Context of Interaction –Ergonomics - Designing Interactive systems – Understanding Userscognition and cognitive frameworks, User Centred approaches Usability, Universal Usability, Understanding and conceptualizing interaction, Guidelines, Principles and Theories. Importance of User Interface: Definition-Importance of good design-Benefits of good design-Human-centered development and Evaluation-Human Performance models-A Brief history of screen design.		

<b>UNIT-II</b>	<b>INTERACTION STYLES</b>	<b>9</b>
GUI: Popularity of graphics - The concept of direct manipulation - Graphical system - Characteristics - Web user - Interface Popularity - Characteristics and Principles of User Interface. Understanding interaction styles, Direct Navigation and Immersive environments, Fluid navigation, Expressive Human and Command Languages, Communication and Collaboration Advancing the user experience, Timely user Experience, Information search, Data Visualization Design process: Human Interaction with computers - Importance of Human Characteristics - Human Consideration - Human Interaction Speeds and Understanding Business Junctions.		

<b>UNIT-III</b>	<b>EVALUATION OF INTERACTION</b>	<b>9</b>
Evaluation Techniques- assessing user experience- usability testing – Heuristic evaluation and walkthroughs, analytics predictive models. Cognitive models, Socio-organizational issues and stakeholder requirements, Communication and collaboration models		

<b>UNIT-IV</b>	<b>MODELS AND THEORIES</b>	<b>9</b>
Task analysis, dialog notations and design, Models of the system, Modeling rich interaction, Ubiquitous computing		

  
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<b>UNIT-V</b>	<b>WEB AND MOBILE INTERACTION</b>	<b>9</b>
Hypertext, Multimedia and WWW, Designing for the web Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Use Transitions-Lookup patterns-Feedback patterns Mobile apps, Mobile navigation, content and control idioms, Multi-touch gestures, Interapp integration, Mobile web		

<b>L:45</b>	<b>T:0</b>	<b>P:0</b>	<b>TOTAL: 45 PERIODS</b>
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### REFERENCES

1. Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven Jacobs, NiklasElmqvist, "Designing the User Interface: Strategies for Effective Human-Computer Interaction", Sixth Edition, Pearson Education, 2016.
2. Alan Dix, Janet Finlay, G D Abowd and Russel Beale, "Human Computer Interaction", Pearson Education, Third Edition, 2004.
3. Helen Sharp Jennifer Preece Yvonne Rogers, "Interaction Design: Beyond Human Computer Interaction", Wiley, 5th Edition, 2019.
4. Alan Cooper, Robert Reimann, David Cronin, Christopher Noessel, "About Face: The Essentials of Interaction Design", 4th Edition, Wiley, 2014
5. Donald A. Norman, "Design of Everyday Things", MIT Press, 2013. 6. Wilbert O Galitz, "The Essential Guide to User Interface Design", Third Edition, Wiley India Pvt., Ltd., 2007.

### COURSE OUTCOMES

At the end of the course students should be able to

- CO1:** Understand the basics of human computer interactions via usability engineering and cognitive modeling
- CO2:** Understand the basic design paradigms, complex interaction styles
- CO3:** Understand the models and theories for user interaction
- CO4:** Examine the evaluation of interaction designs and implementations
- CO5:** Elaborate the above issues for web and mobile applications.

  
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24PCSP202	PERFORMANCE ANALYSIS OF COMPUTER SYSTEMS	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To understand the mathematical foundations needed for performance evaluation of computer systems
- To understand the metrics used for performance evaluation
- To understand the analytical modeling of computer systems
- To enable the students to develop new queuing analysis for both simple and complex systems
- To appreciate the use of smart scheduling and introduce the students to analytical techniques for evaluating scheduling policies


<b>UNIT-I</b>	<b>OVERVIEW OF PERFORMANCE EVALUATION</b>	<b>9</b>
Need for Performance Evaluation in Computer Systems–Overview of Performance Evaluation Methods–Introduction to Queuing–Probability Review–Generating Random Variables for Simulation – Sample Paths, Convergence and Averages–Little’s Law and other Operational Laws –Modification for Closed Systems		

<b>UNIT-II</b>	<b>MARKOV CHAINS AND SIMPLE QUEUES</b>	<b>9</b>
Discrete-Time Markov Chains–Ergodicity Theory–Real World Examples–Google, Aloha–Transition to Continuous-Time Markov Chain–M/M/1.		

<b>UNIT-III</b>	<b>MULTI-SERVER AND MULTI-QUEUE SYSTEMS</b>	<b>9</b>
Server Farms: M/M/k and M/M/k/k – Capacity Provisioning for Server Farms – Time Reversibility and Burke’s Theorem – Networks of Queues and Jackson Product Form – Classed and Closed Networks of Queues.		

<b>UNIT-IV</b>	<b>REAL-WORLD WORKLOADS</b>	<b>9</b>
Case Study of Real-world Workloads – Phase-Type Distributions and Matrix-Analytic Methods – Networks with Time-Sharing Servers – M/G/1 Queue and the Inspection Paradox – Task Assignment Policies for Server Farms.		

<b>UNIT-V</b>	<b>SMART SCHEDULING IN THE M/G/1</b>	<b>9</b>
Performance Metrics – Scheduling Non-Preemptive and Preemptive Non-Size-Based Policies . Scheduling Non-Preemptive and Preemptive Size-Based Policies – Scheduling - CPU scheduling algorithms SRPT and Fairness.		

  
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L:45	T:0	P:0	TOTAL: 45 PERIODS
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## REFERENCES

1. K. S. Trivedi, "Probability and Statistics with Reliability, Queueing and Computer Science Applications", John Wiley and Sons, 2001.
2. Krishna Kant, "Introduction to Computer System Performance Evaluation", McGraw-Hill, 1992.
3. Lieven Eeckhout, "Computer Architecture Performance Evaluation Methods", Morgan and Claypool Publishers, 2010.
4. Mor Harchol - Balter, "Performance Modeling and Design of Computer Systems – Queueing Theory in Action", Cambridge University Press, 2013.
5. Paul J. Fortier and Howard E. Michel, "Computer Systems Performance Evaluation and Prediction", Elsevier, 2003.
6. Raj Jain, "The Art of Computer Systems Performance Analysis: Techniques for Experimental Design, Measurement, Simulation and Modeling", Wiley-Interscience, 1991.
7. Raj Jain, "Art of Computer Systems Performance Analysis: Techniques For Experimental Design Measurements Simulation and Modeling", 2nd edition, Wiley, 2015

## COURSE OUTCOMES

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

- CO1: Identify the need for performance evaluation and the metrics used for it.
- CO2: Distinguish between open and closed queuing networks
- CO3: Apply Little's law and other operational laws to open and closed systems.
- CO4: Use discrete-time and continuous-time Markov chains to model real world systems
- CO5: Develop analytical techniques for evaluating scheduling policies.

  
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24PCSP203	MOBILE AND PERVASIVE COMPUTING	L	T	P	C
		3	0	0	3


<b>COURSE OBJECTIVES</b>
<ul style="list-style-type: none"> <li>To understand the basics of Mobile Computing and Personal Computing</li> <li>To learn the role of cellular networks in Mobile and Pervasive Computing</li> <li>To expose to the concept of sensor and mesh networks</li> <li>To expose to the context aware and wearable computing</li> <li>To develop applications in mobile and pervasive computing environment</li> </ul>

<b>UNIT-I</b>	<b>INTRODUCTION</b>	<b>9</b>
Differences between Mobile Communication and Mobile Computing – Contexts and Names – Functions – Applications and Services – New Applications – Making Legacy Applications Mobile Enabled – Design Considerations – Integration of Wireless and Wired Networks – Standards Bodies – Pervasive Computing – Basics and Vision – Principles of Pervasive Computing – Categories of Pervasive Devices		

<b>UNIT-II</b>	<b>3G AND 4G CELLULAR NETWORKS</b>	<b>9</b>
Migration to 3G Networks – IMT 2000 and UMTS – UMTS Architecture – User Equipment – Radio Network Subsystem – UTRAN – Node B – RNC functions – USIM – Protocol Stack – CS and PS Domains – IMS Architecture – Handover – 3.5G and 3.9G a brief discussion – 4G LAN and Cellular Networks – LTE – Control Plane – NAS and RRC – User Plane – PDCP, RLC and MAC – WiMax IEEE 802.16d/e – WiMax Internetworking with 3GPP		

<b>UNIT-III</b>	<b>SENSOR AND MESH NETWORKS</b>	<b>9</b>
Sensor Networks – Role in Pervasive Computing – In Network Processing and Data Dissemination – Sensor Databases – Data Management in Wireless Mobile Environments – Wireless Mesh Networks – Architecture – Mesh Routers – Mesh Clients – Routing – Cross Layer Approach – Security Aspects of Various Layers in WMN – Applications of Sensor and Mesh networks		

<b>UNIT-IV</b>	<b>CONTEXT AWARE COMPUTING &amp; WEARABLE COMPUTING</b>	<b>9</b>
Adaptability – Mechanisms for Adaptation - Functionality and Data – Transcoding – Location Aware Computing – Location Representation – Localization Techniques – Triangulation and Scene 64 Analysis – Delaunay Triangulation and Voronoi graphs – Types of Context – Role of Mobile Middleware – Adaptation and Agents – Service Discovery Middleware Health BAN- Medical and Technological Requirements-Wearable Sensors-Intra-BAN communications		

  
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<b>UNIT-V</b>	<b>APPLICATION DEVELOPMENT</b>	<b>9</b>
Three tier architecture - Model View Controller Architecture - Memory Management - Information Access Devices - PDAs and Smart Phones - Smart Cards and Embedded Controls - J2ME - Programming for CLDC - GUI in MIDP - Application Development ON Android and iPhone		

<b>L:45</b>	<b>T:0</b>	<b>P:0</b>	<b>TOTAL: 45 PERIODS</b>
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### REFERENCES

1. Judith H Hurwitz, Marcia Kaufman, Adrian Bowles, "Cognitive computing and Big Data Analytics", Wiley, 2015
2. Robert A. Wilson, Frank C. Keil, "The MIT Encyclopedia of the Cognitive Sciences", The MIT Press, 2001.
3. Noah D. Goodman, Joshua B. Tenenbaum, The ProbMods Contributors, "Probabilistic
4. Models of Cognition", Second Edition, 2016, <https://probmods.org/>.

### COURSE OUTCOMES

At the end of the course students should be able to

- CO1: Design a basic architecture for a pervasive computing environment
- CO2: Design and allocate the resources on the 3G-4G wireless networks
- CO3: Analyze the role of sensors in Wireless networks
- CO4: Deploy the location and context information for application development
- CO5: Develop mobile computing applications based on the paradigm of context aware computing and wearable computing

  
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24PCSP204	WEB SERVICES AND API DESIGN	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To learn the basics of Web service
- To become familiar with the Web Services building blocks
- To learn to work with RESTful web services
- To implement the RESTful web services
- To understand resource-oriented Architecture

<b>UNIT-I</b>	<b>INTRODUCTION TO WEB SERVICE</b>	<b>9</b>
Overview – Web service-Architecture – Service-Oriented Architecture (SOA), Architecting Web Services: Web Services Technology Stack, Logical Architectural View, Deployment Architectural View, and Process Architectural View.		

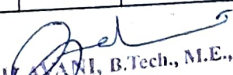
<b>UNIT-II</b>	<b>WEB SERVICES BUILDING BLOCKS</b>	<b>9</b>
Introduction to SOAP: SOAP Syntax- Sending SOAP Messages - SOAP Implementations - Introduction to WSDL: WSDL Syntax - SOAP Binding - WSDL Implementations - Introduction to UDDI: The UDDI API - Implementations - The Future of UDDI		

<b>UNIT-III</b>	<b>RESTFUL WEB SERVICES</b>	<b>9</b>
Programmable Web - HTTP: Documents in Envelopes - Method Information - Scoping Information - The Competing Architectures - Technologies on the Programmable Web - Leftover Terminology - Writing Web Service Clients: The Sample Application - Making the Request: HTTP Libraries - Processing the Response: XML Parsers - JSON Parsers: Handling Serialized Data - Clients Made Easy with WADL.		

<b>UNIT-IV</b>	<b>IMPLEMENTATION OF RESTFUL WEB SERVICES</b>	<b>9</b>
Introducing the Simple Storage Service - Object-Oriented Design of S3 - Resources - HTTP Response Codes Resource- URIs - Addressability - Statelessness - Representations - Links and Connectedness - The Uniform Interface – Spring Web Services – Spring MVC Components - Spring Web Flow - A Service Implementation using Spring Data REST.		

<b>UNIT-V</b>	<b>RESOURCE ORIENTED ARCHITECTURE</b>	<b>9</b>
Resource- URIs - Addressability - Statelessness - Representations - Links and Connectedness - The Uniform Interface- Designing Read-Only Resource-Oriented Services : Resource Design - Turning Requirements Into Read-Only Resources - Figure Out the Data Set- Split the Data Set into Resources- Name the Resources - Design Representation- Link the Resources to Each Other- The HTTP Response		

<b>L:45</b>	<b>T:0</b>	<b>P:0</b>	<b>T: 45 PERIODS</b>
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## REFERENCES

1. Leonard Richardson and Sam Ruby, REST ful Web Services, O'Reilly Media, 2007
2. McGovern, et al., "Java Web Services Architecture", Morgan Kaufmann Publishers, 2005.
3. Lindsay Bassett, Introduction to JavaScript Object Notation, O'Reilly Media, 2015
4. Craig Walls, "Spring in Action, Fifth Edition", Manning Publications, 2018
5. Raja CSP Raman, Ludovic Dewailly, "Building A REST ful Web Service with Spring 5", Packet Publishing, 2018.

## COURSE OUTCOMES

At the end of the course students should be able to


CO1: Explain how to write XML documents.

CO2: Apply the web service building blocks such as SOAP, WSDL and UDDI

CO3: Describe the RestFul web services.

CO4: Implement the RestFul web service with Spring Boot MVC

CO5: Discuss Resource-oriented Architecture.

  
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24PCSP205	CLOUD COMPUTING TECHNOLOGIES	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES


- To gain expertise in Virtualization, Virtual Machines and deploy practical virtualization solution
- To understand the architecture, infrastructure and delivery models of cloud computing.
- To explore the roster of AWS services and illustrate the way to make applications in AWS
- To gain knowledge in the working of Windows Azure and Storage services offered by Windows Azure
- To develop the cloud application using various programming model of Hadoop and Aneka

<b>UNIT-I</b>	<b>VIRTUALIZATION AND VIRTUALIZATION INFRASTRUCTURE</b>	<b>9</b>
<p>Basics of Virtual Machines - Process Virtual Machines – System Virtual Machines –Emulation – Interpretation – Binary Translation - Taxonomy of Virtual Machines. Virtualization – Management Virtualization – Hardware Maximization – Architectures – Virtualization Management – Storage Virtualization – Network Virtualization- Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices – virtual clusters and Resource 38 Management – Virtualization for data center automation</p>		

<b>UNIT-II</b>	<b>CLOUD PLATFORM ARCHITECTURE</b>	<b>9</b>
<p>Cloud Computing: Definition, Characteristics - Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform, software- A Generic Cloud Architecture Design – Layered cloud Architectural Development – Architectural Design Challenges</p>		

<b>UNIT-III</b>	<b>AWS CLOUD PLATFORM - IAAS</b>	<b>9</b>
<p>Amazon Web Services: AWS Infrastructure- AWS API- AWS Management Console - Setting up AWS Storage - Stretching out with Elastic Compute Cloud - Elastic Container Service for Kubernetes- AWS Developer Tools: AWS Code Commit, AWS Code Build, AWS Code Deploy, AWS Code Pipeline, AWS code Star - AWS Management Tools: Cloud Watch, AWS Auto Scaling, AWS control Tower, Cloud Formation, Cloud Trail, AWS License Manager</p>		

<b>UNIT-IV</b>	<b>PAAS CLOUD PLATFORM</b>	<b>9</b>
<p>Windows Azure: Origin of Windows Azure, Features, The Fabric Controller – First Cloud APP in Windows Azure- Service Model and Managing Services: Definition and Configuration, Service runtime API- Windows Azure Developer Portal- Service Management API- Windows</p>		

  
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## Azure Storage Characteristics-Storage Services- REST API- Blops

<b>UNIT-V</b>	<b>PROGRAMMING MODEL</b>	<b>9</b>
Introduction to Hadoop Framework - Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job –Developing Map Reduce Applications - Design of Hadoop file system –Setting up Hadoop Cluster- Aneka: Cloud Application Platform, Thread Programming, Task Programming and Map-Reduce Programming in Aneka		

<b>L:45</b>	<b>T:0</b>	<b>P:0</b>	<b>TOTAL: 45 PERIODS</b>
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1. Bernard Golden, Amazon Web Service for Dummies, John Wiley & Sons, 2013.
2. Raoul Alongi, AWS: The Most Complete Guide to Amazon Web Service from Beginner to Advanced Level, Amazon Asia- Pacific Holdings Private Limited, 2019.
3. Sriram Krishnan, Programming: Windows Azure, O'Reilly, 2010.
4. Rajkumar Buyya, Christian Vacchiola, S.Thamarai Selvi, Mastering Cloud Computing , MCGraw Hill Education (India) Pvt. Ltd., 2013.
5. Danielle Ruest, Nelson Ruest, —Virtualization: A Beginner's Guidel, McGraw-Hill Osborne Media, 2009.
6. Jim Smith, Ravi Nair , "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
7. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010
8. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", McGraw-Hill Osborne Media, 2009.


### COURSE OUTCOMES

At the end of the course students should be able to

- CO1:** Understand the concepts of virtualization in the cloud computing
- CO2:** Identify the architecture, infrastructure and delivery models of cloud computing
- CO3:** Develop the Cloud Application in AWS platform
- CO4:** Apply the concepts of Windows Azure to design Cloud Application
- CO5:** Develop services using various Cloud computing programming models.

  
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# Professional Electives – II

  
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24PCSP206	BIG DATA MINING AND ANALYTICS	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To understand the computational approaches to Modeling, Feature Extraction
- To understand the need and application of Map Reduce
- To understand the various search algorithms applicable to Big Data
- To analyze and interpret streaming data
- To learn how to handle large data sets in main memory and learn the various clustering techniques applicable to Big Data


<b>UNIT-I</b>	<b>DATA MINING AND LARGE SCALE FILES</b>	<b>9</b>
Introduction to Statistical modeling – Machine Learning – Computational approaches to modeling – Summarization – Feature Extraction – Statistical Limits on Data Mining – Distributed File Systems – Map-reduce – Algorithms using Map Reduce – Efficiency of Cluster Computing Techniques.		

<b>UNIT-II</b>	<b>SIMILAR ITEMS</b>	<b>9</b>
Nearest Neighbor Search – Shingling of Documents – Similarity preserving summaries – Locality sensitive hashing for documents – Distance Measures – Theory of Locality Sensitive Functions – LSH Families – Methods for High Degree of Similarities.		

<b>UNIT-III</b>	<b>MINING DATA STREAMS</b>	<b>9</b>
Stream Data Model – Sampling Data in the Stream – Filtering Streams – Counting Distance Elements in a Stream – Estimating Moments – Counting Ones in Window – Decaying Windows.		

<b>UNIT-IV</b>	<b>LINK ANALYSIS AND FREQUENT ITEMSETS</b>	<b>9</b>
Page Rank – Efficient Computation – Topic Sensitive Page Rank – Link Spam – Market Basket Model – A-priori algorithm – Handling Larger Datasets in Main Memory – Limited Pass Algorithm – Counting Frequent Item sets		

<b>UNIT-V</b>	<b>CLUSTERING</b>	<b>9</b>
Introduction to Clustering Techniques – Hierarchical Clustering – Algorithms – K-Means – CURE – Clustering in Non – Euclidean Spaces – Streams and Parallelism – Case Study: Advertising on the Web – Recommendation Systems.		

  
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<b>L:45</b>	<b>T:0</b>	<b>P:0</b>	<b>T:45PERIODS</b>
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1. Jure Leskovec, AnandRajaraman, Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 3rd Edition, 2020.
2. Jiawei Han, MichelineKamber, Jian Pei, "Data Mining Concepts and Techniques", Morgan Kaufman Publications, Third Edition, 2012.
3. Ian H.Witten, Eibe Frank "Data Mining – Practical Machine Learning Tools and Techniques", Morgan Kaufman Publications, Third Edition, 2011.
4. David Hand, HeikkiMannila and Padhraic Smyth, "Principles of Data Mining", MIT PRESS, 2001.

## COURSE OUTCOMES

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

- CO1: Design algorithms by employing Map Reduce technique for solving Big Data problems.
- CO2: Design algorithms for Big Data by deciding on the apt Features set
- CO3: Design algorithms for handling petabytes of datasets
- CO4: Design algorithms and propose solutions for Big Data by optimizing main memory consumption
- CO5: Design solutions for problems in Big Data by suggesting appropriate clustering techniques.

  
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24PCSP207	INFORMATION RETRIEVAL TECHNIQUES	L	T	P	C
		3	0	0	3


COURSE OBJECTIVES
<ul style="list-style-type: none"> <li>To understand the basics of information retrieval with pertinence to modeling, query operations and indexing</li> <li>To get an understanding of machine learning techniques for text classification and clustering</li> <li>To understand the various applications of information retrieval giving emphasis to multimedia IR, web search</li> <li>To explore effectiveness measures, efficiency, and optimization techniques like queueing theory, parallel retrieval, and MapReduce in query processing</li> <li>To understand the concepts of parallel and distributed IR models for digital libraries</li> </ul>

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		

UNIT-IV	EVALUATION AND PARALLEL INFORMATION	9
Traditional Effectiveness Measures – Statistics in Evaluation – Minimizing Adjudication Effect – Nontraditional Effectiveness Measures – Measuring Efficiency – Efficiency Criteria –Queueing Theory – Query Scheduling – Parallel Information Retrieval – Parallel Query Processing – Map Reduce.		


  
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<b>UNIT-V</b>	<b>SEARCHING THE WEB</b>	<b>9</b>
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		

<b>L:45</b>	<b>T:0</b>	<b>P:0</b>	<b>TOTAL: 45 PERIODS</b>
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<b>REFERENCES</b>
<ol style="list-style-type: none"> <li>1. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, "Introduction to Information Retrieval, Cambridge University Press, First South Asian Edition, 2017.</li> <li>2. Stefan Buttcher, Implementing and Evaluating Search Engines, The MIT Press, Cambridge, Massachusetts London, England, 2016.</li> <li>3. Ricardo Baeza – Yates, Berthier Ribeiro – Neto, "Modern Information Retrieval: The concepts and Technology behind Search (ACM Press Books), Second Edition, 2011.</li> </ol>

<b>COURSE OUTCOMES</b>
At the end of the course 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: Categorize the different types of IR Models.. 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.

  
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24PCSP208	SOFTWARE QUALITY ASSURANCE	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- Be exposed to the software quality factors, Quality Assurance (SQA) architecture and SQA components
- Understand the integration of SQA components into the project life cycle
- Be familiar with the software quality infrastructure
- Be exposed to the management components of software quality
- Be familiar with the Quality standards, certifications and assessments

<b>UNIT-I</b>	<b>INTRODUCTION TO SOFTWARE QUALITY &amp; ARCHITECTURE</b>	<b>9</b>
Need for Software quality – Software quality assurance (SQA) – Software quality factors- McCall's quality model – SQA system components – Pre project quality components – Development and quality plans.		


<b>UNIT-II</b>	<b>SQA COMPONENTS AND PROJECT LIFE CYCLE</b>	<b>9</b>
Integrating quality activities in the project life cycle – Reviews – Software Testing – Quality of software maintenance components – Quality assurance for external participants contribution – CASE tools for software quality Management.		

<b>UNIT-III</b>	<b>SOFTWARE QUALITY INFRASTRUCTURE</b>	<b>9</b>
Procedures and work instructions -Supporting quality devices - Staff training and certification - Corrective and preventive actions - Configuration management - Software change control - Configuration management audit - Documentation control.		

<b>UNIT-IV</b>	<b>SOFTWARE QUALITY MANAGEMENT &amp; METRICS</b>	<b>9</b>
Project process control – Software quality metrics – Cost of software quality – Classical quality cost model – Extended model – Application and Problems in application of Cost model.		

<b>UNIT-V</b>	<b>STANDARDS, CERTIFICATIONS &amp; ASSESSMENTS</b>	<b>9</b>
Quality management standards – ISO 9001 and ISO 9000-3 –Capability Maturity Models – CMM and CMMI assessment methodologies - Bootstrap methodology – SPICE Project – SQA project process standards – Organization of Quality Assurance – Role of management in SQA – SQA units and other actors in SQA systems		

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## REFERENCES

1. Daniel Galin, "Software Quality Assurance", Pearson Publication, 2009.
2. Alan C. Gillies, "Software Quality: Theory and Management", International Thomson Computer Press, 2011.
3. Kshirasagar Naim and Priyadarshi Tripathy, "Software Testing and Quality Assurance Theory and Practice", John Wiley & Sons Inc., 2011.
4. Mordechai Ben-Menachem "Software Quality: Producing Practical Consistent Software", International Thompson Computer Press, 2014

## COURSE OUTCOMES

At the end of the course students should be able to

- CO1: Utilize the concepts of SQA in software development life cycle
- CO 2: Demonstrate their capability to adopt quality standards.
- CO3: Assess the quality of software products.
- CO4: Apply the concepts in preparing the quality plan & documents.
- CO5: Ensure whether the product meets company's quality standards and client's expectations and demands

  
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24PCSP209	COGNITIVE COMPUTING	L	T	P	C
		3	0	0	3

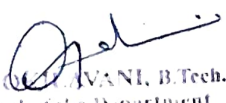
<b>COURSE OBJECTIVES</b>
<ul style="list-style-type: none"> <li>To familiarize Use the Innovation Canvas to justify potentially successful products.</li> <li>To learn various ways in which to develop a product idea.</li> <li>To understand about how Big Data can play vital role in Cognitive Computing</li> <li>To know about the business applications of Cognitive Computing</li> <li>To get into all applications of Cognitive Computing</li> </ul>

<b>UNIT-I</b>	<b>FOUNDATION OF COGNITIVE COMPUTING</b>	<b>9</b>
<p>Foundation of Cognitive Computing: cognitive computing as a new generation, the uses of cognitive systems, system cognitive, gaining insights from data, Artificial Intelligence as the foundation of cognitive computing, understanding cognition Design Principles for Cognitive Systems: Components of a cognitive system, building the corpus, bringing data into cognitive system, machine learning, hypotheses generation and scoring, presentation, and visualization services</p>		

<b>UNIT-II</b>	<b>NATURAL LANGUAGE PROCESSING IN COGNITIVE SYSTEMS</b>	<b>9</b>
<p>Natural Language Processing in support of a Cognitive System: Role of NLP in a cognitive system, semantic web, Applying Natural language technologies to Business problems Representing knowledge in Taxonomies and Ontologies: Representing knowledge, Defining Taxonomies and Ontologies, knowledge representation, models for knowledge representation, implementation considerations</p>		

<b>UNIT-III</b>	<b>BIG DATA AND COGNITIVE COMPUTING</b>	<b>9</b>
<p>Relationship between Big Data and Cognitive Computing: Dealing with human-generated data defining big data, architectural foundation, analytical data warehouses, Hadoop, data in motion and streaming data, integration of big data with traditional data Applying Advanced Analytics to cognitive computing: Advanced analytics is on a path to cognitive computing, Key capabilities in advanced analytics, using advanced analytics to create value, Impact of open source tools on advanced analytics</p>		

<b>UNIT-IV</b>	<b>BUSINESS IMPLICATIONS OF COGNITIVE COMPUTING</b>	<b>9</b>
<p>Preparing for change , advantages of new disruptive models , knowledge meaning to business, difference with a cognitive systems approach , meshing data together differently, using business knowledge to plan for the future , answering business questions in new ways , building business specific solutions , making cognitive computing a reality , cognitive</p>		

  
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application changing the market The process of building a cognitive application: Emerging cognitive platform, defining the objective, defining the domain, understanding the intended users and their attributes, questions and exploring insights, training and testing

<b>UNIT-V</b>	<b>APPLICATION OF COGNITIVE COMPUTING</b>	<b>9</b>
Building a cognitive health care application: Foundations of cognitive computing for healthcare, constituents in healthcare ecosystem, learning from patterns in healthcare Data, Building on a foundation of big data analytics, cognitive applications across the health care ecosystem, starting with a cognitive application for healthcare, using cognitive applications to improve health and wellness, using a cognitive application to enhance the electronic medical record Using cognitive application to improve clinical teaching		

<b>L:45</b>	<b>T:0</b>	<b>P:0</b>	<b>TOTAL: 45 PERIODS</b>
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#### **-REFERENCES**

1. Judith H Hurwitz, Marcia Kaufman, Adrian Bowles, "Cognitive computing and Big Data Analytics", Wiley, 2015
2. Robert A. Wilson, Frank C. Keil, "The MIT Encyclopedia of the Cognitive Sciences", The MIT Press, 2001.
- 3. Noah D. Goodman, Joshua B. Tenenbaum, The ProbMods Contributors, "Probabilistic Models of Cognition", Second Edition, 2016, <https://probmods.org/>.

#### **COURSE OUTCOMES**

At the end of the course students should be able to


CO1: Explain applications in Cognitive Computing.

CO2: Describe Natural language processor role in Cognitive computing.

CO3: Explain future directions of Cognitive Computing.

CO4: Evaluate the process of taking a product to market.

CO5: Comprehend the applications involved in this domain.

  
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24PCSP210	COMPILER OPTIMIZATION TECHNIQUES	L	T	P	C
		3	0	0	3

### COURSE 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.

<b>UNIT-I</b>	<b>INTRODUCTION</b>	<b>9</b>
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.		


<b>UNIT-II</b>	<b>INSTRUCTION-LEVEL PARALLELISM</b>	<b>9</b>
Processor Architectures – Code-Scheduling Constraints – Basic-Block Scheduling –Global Code Scheduling – Advanced code motion techniques – Interaction with Dynamic Schedulers- Software Pipelining.		

<b>UNIT-III</b>	<b>OPTIMISING FOR PARALLELISM AND LOCALITY-THEORY</b>	<b>9</b>
Basic Concepts – Matrix-Multiply: An Example - Iteration Spaces - Affine Array Indexes – Data Reuse- Array data dependence Analysis.		

<b>UNIT-IV</b>	<b>OPTIMISING FOR PARALLELISM AND LOCALITY – APPLICATION</b>	<b>9</b>
Finding Synchronisation - Free Parallelism – Synchronisation Between Parallel Loops – Pipelining – Locality Optimizations – Other Uses of Affine Transforms.		

<b>UNIT-V</b>	<b>INTERPROCEDURAL ANALYSIS</b>	<b>9</b>
Basic Concepts – Need for Interprocedural Analysis – A Logical Representation of Data Flow – A 69 Simple Pointer-Analysis Algorithm – Context Insensitive Interprocedural Analysis – Context Sensitive Pointer-Analysis - Datalog Implementation by Binary Decision Diagrams.		

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## 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, 2002.
3. Steven S. Muchnick, "Advanced Compiler Design and Implementation",Morgan Kaufmann Publishers - Elsevier Science, India, 2007
4. John Hopcroft, Rajeev Motwani, Jeffrey Ullman, "Introduction To Automata Theory Languages, and Computation", Third Edition, Pearson Education, 2007.
5. Torbengidius Mogensen, "Basics of Compiler Design", Springer, 2011.
6. Charles N, Ron K Cytron, Richard J LeBlanc Jr., "Crafting a Compiler", Pearson Education, 2010

## COURSE OUTCOMES

Upon completion of this course, the student should be able to

- CO1: Identify the different optimization techniques that are possible for a sequence of code
- CO 2: Design performance enhancing optimization techniques
- CO3: Manage procedures with optimal overheads
- CO4:Ensure better utilization of resources
- CO5: Optimize memory usage by applying scalar replacement techniques to reduce memory access costs.

# Professional Electives – III



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24PCSP301	NATURAL LANGUAGE PROCESSING	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To understand basics of linguistics, probability and statistics
- To study statistical approaches to NLP and understand sequence labeling
- To outline different parsing techniques associated with NLP
- To explore semantics of words and semantic role labeling of sentences
- To understand discourse analysis, question answering and chatbots


<b>UNIT-I</b>	<b>INTRODUCTION NATURAL LANGUAGE PROCESSING</b>	9
Natural Language Processing–Components - Basics of Linguistics and Probability and Statistics–Words-Tokenization-Morphology-Finite State Automata		

<b>UNIT-II</b>	<b>STATISTICAL NLP AND SEQUENCE LABELING</b>	9
N-grams and Language models –Smoothing -Text classification- Naïve Bayes classifier – Evaluation - Vector Semantics – TF-IDF - Word2Vec- Evaluating Vector Models –Sequence Labeling – Part of Speech – Part of Speech Tagging -Named Entities –Named Entity Tagging		

<b>UNIT-III</b>	<b>CONTEXTUAL EMBEDDING</b>	9
Constituency –Context Free Grammar –Lexicalized Grammars- CKY Parsing – Earley's algorithm-Evaluating Parsers -Partial Parsing – Dependency Relations- Dependency Parsing Transition Based Graph Based.		

<b>UNIT-IV</b>	<b>COMPUTATIONAL SEMANTICS</b>	9
-Word Senses and WordNet – Word Sense Disambiguation – Semantic Role Labeling – Proposition Bank- FrameNet- Selectional Restrictions - Information Extraction - Template Filling.		

<b>UNIT-V</b>	<b>DISCOURSE ANALYSIS AND SPEECH PROCESSING</b>	9
Discourse Coherence – Discourse Structure Parsing – Centering and Entity Based Coherence – Question Answering –Factoid Question Answering – Classical QA Models – Chatbots and Dialogue systems – Frame-based Dialogue Systems – Dialogue–State Architecture.		

  
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L:45	T:0	P:45	TOTAL: 45 PERIODS
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## REFERENCES

1. Daniel Jurafsky and James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition" (Prentice Hall Series in Artificial Intelligence), 2020
2. Jacob Eisenstein. "Natural Language Processing", MIT Press, 2019
3. Samuel Burns "Natural Language Processing: A Quick Introduction to NLP with Python and NLTK", 2019
4. Christopher Manning, "Foundations of Statistical Natural Language Processing", MIT Press, 2009.
5. Nitin Indurkha, Fred J. Damerau, "Handbook of Natural Language Processing", Second edition, Chapman & Hall/CRC: Machine Learning & Pattern Recognition, Hardcover, 2010
6. Deepti Chopra, Nisheeth Joshi, "Mastering Natural Language Processing with Python", Packt Publishing Limited, 2016
7. Mohamed Zakaria Kurdi "Natural Language Processing and Computational Linguistics: Speech, Morphology and Syntax (Cognitive Science)", ISTE Ltd., 2016
8. Atefeh Farzindar, Diana Inkpen, "Natural Language Processing for Social Media (Synthesis Lectures on Human Language Technologies)", Morgan and Claypool Life Sciences, 2015

## COURSE OUTCOMES

At the end of the course students should be able to

- CO1: Understand basics of linguistics, probability and statistics associated with NLP
- CO 2: Implement a Part-of-Speech Tagger
- CO3: Design and implement a sequence labeling problem for a given domain
- CO4: Implement semantic processing tasks and simple document indexing and searching system using the concepts of NLP
- CO5: Implement a simple chat bot using dialogue system concepts

  
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24PCSP302	WEB ANALYTICS	L	T	P	C
		3	0	0	3


<b>COURSE OBJECTIVES</b>
<ul style="list-style-type: none"> <li>To understand the Web analytics platform, and their evolution.</li> <li>To learn about the various Data Streams Data.</li> <li>To learn about the benefits of surveys and capturing of data</li> <li>To understand Common metrics of web as well as KPI related concepts.</li> <li>To learn about the various Web analytics versions</li> </ul>

<b>UNIT-I</b>	<b>INTRODUCTION</b>	<b>9</b>
-Definition, Process, Key terms: Site references, Keywords and Key phrases; building block terms: Visit characterization terms, Content characterization terms, Conversion metrics; Categories: Offsite web, on site web; Web analytics platform, Web analytics evolution, Need for web analytics, Advantages, Limitations.		

<b>UNIT-II</b>	<b>DATA COLLECTION</b>	<b>9</b>
Click stream Data: Web logs, Web Beacons, JavaScript tags, Packet Sniffing; Outcomes Data: E-commerce, Lead generation, Brand/Advocacy and Support; Research data: Mindset, Organizational structure, Timing; Competitive Data: Panel-Based measurement, ISP-based measurement, and Search Engine data.		

<b>UNIT-III</b>	<b>QUALITATIVE ANALYSIS</b>	<b>9</b>
Heuristic evaluations: Conducting a heuristic evaluation, Benefits of heuristic evaluations; Site Visits: Conducting a site visit, Benefits of site visits; Surveys: Website surveys, Post-visit surveys, creating and running a survey, Benefits of surveys. Capturing data: Web logs or JavaScript's tags, Separate data serving and data capture, Type and size of data, Innovation, Integration, Selecting optimal web analytic tool, Understanding click stream data quality, Identifying unique page definition, Using cookies, Link coding issues.		

<b>UNIT-IV</b>	<b>WEB METRICS</b>	<b>9</b>
Common metrics: Hits, Page views, Visits, Unique visitors, Unique page views, Bounce, Bounce rate, Page/visit, Average time on site, New visits; Optimization (e-commerce, non e-commerce sites): Improving bounce rates, Optimizing ad words campaigns; Real time report, Audience report, Traffic source report, Custom campaigns, Content report, Google analytics, Introduction to KPI, characteristics, Need for KPI, Perspective of KPI, Uses of KPI. Relevant Technologies: Internet & TCP/IP, Client / Server Computing, HTTP (Hypertext Transfer Protocol), Server Log Files & Cookies, Web Bugs		


  
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<b>UNIT-V</b>	<b>WEB ANALYTICS 2.0</b>	<b>9</b>
<p>Web analytics 1.0, Limitations of web analytics 1.0, Introduction to analytic 2.0, Competitive intelligence analysis : CI data sources, Toolbar data, Panel data ,ISP data, Search engine data, Hybrid data, Website traffic analysis: Comparing long term traffic trends, Analyzing competitive site overlap and opportunities. Google Analytics: Brief introduction and working, Adwords, Benchmarking, Categories of traffic: Organic traffic, Paid traffic; Google website optimizer, Implementation technology, Limitations, Performance concerns, Privacy issues.</p>		

<b>L:45</b>	<b>T: 0</b>	<b>P: 0</b>	<b>TOTAL: 45PERIODS</b>
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<b>REFERENCES</b>
<ol style="list-style-type: none"> <li>1. Clifton B., Advanced Web Metrics with Google Analytics, Wiley Publishing, Inc.2nd ed, 2012.</li> <li>2. Kaushik A., Web Analytics 2.0, The Art of Online Accountability and Science of Customer Centricity, Wiley Publishing, Inc. 1st ed, 2010.</li> <li>3. Sterne J., Web Metrics: Proven methods for measuring web site success, John Wiley and Sons, 2002</li> </ol>

<b>COURSE OUTCOMES</b>
<p>Upon completion of this course, the students should be able to:</p> <p>CO1: Understand the Web analytics platform, and their evolution.</p> <p>CO2: Use the various Data Streams Data.</p> <p>CO3: Know how the survey of capturing of data will benefit.</p> <p>CO4: Understand Common metrics of web as well as KPI related concepts.</p> <p>CO5: Apply various Web analytics versions in existence.</p>

  
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24PCSP303	DEEP LEARNING	L	T	P	C
		3	0	0	3


<b>COURSE OBJECTIVES</b>
<ul style="list-style-type: none"> <li>• Develop and Train Deep Neural Networks.</li> <li>• Develop a CNN, R-CNN, Fast R-CNN, Faster-R-CNN, Mask-RCNN for detection and recognition</li> <li>• Build and train RNNs, work with NLP and Word Embeddings</li> <li>• The internal structure of LSTM and GRU and the differences between them</li> <li>• The Auto Encoders for Image Processing</li> </ul>

<b>UNIT-I</b>	<b>DEEP LEARNING CONCEPTS</b>	<b>9</b>
<p>Fundamentals about Deep Learning. Perception Learning Algorithms. Probabilistic modelling. Early Neural Networks. How Deep Learning different from Machine Learning. Scalars. Vectors. Matrixes, Higher Dimensional Tensors. Manipulating Tensors. Vector Data. Time Series Data. Image Data, Video Data. □</p>		

<b>UNIT-II</b>	<b>NEURAL NETWORKS</b>	<b>9</b>
<p>About Neural Network. Building Blocks of Neural Network. Optimizers. Activation Functions. Loss Functions. Data Pre-processing for neural networks, Feature Engineering. Overfitting and Underfitting. Hyperparameters.</p>		

<b>UNIT-III</b>	<b>CONVOLUTIONAL NEURAL NETWORK</b>	<b>9</b>
<p>About CNN. Linear Time Invariant. Image Processing Filtering. Building a convolutional neural network. Input Layers, Convolution Layers. Pooling Layers. Dense Layers. Backpropagation Through the Convolutional Layer. Filters and Feature Maps. Backpropagation Through the Pooling Layers. Dropout Layers and Regularization. Batch Normalization. Various Activation Functions. Various Optimizers. LeNet, AlexNet, VGG16, ResNet. Transfer Learning with Image Data. Transfer Learning using Inception Oxford VGG Model, Google Inception Model, Microsoft ResNet Model. R-CNN, Fast R-CNN, Faster R-CNN, Mask-RCNN, YOLO</p>		

<b>UNIT-IV</b>	<b>NATURAL LANGUAGE PROCESSING USING RNN</b>	<b>9</b>
<p>About NLP &amp; its Toolkits. Language Modeling . Vector Space Model (VSM). Continuous Bag of Words (CBOW). Skip-Gram Model for Word Embedding. Part of Speech (PoS) Global Co-occurrence Statistics-based Word Vectors. Transfer Learning. Word2Vec. Global Vectors for Word Representation GloVe. Backpropagation Through Time. Bidirectional RNNs (BRNN) . Long Short Term Memory (LSTM). Bi-directional LSTM. Sequence-to-Sequence Models (Seq2Seq). Gated recurrent unit GRU. □</p>		


  
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<b>UNIT-V</b>	<b>DEEP REINFORCEMENT &amp; UNSUPERVISED LEARNING</b>	<b>9</b>
About Deep Reinforcement Learning. Q-Learning. Deep Q-Network (DQN). Policy Gradient Methods. Actor-Critic Algorithm. About Autoencoding. Convolutional Auto Encoding. Variational Auto Encoding. Generative Adversarial Networks. Autoencoders for Feature Extraction. Auto Encoders for Classification. Denoising Autoencoders. Sparse Autoencoders		

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<b>REFERENCES</b>
<ol style="list-style-type: none"> <li>1. Deep Learning A Practitioner's Approach Josh Patterson and Adam Gibson O'Reilly Media, Inc.2017</li> <li>2. Learn Keras for Deep Neural Networks, Jojo Moolayil, Apress,2018</li> <li>3. Deep Learning Projects Using TensorFlow 2, Vinita Silaparasetty, Apress, 2020</li> <li>4. Deep Learning with Python, FRANÇOIS CHOLLET, MANNING SHELTER ISLAND,2017</li> <li>5. Pro Deep Learning with TensorFlow, Santanu Pattanayak, Apress,2017</li> </ol>

<b>COURSE OUTCOMES</b>
Upon completion of this course, the students should be able to:
CO1: Feature Extraction from Image and Video Data
CO2: Implement Image Segmentation and Instance Segmentation in Images
CO3: Implement image recognition and image classification using a pretrained network (Transfer Learning)
CO4: Traffic Information analysis using Twitter Data
CO5: Autoencoder for Classification & Feature Extraction

  
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24PCSP304	FORMAL MODELS OF SOFTWARE SYSTEMS	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES


- To understand the goals, complexity of software systems, the role of Specification activities and qualities to control complexity
- To understand the fundamentals of abstraction and formal systems
- To learn fundamentals of logic reasoning- Propositional Logic, temporal logic and apply to 70 models systems
- To understand formal specification models based on set theory, calculus and algebra and apply to a case study

<b>UNIT-I</b>	<b>SPECIFICATION FUNDAMENTALS</b>	<b>9</b>
<p>Role of Specification- Software Complexity - Size, Structural, Environmental, Application, domain, Communication Complexity, How to Control Complexity. Software specification, Specification Activities-Integrating Formal Methods into the Software Lifecycle. Specification Qualities- Process Quality Attributes of Formal Specification Languages, Model of Process Quality, Product Quality and Utility, Conformance to Stated Goals Quality Dimensions and Quality Model.</p>		

<b>UNIT-II</b>	<b>FORMAL METHODS</b>	<b>9</b>
<p>Abstraction- Fundamental Abstractions in Computing. Abstractions for Software Construction. Formalism Fundamentals - Formal Systems, Formalization Process in Software Engineering Components of a Formal System- Syntax, Semantics, and Inference Mechanism. Properties of Formal Systems - Consistency. Automata-Deterministic Finite Accepters, State Machine Modeling Nondeterministic Finite Accepters, Finite State Transducers Extended Finite State Machine. Case Study—Elevator Control. Classification of C Methods-Property-Oriented Specification Methods, Model-Based Specification Techniques.</p>		

<b>UNIT-III</b>	<b>LOGIC</b>	<b>9</b>
<p>Propositional Logic - Reasoning Based on Adopting a Premise, Inference Based on Natural Deduction. Predicate Logic - Syntax and Semantics, Policy Language Specification, knowledge Representation Axiomatic Specification. Temporal Logic -. Temporal Logic for Specification and Verification, Temporal Abstraction Propositional Temporal Logic (PTL), First Order Temporal Logic (FOTL). Formal Verification, Verification of Simple FOTL, Model Checking, Program Graphs, Transition Systems.</p>		

<b>UNIT-IV</b>	<b>SPECIFICATION MODELS</b>	<b>9</b>
<p>Mathematical Abstractions for Model-Based Specifications-Formal Specification Based on Set Theory, Relations and Functions. Property-Oriented Specifications- Algebraic Specification, Properties of Algebraic Specifications, Reasoning, Structured Specifications. Case Study-</p>		

  
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A Multiple Window Environment: requirements, Modeling Formal Specifications. Calculus of Communicating Systems: Specific Calculus for Concurrency. Operational Semantics of Agents, Simulation and Equivalence, Derivation Trees, Labeled Transition Systems.

UNIT-V	FORMAL LANGUAGES	9
<p>The Z Notation, abstractions in Z, Representational Abstraction, Types, Relations and Functions, Sequences, Bags. Free Types-Schemas, Operational Abstraction -Operations Schema Decorators, Generic Functions, Proving Properties from Z specifications, Consistency of Operations. Additional Features in Z. Case Study: An Automated Billing System. The Object-Z Specification Language- Basic Structure of an Object-Z, Specification. Parameterized Class, Object-Orientation, composition of Operations-Parallel Communication Operator, Nondeterministic Choice Operator, and Environment Enrichment. The B-Method -Abstract Machine Notation (AMN), Structure of a B Specification, arrays, statements. Structured Specifications, Case Study- A Ticketing System in a Parking.</p>		

L:45	T:0	P:0	TOTAL: 45 PERIODS
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### REFERENCES

1. Mathematical Logic for computer science ,second edition, M.Ben-Ari ,Springer,2012.
2. Logic in Computer Science- modeling and reasoning about systems, 2 nd Edition,Cambridge University Press, 2004.
3. Specification of Software Systems, V.S. Alagar, K. Periyasamy, David Grises and Fred B Schneider, Springer –Verlag London, 2011
4. The ways Z: Practical programming with formal methods, Jonathan Jacky, Cambridge University Press,1999.
5. Using Z-Specification Refinement and Proof,Jim Woodcock and Jim Devies Prentice Hall, 1996

### COURSE OUTCOMES

At the end of the course students should be able to

- CO1: Understand the complexity of software systems, the need for formal specifications  
Activities and qualities to control complexity.
- CO2: Gain knowledge on fundamentals of abstraction and formal systems
- CO3: Learn the fundamentals of logic reasoning- Propositional Logic, temporal logic and apply to models systems
- CO4: Develop formal specification models based on set theory, calculus and algebra and apply to a typical case study
- CO5: Have working knowledge on Z, Object Z and B Specification languages with case studies.

  
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24PCSP305	HIGH PERFORMANCE COMPUTING FOR BIG DATA	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To learn the fundamental concepts of High Performance Computing
- To learn the network & software infrastructure for high performance computing
- To understand real time analytics using high performance computing
- To learn the different ways of security perspectives and technologies used in HPC
- To understand the emerging big data applications.

<b>UNIT-I</b>	<b>INTRODUCTION</b>	<b>9</b>
The Emerging IT Trends- IOT/IOE-Apache Hadoop for big data analytics-Big data into big insights and actions – Emergence of BDA discipline – strategic implications of big data – BDA Challenges – HPC paradigms – Cluster computing – Grid Computing – Cloud computing – Heterogeneous computing – Mainframes for HPC - Supercomputing for BDA – Appliances for BDA.		

<b>UNIT-II</b>	<b>NETWORK &amp; SOFTWARE INFRASTRUCTURE FOR HIGH PERFORMANCE BDA</b>	<b>9</b>
Design of Network Infrastructure for high performance BDA – Network Virtualization – Software Defined Networking – Network Functions Virtualization – WAN optimization for transfer of big data – started with SANs- storage infrastructure requirements for storing big data – FC SAN – IP SAN – NAS – GFS – Panasas – Luster file system – Introduction to cloud storage		

<b>UNIT-III</b>	<b>REAL TIME ANALYTICS USING HIGH PERFORMANCE COMPUTING</b>	<b>9</b>
Technologies that support Real time analytics – MOA: Massive online analysis – GPPS: General parallel file system – Client case studies – Key distinctions – Machine data analytics – operational analytics – HPC Architecture models – In Database analytics – In memory analytics		

<b>UNIT-IV</b>	<b>SECURITY AND TECHNOLOGIES</b>	<b>9</b>
Security, Privacy and Trust for user – generated content: The challenges and solutions – Role of real time big data processing in the IoT – End to End Security Framework for big sensing data streams – Clustering in big data		

<b>UNIT-V</b>	<b>EMERGING BIG DATA APPLICATIONS</b>	<b>9</b>
Deep learning Accelerators – Accelerators for clustering applications in machine learning - Accelerators for classification algorithms in machine learning – Accelerators for Big data Genome Sequencing.		

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<b>L:45</b>	<b>T:0</b>	<b>P:0</b>	<b>TOTAL: 45 PERIODS</b>
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## REFERENCES

1. Pethuru Raj, Anupama Raman, Dhivya Nagaraj and Siddhartha Duggirala, "High-Performance Big-Data Analytics: Computing Systems and Approaches", Springer, 1st Edition, 2015.
2. "Big Data Management and Processing", Kuan-Ching Li , Hai Jiang, Albert Y. Zomaya, CRC Press,1st Edition,2017.
3. "High Performance Computing for Big Data: Methodologies and Applications", Chao wang ,CRC Press,1st Edition,2018
4. "High-Performance Data Mining And Big Data Analytics" , Khosrow Hassibi, Create Space Independent Publishing Platform,1st Edition,2014
5. "High performance computing: Modern systems and practices", Thomas Sterling, Matthew Anderson, Morgan Kaufmann publishers, 1st Edition,2017

## COURSE OUTCOMES

At the end of the course students should be able to

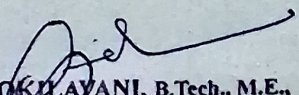
CO1: Understand the basics concepts of High Performance computing systems

CO2: Apply the concepts of network and software infrastructure for high performance Computing.

CO3: Use real time analytics using high performance computing.

CO4: Apply the security models and big data applications in high performance computing.

CO5: Understand the emerging big data applications.

  
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24PCEO01	ENVIRONMENTAL SUSTAINABILITY	L	T	P	C
		3	0	0	3

**COURSE OBJECTIVES:**

- To prepare students to take responsibility of Environmental protection
- To emphasize the concept of sustainable development
- To emphasize the importance of biodiversity protection
- To gain knowledge on impact of industrial pollution on the environment
- To acquire interest to sustainable development and pollution economics

<b>UNIT-I</b>	<b>INTRODUCTION</b>	<b>9</b>
Valuing the Environment: Concepts, Valuing the Environment: Methods, Property Rights, Externalities, and Environmental Problems		

<b>UNIT-II</b>	<b>CONCEPT OF SUSTAINABILITY</b>	<b>9</b>
Sustainable Development: Defining the Concept, the Population Problem, Natural Resource Economics: An Overview, Energy, Water, Agriculture		

<b>UNIT-III</b>	<b>SIGNIFICANCE OF BIODIVERSITY</b>	<b>9</b>
Biodiversity, Forest Habitat, Commercially Valuable Species, Stationary - Source Local Air Pollution, Acid Rain and Atmospheric Modification, Transportation		

<b>UNIT-IV</b>	<b>POLLUTION IMPACTS</b>	<b>9</b>
Water Pollution, Solid Waste and Recycling, Toxic Substances and Hazardous Wastes, Global Warming		

<b>UNIT-V</b>	<b>ENVIRONMENTAL ECONOMICS</b>	<b>9</b>
Development, Poverty, and the Environment, Visions of the Future, Environmental economics and policy by Tom Tietenberg, Environmental Economics		

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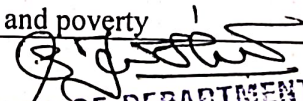
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1. Andrew Hoffman, 'Competitive Environmental Strategy - A Guide for the Changing Business Landscape, Island Press.
2. Stephen Doven, Environment and Sustainability Policy: Creation, Implementation, Evaluation, the Federation Press, 2005
3. Robert 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

**COURSE OUTCOMES**

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

- CO1: Understand the value of environment and the hidden losses caused by pollution  
CO2: Understand the real economics of sustainable development  
CO3: Realize the loss of habitat and extinction of species due to pollution  
CO4: Learn the irreversible impacts of pollution on the biosphere  
CO5: Understand the impact of pollution on social life of humans and poverty

  
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24PCE002	VIBRATION AND NOISE CONTROL STRATEGIES	L	T	P	C
		3	0	0	3

**COURSE 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

<b>UNIT-I</b>	<b>BASICS OF VIBRATION</b>	<b>9</b>
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		

<b>UNIT-II</b>	<b>BASICS OF NOISE</b>	<b>9</b>
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.		

<b>UNIT-III</b>	<b>INSTRUMENTATION FOR VIBRATION MEASUREMENT</b>	<b>9</b>
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		

<b>UNIT-IV</b>	<b>INSTRUMENTATION FOR NOISE MEASUREMENT AND ANALYSIS</b>	<b>9</b>
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.		

<b>UNIT-V</b>	<b>METHODS OF VIBRATION CONTROL, SOURCES OF NOISE AND ITS CONTROL</b>	<b>9</b>
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		

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## 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.

## COURSE OUTCOMES

On completion of the course, the student is expected to be able to

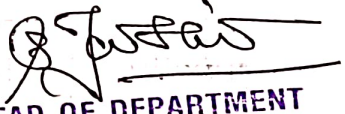
CO1: Understand need for environmental clearance, its legal procedure, need of EIA, its types, stakeholders and their roles

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

  
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24PCEO03	INTEGRATED WATER RESOURCES MANAGEMENT	L	T	P	C
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**COURSE OBJECTIVES:**

- 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.

<b>UNIT-I</b>	<b>CONTEXT FOR IWRM</b>	<b>9</b>
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.		

<b>UNIT-II</b>	<b>WATER ECONOMICS</b>	<b>9</b>
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.		

<b>UNIT-III</b>	<b>LEGAL AND REGULATORY SETTINGS</b>	<b>9</b>
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.		

<b>UNIT-IV</b>	<b>WATER AND HEALTH WITHIN THE IWRM CONTEXT</b>	<b>9</b>
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.		

<b>UNIT-V</b>	<b>AGRICULTURE IN THE CONCEPT OF IWRM</b>	<b>9</b>
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.		

<b>L:45</b>	<b>T: 00</b>	<b>P: 00</b>	<b>Total: 45 Periods</b>
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**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

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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.

## COURSE OUTCOMES

On completion of the course, the student is expected to be able to

- CO1: Apply the basic concepts of vibration in damped and undamped systems
- CO2: Apply the basic concepts of noise and to understand its effects on systems
- CO3: Select the instruments required for vibration measurement and its analysis
- CO4: Select the instruments required for noise measurement and its analysis.
- CO5: Recognize the noise sources and to control the vibration levels in a body and to control noise under different strategies.

  
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24PCEO04	ENVIRONMENTAL IMPACT ASSESSMENT	L	T	P	C
		3	0	0	3

**COURSE 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.

<b>UNIT-I</b>	<b>INTRODUCTION</b>	<b>9</b>
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.		

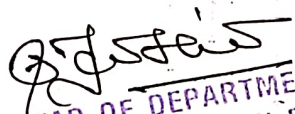
<b>UNIT-II</b>	<b>IMPACT IDENTIFICATION AND PREDICTION</b>	<b>9</b>
Matrices – networks – checklists – cost benefit analysis – analysis of alternatives – expert systems in EIA. prediction tools for EIA – mathematical modeling for impact prediction – assessment of impacts – air – water – soil – noise – biological – cumulative impact assessment		

<b>UNIT-III</b>	<b>SOCIO-ECONOMIC IMPACT ASSESSMENT</b>	<b>9</b>
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		

<b>UNIT-IV</b>	<b>EIA DOCUMENTATION AND ENVIRONMENTAL MANAGEMENT PLAN</b>	<b>9</b>
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		

<b>UNIT-V</b>	<b>CASE STUDIES</b>	<b>9</b>
Mining, power plants, cement plants, highways, petroleum refining industry, storage & handling of hazardous chemicals, common hazardous waste facilities, CETPs, CMSWMF, building and construction projects		

<b>L:45</b>	<b>T: 00</b>	<b>P: 00</b>	<b>Total: 45 Periods</b>
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 Tirupur-635660, Tamilnadu.

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.

### **COURSE 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.

  
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24PECO01	IOT FOR SMART SYSTEMS	L	T	P	C
		3	0	0	3

**COURSE OBJECTIVES:**

- To study about Internet of Things technologies and its role in real time applications.
- To introduce the infrastructure required for IoT
- To familiarize the accessories and communication techniques for IoT.
- To provide insight about the embedded processor and sensors required for IoT
- To familiarize the different platforms and Attributes for IoT

<b>UNIT-I</b>	<b>INTRODUCTION TO INTERNET OF THINGS</b>	<b>9</b>
Overview, Hardware and software requirements for IOT, Sensor and actuators, Technology drivers, Business drivers, Typical IoT applications, Trends and implications.		

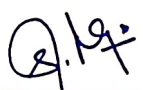
<b>UNIT-II</b>	<b>IOT ARCHITECTURE</b>	<b>9</b>
IoT reference model and architecture -Node Structure - Sensing, Processing, Communication, Powering, Networking - Topologies, Layer/Stack architecture, IoT standards, Cloud computing for IoT, Bluetooth, Bluetooth Low Energy beacons.		

<b>UNIT-III</b>	<b>PROTOCOLS AND WIRELESS TECHNOLOGIES FOR IOT PROTOCOLS</b>	<b>9</b>
NFC, SCADA and RFID, Zigbee MIPI, M-PHY, UniPro, SPMI, SPI, M-PCIe GSM, CDMA, LTE, GPRS, small cell. <b>Wireless technologies for IoT:</b> WiFi (IEEE 802.11), Bluetooth/Bluetooth Smart, ZigBee/ZigBee Smart, UWB (IEEE 802.15.4), 6LoWPAN, Proprietary systems-Recent trends.		

<b>UNIT-IV</b>	<b>IOT PROCESSORS</b>	<b>9</b>
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.		

<b>UNIT-V</b>	<b>CASE STUDIES</b>	<b>9</b>
Industrial IoT, Home Automation, smart cities, Smart Grid, connected vehicles, electric vehicle charging, Environment, Agriculture, Productivity Applications, IOT Defense		

<b>L:45</b>	<b>T:0</b>	<b>P:0</b>	<b>T: 45 PERIODS</b>
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## REFERENCES

1. ArshdeepBahga and VijaiMadiseti : 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 Madiseti , 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.

## COURSE OUTCOMES

At the end of the course students should be able to

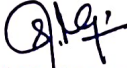
CO1: Analyze the concepts of IoT and its present developments.

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

  
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24PCSO02	INTERNET OF THINGS AND CLOUD	L	T	P	C
		3	0	0	3

<b>COURSE OBJECTIVES</b>					
<ul style="list-style-type: none"> <li>To understand Smart Objects and IoT Architectures</li> <li>To learn about various IOT-related protocols</li> <li>To build simple IoT Systems using Arduino and Raspberry Pi.</li> <li>To understand data analytics and cloud in the context of IoT</li> <li>To develop IoT infrastructure for popular applications</li> </ul>					

<b>UNIT-I</b>	<b>FUNDAMENTALS OF IoT</b>	<b>9</b>
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		

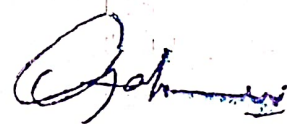
<b>UNIT-II</b>	<b>PROTOCOLS FOR IoT</b>	<b>9</b>
Infrastructure protocol (IPV4/V6/RPL), Identification (URIs), Transport (Wifi, Lifi, BLE), Discovery, Data Protocols, Device Management Protocols. – A Case Study with MQTT/CoAP usage-IoT privacy, security and vulnerability solutions.		

<b>UNIT-III</b>	<b>CASE STUDIES/INDUSTRIAL APPLICATIONS</b>	<b>9</b>
Case studies with architectural analysis: IoT applications – Smart City – Smart Water – Smart Agriculture – Smart Energy – Smart Healthcare – Smart Transportation – Smart Retail – Smart waste management.		

<b>UNIT-IV</b>	<b>CLOUD COMPUTING INTRODUCTION</b>	<b>9</b>
Introduction to Cloud Computing - Service Model – Deployment Model- Virtualization Concepts – Cloud Platforms – Amazon AWS – Microsoft Azure – Google APIs		

<b>UNIT-V</b>	<b>IoT AND CLOUD</b>	<b>9</b>
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		

L:45	T:0	P:0	Total: 45 PERIODS
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## 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.

## COURSE OUTCOMES

Upon completion of the course, the students 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



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24PCSO03	MACHINE LEARNING AND DEEP LEARNING	L	T	P	C
		3	0	0	3

<b>COURSE OBJECTIVES</b>					
<ul style="list-style-type: none"> <li>• Understanding about the learning problem and algorithms</li> <li>• Providing insight about neural networks</li> <li>• Introducing the machine learning fundamentals and significance</li> <li>• Enabling the students to acquire knowledge about pattern recognition.</li> <li>• Motivating the students to apply deep learning algorithms for solving real life problems</li> </ul>					

<b>UNIT-I</b>	<b>LEARNING PROBLEMS AND ALGORITHMS</b>	<b>9</b>
Various paradigms of learning problems, Supervised, Semi-supervised and Unsupervised algorithms		

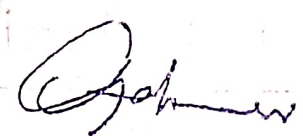
<b>UNIT-II</b>	<b>NEURAL NETWORKS</b>	<b>9</b>
Differences between Biological and Artificial Neural Networks - Typical Architecture, Common Activation Functions, Multi-layer neural network, Linear Separability, Hebb Net, Perceptron, Adaline, Standard Back propagation Training Algorithms for Pattern Association - 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.		

<b>UNIT-III</b>	<b>MACHINE LEARNING – FUNDAMENTALS &amp; FEATURE SELECTIONS &amp; CLASSIFICATIONS</b>	<b>9</b>
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.		

<b>UNIT-IV</b>	<b>DEEP LEARNING: CONVOLUTIONAL NEURAL NETWORKS</b>	<b>9</b>
Feed forward networks, Activation functions, back propagation in CNN, optimizers, batch normalization, convolution layers, pooling layers, fully connected layers, dropout, Examples of CNNs.		

<b>UNIT-V</b>	<b>DEEP LEARNING: RNNs, AUTOENCODERS AND GANS</b>	<b>9</b>
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		

<b>L:45</b>	<b>T:0</b>	<b>P:0</b>	<b>Total: 45 PERIODS</b>
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## 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.

## COURSE OUTCOMES

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.



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24UPEEO01	ELECTRIC VEHICLE TECHNOLOGY	L	T	P	C
		3	1	0	3

<b>COURSE OBJECTIVES</b>
<ul style="list-style-type: none"> <li>To learn the structure of Electric Vehicle, Hybrid Electric Vehicle</li> <li>To study about the EV conversion components</li> <li>To know about the details and specifications for Electric Vehicles</li> <li>To understand the concepts of Plug-in Hybrid Electric Vehicle</li> <li>To model and simulate all types of DC motors</li> </ul>

<b>UNIT-I</b>	<b>VEHICLE ARCHITECTURE AND SIZING</b>	<b>9</b>
Electric Vehicle History and Evolution of Electric Vehicles. Series, Parallel and Series parallel Architecture, Micro and Mild architectures. Mountain Bike - Motorcycle - Electric Cars and Heavy Duty EVs. - Details and Specifications.		

<b>UNIT-II</b>	<b>VEHICLE MECHANICS</b>	<b>9</b>
Vehicle mechanics- Roadway fundamentals, Laws of motion, Vehicle Kinetics, Dynamics of vehicle motion, propulsion power, velocity and acceleration, Tire-Road mechanics; Propulsion System Design.		

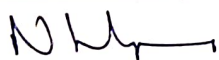
<b>UNIT-III</b>	<b>POWER COMPONENTS AND BRAKES</b>	<b>9</b>
Power train Component sizing- Gears, Clutches, Differential, Transmission and Vehicle Brakes. EV power train sizing, HEV Power train sizing, Example.		

<b>UNIT-IV</b>	<b>HYBRID VEHICLE CONTROL STRATEGY</b>	<b>9</b>
Vehicle supervisory control, Mode selection strategy, Model Control strategies.		

<b>UNIT-V</b>	<b>PLUG-IN HYBRID ELECTRIC VEHICLE</b>	<b>9</b>
Introduction-History - Comparison with electrical and hybrid electrical vehicle - Construction and working of PHEV-Block diagram and components-Charging mechanisms - Advantages of PHEVs.		

<b>L: 45</b>	<b>T: 00</b>	<b>P: 00</b>	<b>Total: 45 Periods</b>
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<b>TEXT BOOKS</b>
<ol style="list-style-type: none"> <li>Mehrdad Ehsani, YiminGao, Sebastian E. Gay, Ali Emadi, 'Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design', CRC Press, 2004.</li> <li>Build Your Own Electric Vehicle, Seth Leitman, Bob Brant, McGraw Hill, Third Edition 2013.</li> </ol>

  
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## REFERENCES

1. Advanced Electric Drive Vehicles, Ali Emadi, CRC Press, First edition 2017.
2. The Electric Vehicle Conversion Handbook: How to Convert Cars, Trucks, Motorcycles, and Bicycles -Includes EV Components, Kits, and Project Vehicles Mark Warner, HP Books, 2011.
3. Heavy-duty Electric Vehicles from Concept to Reality, Shashank Arora, Alireza Tashakori Abkenar, Shantha Gamini Jayasinghe, Kari Tammi, Elsevier Science, 2021

## COURSE OUTCOMES

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

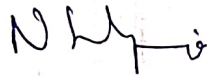
CO1: Summarize the History and Evolution of EVs, Hybrid and Plug-In Hybrid EVs.

CO2: Describe the various EV components.

CO3: Explain the power train components such as gears, clutches, differential, transmission, and braking systems used in EVs.

CO4: Infer the hybrid vehicle control strategy.

CO5: Explain the concepts related in the Plug-In Hybrid Electric Vehicles.



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24UPEEO02	RENEWABLE ENERGY TECHNOLOGIES	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To know the Indian and global energy scenario.
- To learn the various solar energy technologies and its applications.
- To educate the various wind energy technologies.
- To explore the various bio-energy technologies.
- To study the ocean and geothermal technologies.

UNIT-I	ENERGY SCENARIO	9
Indian energy scenario in various sectors - domestic, industrial, commercial, agriculture, transportation and others - Present conventional energy status - Present renewable energy status - Potential of various renewable energy sources - Global energy status - Per capita energy consumption - Future energy plans.		

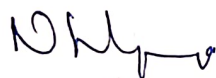
UNIT-II	SOLAR ENERGY	9
Solar radiation - Measurements of solar radiation and sunshine - Solar spectrum - Solar thermal collectors - Flat plate and concentrating collectors - Solar thermal applications - Solar thermal energy storage - Fundamentals of solar photo voltaic conversion - Solar cells - Solar PV Systems - Solar PV applications.		

UNIT-III	WIND ENERGY	9
Wind data and energy estimation - Betz limit - Site selection for wind farms - characteristics - Wind resource assessment - Horizontal axis wind turbine - components - Vertical axis wind turbine - Wind turbine generators and its performance - Hybrid systems - Environmental issues - Applications.		

UNIT-IV	BIO-ENERGY	9
Bio resources - Biomass direct combustion - thermochemical conversion - biochemical conversion-mechanical conversion - Biomass gasifier - Types of biomass gasifiers Cogeneration- Carbonisation - Pyrolysis - Biogas plants - Digesters - Biodiesel production - Ethanol production - Applications.		

UNIT-V	OCEAN AND GEOTHERMAL ENERGY	9
Small hydro - Tidal energy -Wave energy - Open and closed OTEC Cycles - Limitations - Geothermal energy - Geothermal energy sources - Types of geothermal power plants - Applications - Environmental impact.		

L: 45	T: 00	P: 00	Total: 45 Periods
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### TEXT BOOKS

1. Fundamentals and Applications of Renewable Energy, Indian Edition, by Mehmet Kanoglu, Yunus A. Cengel, John M. Cimbala, cGraw Hill; First edition (10 December 2020), ISBN-10 : 9390385636.
2. Renewable Energy Sources and Emerging Technologies, by Kothari, Prentice Hall India Learning Private Limited; 2nd edition (1 January 2011), ISBN-10 : 8120344707.

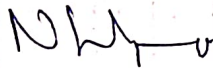
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1. Godfrey Boyle, "Renewable Energy, Power for a Sustainable Future", Oxford University Press, U.K., 2012.
2. Rai.G.D., "Non-Conventional Energy Sources", Khanna Publishers, New Delhi, 2014.
3. Sukhatme.S.P., "Solar Energy: Principles of Thermal Collection and Storage", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2009.
4. Tiwari G.N., "Solar Energy – Fundamentals Design, Modelling and applications", Alpha Science Intl Ltd, 2015.
5. Twidell, J.W. & Weir A., "Renewable Energy Resources", EFNSpon Ltd., UK, 2015.

### COURSE OUTCOMES

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

- CO1: Discuss the Indian and global energy scenario.  
CO2: Describe the various solar energy technologies and its applications.  
CO3: Elucidate the various wind energy technologies.  
CO4: Explore the various bio-energy technologies.  
CO5: Outline the ocean and geothermal technologies.



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24PECO02	BIOMEDICAL SIGNAL PROCESSING	L	T	P	C
		3	0	0	3

**COURSE OBJECTIVES:**

- Describe the properties and suitable models of biomedical signals
- Introduce the basic signal processing techniques in analyzing biomedical signals
- Develop computational skills in filtering of biomedical signals
- Develop an understanding on ECG signal compression algorithms
- Develop an understanding on feature extraction of biomedical signals

<b>UNIT-I</b>	<b>INTRODUCTION TO BIOMEDICAL SIGNALS</b>	<b>9</b>
Introduction to Biomedical Signals: The nature of Biomedical Signals, Examples of Biomedical Signals, Objectives and difficulties in Biomedical analysis. Electrocardiography: Basic electrocardiography, ECG lead systems, ECG signal characteristics. Signal Conversion :Simple signal conversion systems, Conversion requirements for biomedical signals, Signal conversion circuits		

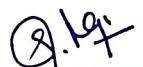
<b>UNIT-II</b>	<b>SIGNAL AVERAGING</b>	<b>9</b>
Signal Averaging: Basics of signal averaging, signal averaging as a digital filter, a typical averager, software for signal averaging, limitations of signal averaging. Adaptive Noise Cancelling: Principal noise canceller model, 60-Hz adaptive cancelling using a sine wave model, other applications of adaptive filtering		

<b>UNIT-III</b>	<b>DATA COMPRESSION TECHNIQUES</b>	<b>9</b>
Data Compression Techniques: Turning point algorithm, AZTEC algorithm, Fan algorithm, Huffman coding, data reduction algorithms The Fourier transform, Correlation, Convolution, Power spectrum estimation, Frequency domain analysis of the ECG		

<b>UNIT-IV</b>	<b>CARDIOLOGICAL SIGNAL PROCESSING</b>	<b>9</b>
Cardiological signal processing: Basic Electrocardiography, ECG data acquisition, ECG lead system, ECG signal characteristics (parameters and their estimation), Analog filters, ECG amplifier, and QRS detector, Power spectrum of the ECG, Bandpass filtering techniques, Differentiation techniques, Template matching techniques, A QRS detection algorithm, Realtime ECG processing algorithm, ECG interpretation, ST segment analyzer, Portable arrhythmia monitor		

<b>UNIT-V</b>	<b>NEUROLOGICAL SIGNAL PROCESSING</b>	<b>9</b>
Neurological signal processing: The brain and its potentials, The electrophysiological origin of brain waves, The EEG signal and its characteristics (EEG rhythms, waves, and transients), Correlation. Analysis of EEG channels: Detection of EEG rhythms, Template matching for EEG, spike and wave detection		

L:45	T:0	P:0	T: 45 PERIODS
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 HEAD OF THE DEPARTMENT  
 Department of ECE  
 Jai Shriram Engineering College  
 Avinashpalayam, Tirupur-638660.

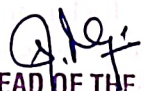
## REFERENCES

1. Rangaraj M Rangayyan "Biomedical Signal Analysis – A case study approach" IEEE press series in biomedical engineering, First Edition, 2002
2. John G Proakis, Dimitris and G. Manolakis, "Digital Signal Processing Principles algorithms, applications" PHI Third Edition. 2006
3. Willis J. Tompkins " Biomedical Digital Signal Processing", EEE, PHI, 2004
4. D C Reddy "Biomedical Signal Processing: Principles and Techniques", Tata McGraw-Hill Publishing Co. Ltd, 2005
5. J G Webster "Medical Instrumentation: Application & Design", John Wiley & Sons Inc., 2001

## COURSE OUTCOMES

At the end of the course students should be able to

- CO1: Possess skills necessary to analyze ECG and EEG Signals
- CO2: Apply classical and modern filtering techniques for ECG and EEG Signals
- CO3: Apply classical and modern compression techniques for ECG and EEG Signals
- CO4: Develop an understanding on ECG feature extraction
- CO5: Develop an understanding on EEG feature extraction

  
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24PECO03	<b>ROBOTICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		3	0	0	3

**COURSE OBJECTIVES:**

- To Introduce the concepts of Robotic systems
- To understand the concepts of Instrumentation and control related to Robotics
- To understand the kinematics and dynamics of robotics
- To explore robotics in Industrial applications

<b>UNIT-I</b>	<b>INTRODUCTION TO ROBOTICS</b>	<b>9</b>
Robotics -History - Classification and Structure of Robotic Systems - Basic components - Degrees of freedom - Robot joints coordinates- Reference frames - workspace- Robot languages- Robotic sensors- proximity and range sensors, ultrasonic sensor, touch and slip sensor.		

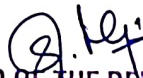
<b>UNIT-II</b>	<b>ROBOT KINEMATICS AND DYNAMICS</b>	<b>9</b>
Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Forward and inverse kinematics, Jacobian, Dynamic Modelling: Forward and inverse dynamics, Equations of motion using Euler-Lagrange formulation, Newton Euler formulation.		

<b>UNIT-III</b>	<b>ROBOTICS CONTROL</b>	<b>9</b>
Control of robot manipulator - state equations - constant solutions -linear feedback systems, singleaxis PID control - PD gravity control -computed torque control, variable structure control and impedance control.		

<b>UNIT-IV</b>	<b>ROBOT INTELLIGENCE AND TASK PLANNING</b>	<b>9</b>
Artificial Intelligence - techniques - search problem reduction - predicate logic means and end analysis -problem solving -robot learning - task planning - basic problems in task planning - AI in robotics and Knowledge Based Expert System in robotics		

<b>UNIT-V</b>	<b>INDUSTRIAL ROBOTICS</b>	<b>9</b>
Robot cell design and control - cell layouts - multiple robots and machine interference - work cell design - work cell control - interlocks – error detection deduction and recovery - work cell controller - robot cycle time analysis. Safety in robotics, Applications of robot and future scope.		

<b>L:45</b>	<b>T:0</b>	<b>P:0</b>	<b>T: 45 PERIODS</b>
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 Jai Shriram Engineering College  
 Avinashipalayam, Tirupur-638660.

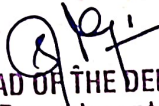
## REFERENCES

1. John J. Craig, 'Introduction to Robotics (Mechanics and Control)', Addison-Wesley, 2nd Edition, 2004.
2. Richard D. Klafter, Thomas A. Chmielewski, Michael Negin, 'Robotics Engineering: An Integrated Approach', PHI Learning, New Delhi, 2009.
3. K.S.Fu, R.C.Gonzalez and C.S.G.Lee, 'Robotics Control, Sensing, Vision and Intelligence', Tata McGraw Hill, 2nd Reprint, 2008.
4. Reza N.Jazar, 'Theory of Applied Robotics Kinematics, Dynamics and Control', Springer, 1st Indian Reprint, 2010.
5. Mikell. P. Groover, Michell Weis, Roger. N. Nagel, Nicolous G.Odrey, 'Industrial Robotics Technology, Programming and Applications', McGraw Hill, Int 2012.

## COURSE OUTCOMES

At the end of the course students should be able to

- CO1: Describe the fundamentals of robotics
- CO2: Understand the concept of kinematics and dynamics in robotics.
- CO3: Discuss the robot control techniques
- CO4: Explain the basis of intelligence in robotics and task planning
- CO5: Discuss the industrial applications of robotics

  
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24PMBO01	SUSTAINABLE MANAGEMENT	L	T	P	C
		3	0	0	3

<b>Prerequisites:</b>
Nil

<b>COURSE OBJECTIVES:</b>
<ul style="list-style-type: none"> <li>To provide students with fundamental knowledge of the notion of corporate sustainability.</li> <li>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.</li> <li>To learn about sustainable development goals for modern business.</li> </ul>

<b>UNIT-I</b>	<b>MANAGEMENT OF SUSTAINABILITY</b>	<b>9</b>
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.		

<b>UNIT-II</b>	<b>CORPORATE SUSTAINABILITY AND RESPONSIBILITY</b>	<b>9</b>
Corporate sustainability parameter, corporate sustainability institutional framework, integration of sustainability into strategic planning and regular business practices, fundamentals of stakeholder engagement.		

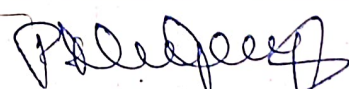
<b>UNIT-III</b>	<b>SUSTAINABILITY MANAGEMENT: STRATEGIES AND APPROACHES</b>	<b>9</b>
Corporate sustainability management and competitiveness: Sustainability-oriented corporate strategies, markets and competitiveness, Green Management between theory and practice, Sustainable Consumption and Green Marketing strategies, Environmental regulation and strategic postures; Green Management approaches and tools; Green engineering: clean technologies and innovation processes; Sustainable Supply Chain Management and Procurement.		

<b>UNIT-IV</b>	<b>SUSTAINABILITY AND INNOVATION</b>	<b>9</b>
Socio-technical transitions and sustainability, Sustainable entrepreneurship, Sustainable pioneers in green market niches, Smart communities and smart specializations. Climate resilience, sustainable supply chains, and the integration of environmental, social, and governance (ESG) practices. Sustainable Development Goals (SDGs).		

<b>UNIT-V</b>	<b>SUSTAINABLE MANAGEMENT OF RESOURCES, COMMODITIES AND COMMONS</b>	<b>9</b>
Energy management, Water management, Waste management, Wild Life Conservation, Emerging trends in sustainable management, Case Studies.		

L:45	T: 00	P:00	Total :45 Periods
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88



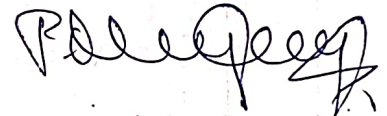
**Dr. P.MEGALADEVI** MBA, M.Com., Ph.D.,  
 DEAN - School of Management Studies  
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 Dharapuram Road, Avinashpalayam,  
 Tirupur-638 660. Tamil Nadu, India.

## 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

## 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 sustainability performances.
- CO4: Knowledge of innovative practices in sustainable business and community management
- CO5: Deep understanding of sustainable management of resources and commodities



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24PMBO02	<b>MICRO AND SMALL BUSINESS MANAGEMENT</b>	L	T	P	C
		3	0	0	3

<b>Prerequisites:</b>
Nil

<b>COURSE OBJECTIVES:</b>
<ul style="list-style-type: none"> <li>To familiarize students with the theory and practice of small business management.</li> <li>To learn the legal issues faced by small business and how they impact operations.</li> <li>To learn modern finance functions and technology and innovations.</li> </ul>

<b>UNIT-I</b>	<b>INTRODUCTION TO SMALL BUSINESS</b>	<b>9</b>
<p>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</p>		

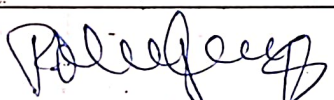
<b>UNIT-II</b>	<b>SCREENING THE BUSINESS OPPORTUNITY AND FORMULATING THE BUSINESS PLAN</b>	<b>9</b>
<p>Concepts of opportunity recognition; Key factors leading to new venture failure; New venture screening process; Applying new venture screening process to the early stage small firm Role planning in small business - importance of strategy formulation - management skills for small business creation and development.</p>		

<b>UNIT-III</b>	<b>BUILDING THE RIGHT TEAM AND MARKETING STRATEGY</b>	<b>9</b>
<p>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</p>		

<b>UNIT-IV</b>	<b>FINANCING SMALL BUSINESS</b>	<b>9</b>
<p>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. Sustainable finance, circular economy, digitalization, and the evolving role of technology and innovation.</p>		

<b>UNIT-V</b>	<b>VALUING SMALL BUSINESS AND CRISIS MANAGEMENT</b>	<b>9</b>
<p>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.</p>		

L:45	T: 00	P:00	Total :45 Periods
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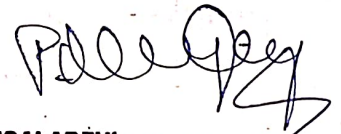
**Dr. P. MEGALADEVI** MBA., M.Com., Ph.D.,  
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 Dharapuram Road, Avinashpalayam,  
 Tirunelveli-628 660 Tamil Nadu, India.

## 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.

## COURSEOUTCOMES

- CO1. Familiarize 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



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24PME00 1	NANOCOMPOSITE MATERIALS	L	T	P	C
		3	0	0	3

<b>Prerequisites:</b>
Nil

<b>COURSE OBJECTIVES:</b>
To introduce the fundamentals of nanocomposites, including their nomenclature, properties, processing, and characterization.
To study metal-based nanocomposites and understand their synthesis methods, structural features, and functional properties.
To explore polymer-based nanocomposites, focusing on preparation techniques, structure-property relationships, and potential applications.

<b>UNIT-I</b>	<b>BASICS OF NANOCOMPOSITES</b>	<b>9</b>
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.		

<b>UNIT-II</b>	<b>METAL BASED NANOCOMPOSITES</b>	<b>9</b>
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		

<b>UNIT-III</b>	<b>POLYMER BASED NANOCOMPOSITES</b>	<b>9</b>
Preparation and characterization of diblock Copolymer based nanocomposites; Polymer Carbon nanotubes-based composites, their mechanical properties, and industrial possibilities.		

<b>UNIT-IV</b>	<b>NANOCOMPOSITE FROM BIOMATERIALS</b>	<b>9</b>
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.		

<b>UNIT-V</b>	<b>NANOCOMPOSITE TECHNOLOGY</b>	<b>9</b>
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 - Nano packaging for enhanced shelf life - Smart/Intelligent packaging.		

*Card*

L:4 5	T:0	P:0	Total :45 Periods
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**Jai Shriram Engineering College**  
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 Tirupur-638 660. Tamil Nadu, India.

**TEXT BOOKS**

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.

**REFERENCES**

1. Carbon Nanotubes (Carbon , Vol 33) - M. Endo, S. Iijima, M.S. Dresselhaus 1997.
2. The search for novel, super hard materials- Stan Veprjek (Review Article) JVST A, 1999
3. Nanometer versus micrometer-sized particles-Christian Brosseau, Jamal BeN Youssef, Philippe Talbot, Anne-Marie Konn, (Review Article) J. Appl. Phys, Vol 93, 2003
4. Diblock Copolymer, - Aviram (Review Article), Nature, 2002
5. 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

**COURSE OUTCOMES:****At the end of the course the students would be able to**

Explain the nomenclature, properties, and fabrication methods of nanocomposites and analyse their structural and mechanical characteristics.

Assess and compare metal-based nanocomposites, including metal-metal, metal-oxide, and core-shell systems, with respect to their preparation techniques, functionalities, and fractal behaviour.

Develop and characterize polymer-based nanocomposites, such as diblock copolymers and CNT-polymer composites, and evaluate their mechanical and industrial relevance.

Describe natural biomaterial nanocomposites and apply biomimetic strategies for synthesizing organic-inorganic nanocomposite materials for biomedical applications.

Apply nanocomposite technology in membranes, textiles, cosmetics, and food packaging.

*Aradhya*

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24PME00 2	ADDITIVE MANUFACTURING	L	T	P	C
		3	0	0	3

**Prerequisites:**

Nil

**COURSE OBJECTIVES:**

- To introduce the principles, classifications, and major technologies of additive manufacturing.
- To understand material behaviour, consolidation mechanisms, and process, structure property relationships in AM.
- To develop skills in digital modelling, slicing, and process planning for efficient and high-quality 3D printing.

<b>UNIT-I</b>	<b>INTRODUCTION TO ADDITIVE MANUFACTURING</b>	7
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Introduction to layered manufacturing, Importance of Additive Manufacturing in Product Development, Classification of additive manufacturing processes, Common additive manufacturing technologies, Capabilities, materials, costs, advantages and limitations of different systems.

<b>UNIT-II</b>	<b>MATERIALS AND MECHANISMS IN ADDITIVE MANUFACTURING</b>	9
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Material science for additive manufacturing-Mechanisms of material consolidation-FDM, SLS, SLM, 3D printing and jetting technologies. Polymers coalescence and sintering, photopolymerization, solidification rates, meso and macro structures, Process evaluation: process-structure relationships, structure property relationships, Applications: Prototyping, Industrial tooling, Aerospace, Automobile, Medical etc., Quality control and reliability: Defects in FDM, SLS and SLM, Critical process parameters: geometry, temperature, composition, phase transformation, Numerical and experimental evaluation: roles of process parameter combination, process optimization.

<b>UNIT-III</b>	<b>CAD AND SOFTWARE TOOLS FOR 3D PRINTING</b>	9
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CAD Modelling for 3D printing: 3D Scanning and digitization, data handling & reduction Methods, AM Software: data formats and standardization, Slicing algorithms: uniform flat layer slicing, adaptive slicing, Process-path generation: Process-path algorithms, rasterization, part Orientation and support generation.

<b>UNIT-IV</b>	<b>POWDER BED FUSION AND BINDER JETTING TECHNOLOGIES</b>	10
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Powder Bed Fusion: Selective Laser Sintering (SLS): Principles, Process, Indirect and Direct SLS – Powder Structure, Materials, Surface Deviation and Accuracy, Applications, Multi-jet Fusion Principles, Processes, Materials, Capabilities and Applications. Selective Laser Melting (SLM) and Electron Beam Melting (EBM): Principles, Processes, Materials, Limitations and Applications.  
Binder Jetting: Three-Dimensional Printing (3DP): Principles, Process, Physics of 3DP, Materials Capabilities, Limitations and Applications.

*Carthi*

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<b>UNIT-V</b>	<b>DIRECT ENERGY DEPOSITION &amp; HYBRID AM TECHNOLOGIES</b>	10
Direct Energy Deposition: Laser Engineered Net Shaping (LENS): Processes, Materials, Capabilities Limitations and Applications. Ultrasonic Additive Manufacturing (UAM) Process, Parameters Capabilities, Applications. Case Studies. Hybrid Additive Manufacturing, Need, Principles, Part Quality and Process Efficiency. Wire Arc Additive Manufacturing (WAAM) Processes, Materials Capabilities, Limitations and Applications and Case Studies		

<b>L:4</b>	<b>T:0</b>	<b>P:0</b>	<b>Total :45 Periods</b>
<b>5</b>			

<b>TEXT BOOKS</b>
<ol style="list-style-type: none"> <li>Gibson, I., Rosen, D.W. and Stucker, B., "Additive Manufacturing Methodologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2015.</li> <li>Chua, C.K., Leong K.F. and Lim C.S., "Rapid prototyping: Principles and applications", Third edition, World Scientific Publishers, 2010.</li> </ol>
<b>REFERENCES</b>
<ol style="list-style-type: none"> <li>Liou, L.W. and Liou, F.W., "Rapid Prototyping and Engineering applications: A tool box for prototype development", CRC Press, 2011.</li> <li>Kamrani, A.K. and Nasr, E.A., "Rapid Prototyping: Theory and practice", Springer, 2006.</li> <li>Hilton, P.D. and Jacobs, P.F., Rapid Tooling: Technologies and Industrial Applications, CRC Press, 2000</li> <li>Kruth, J.P., Froyen, L., et al., Selective Laser Sintering and Melting: Fundamentals and Applications.</li> </ol>
<b>COURSE OUTCOMES:</b>
<p><b>At the end of the course the students would be able to</b></p> <ul style="list-style-type: none"> <li>Explain the principles, classifications, and key technologies of additive manufacturing.</li> <li>Analyse material behaviour and consolidation mechanisms in various AM processes.</li> <li>Apply CAD modelling, data processing, slicing, and toolpath generation techniques for preparing digital models suitable for 3D printing.</li> <li>Evaluate Powder Bed Fusion, Binder Jetting, and Directed Energy Deposition processes with respect to their principles, materials, limitations, and industrial applications.</li> <li>Assess hybrid AM processes and advanced AM technologies and propose suitable process parameters and optimization strategies for improved part quality and reliability.</li> </ul>

*Carthi*

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**JAI SHRIRAM ENGINEERING COLLEGE, TIRUPPUR – 638 660**

**(An Autonomous Institution)**

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

Recognized by UGC & Accredited by NAAC and NBA (CSE and ECE)



## **REGULATIONS 2024**

### **M.E. COMPUTER SCIENCE AND ENGINEERING**

#### **CHOICE BASED CREDIT SYSTEM**

#### **SYLLABUS FOR OPEN ELECTIVES**

24PAC001	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		

L:45	T:0	P:0	T: 45 PERIODS
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 HEAD OF THE DEPARTMENT  
 Dept. of Science & Humanities  
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## 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.

## COURSE OUTCOMES

At the end of the course students should be able to

- 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.



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TIRUPUR - 638 660, TAMILNADU.

24PAC002	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

<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>6</b>
Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.		

<b>UNIT II</b>	<b>REPERCUSSIONS OF DISASTERS AND HAZARDS</b>	<b>6</b>
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.		

<b>UNIT III</b>	<b>DISASTER PRONE AREAS IN INDIA</b>	<b>6</b>
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		

<b>UNIT IV</b>	<b>DISASTER PREPAREDNESS AND MANAGEMENT</b>	<b>6</b>
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.		

<b>UNIT V</b>	<b>RISK ASSESSMENT</b>	<b>6</b>
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		

<b>L:45</b>	<b>T:0</b>	<b>P:0</b>	<b>T: 45 PERIODS</b>
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## REFERENCES

1. Goel S. L., Disaster Administration and Management Text And Case Studies", Deep& Deep Publication Pvt. Ltd., New Delhi,2009.
2. Nishitha Rai, 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.

## COURSE OUTCOMES

At the end of the course students should be able to

CO1: Ability to summarize basics of disaster.

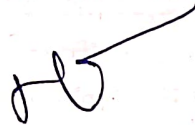
CO2: Ability to explain a critical understanding of key concepts in disaster risk reduction and

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



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24PAC003	CONSTITUTION OF INDIA	L	T	P	C
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**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 of nationhood in the early years of Indian nationalism.
  - To address the role of socialism in India after the commencement of the Bolshevik.
  - Revolution 1917 And its impact on the initial drafting of the Indian Constitution.

UNIT I	HISTORY OF MAKING OF THE INDIAN CONSTITUTION	9
History, Drafting Committee, (Composition & Working)		

UNIT II	PHILOSOPHY OF THE INDIAN CONSTITUTION	9
Preamble, Salient Features		

UNIT III	CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES	9
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	9
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	9
District's Administration head: Role and Importance, 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	9
Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.		

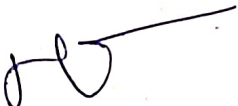
## REFERENCES

1. Allan Bonnick, "Automotive Computer Controlled Systems", Butterworth-Heinemann, Elsevier, 1st Edition, 2011. (Unit I)
2. Eric C. Howanietz, "Automobile Electronics" by SAE Publications, 1995. (Unit II)
3. Tom Weather Jr and Cland C. Hunter, "Automotive Computers and Control System" Prentice-Hall Inc., 1984 New Jersey. (Unit II, III)
4. R.K. Jurgen, "Automotive Electronics Handbook", McGraw Hill 2<sup>nd</sup> Edition, 1995. (Unit IV, V)
5. William B Ribbens, "Understanding Automotive Electronics", 5<sup>th</sup> edition - Butterworth-Heinemann Woburn, 1998. (Unit V)

## COURSE OUTCOMES

At the end of the course students should be able to

- CO1: Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- CO2: Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- CO3: 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.
- CO4: Discuss the passage of the Hindu Code Bill of 1956

  
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24PAC004	நற்றமிழ் இலக்கியம்	L	T	P	C
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UNIT I	சங்கஇலக்கியம்	6
1. தமிழின் துவக்க நூல் தொல்காப்பியம் - எழுத்து, சொல், பொருள் 2. அகநானூறு (82) -இயற்கை இன்னிசை அரங்கம் 3 குறிஞ்சிப்பாட்டின் மலர்க்காட்சி 4. புறநானூறு (95,195) -போரை நிறுத்திய ஓளவையார்.		

UNIT II	அறநெறித்தமிழ்	6
1. அறநெறி வகுத்த திருவள்ளுவர் அறம் வலியுறுத்தல், அன்புடைமை ஒப்புறவு அறிதல், ஈகை, புகழ் 2. பிற அறநூல்கள் இலக்கிய மருந்து ஏலாதி, சிறுபஞ்சமூலம். திரிகடுகம் ஆசாரக்கோவை (தூய்மையை வலியுறுத்தும் நூல்)		

UNIT III	இரட்டைக்காப்பியங்கள்	6
1. கண்ணகியின் புரட்சி சிலப்பதிகார வழக்குரை காதை 2. சமூகசேவை இலக்கியம் மணிமேகலை சிறைக்கோட்டம் அறக்கோட்டமாகிய காதை		

UNIT IV	அருள் நெறித் தமிழ்	6
1. சிறுபாணாற்றுப்படை - பாரி முல்லைக்குத் தேர் கொடுத்தது. பேகன் மயிலுக்குப் போர்வை கொடுத்தது, அதியமான் ஓளவைக்கு 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		

  
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ஆகியவை பற்றிய செய்திகள்

UNIT V	நவீன தமிழ் இலக்கியம்	6
<p>1. உரைநடைத் தமிழ். -தமிழின் முதல் புதினம். -தமிழின் முதல் சிறுகதை. -கட்டுரை இலக்கியம். -பயண இலக்கியம். -நாடகம்.</p> <p>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</p>		

L:45 T:0 P:0 T: 45 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

  
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