

**Scheme of Instruction and Syllabus**

**For**

**MCA- III&IV semester**

**Regulation : R-21**

**2022-23**

**Two years MCA Program**

**Master of Computer Applications**

**With effect from the academic year 2022-2023**

**(Applicable to students admitted during the academic year 2021-22 onwards)**



**Mahatma Gandhi University**

**Nalgonda**

**Telangana State**

**508254**

**SCHEME OF INSTRUCTION**  
**MASTER OF COMPUTER APPLICATIONS (MCA)**  
**[ Regulation : R-21 ]**  
**SEMESTER- III**

SNo	Course Code	Course Title	Hours/ Week			Scheme of Examination			No of Credits
			L	T	P	Max Marks		Duration (hrs)	
<b>THEORY</b>						<b>CIE</b>	<b>SEE</b>	<b>SEE</b>	<b>Cr</b>
1	PCC301	Software Engineering	4		-	30	70	3	4
2	PCC302	Computer Networks	4		-	30	70	3	4
3	PCC303	Data Science	3	1	-	30	70	3	3
4	PCC304	Web Technologies	3	-	-	30	70	3	3
5	PEC**	Professional Elective-I	3	-	-	30	70	3	3
6	PEC**	Professional Elective-II	3	-	-	30	70	3	3
<b>PRACTICALS</b>									
7	LCC351	Computer Networks Lab	-		3	25	50	3	2
8	LCC352	Software Engineering Lab	-		3	25	50	3	2
9	LCC353	Data science Lab	-		3	25	50	3	2
10	PS354	Project Seminar	-		2	25	-	-	1
			<b>20</b>	<b>1</b>	<b>11</b>	<b>280</b>	<b>570</b>	<b>-</b>	<b>27</b>



**Professional Electives**

Course Code-PEC**	Professional Elective -1
PEC311	Information Security
PEC312	Network Security
PEC313	Cyber Security
PEC314	Soft computing

Course Code-PEC**	Professional Elective - II
PEC321	Distributed Systems
PEC322	Cloud Computing
PEC323	Enterprise Architecture
PEC324	Natural Language Processing

Abbreviation	Full Form	Abbreviation	Full Form
PCC	Professional Core Course	CIE	Continuous Internal Evaluation
PEC	Professional Elective Course	SEE	Semester End Evaluation
PS	Project Seminar	L	Lecture
LCC	Laboratory Core Course	P	Practical

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**SCHEME OF INSTRUCTION**  
**MASTER OF COMPUTER APPLICATIONS (MCA)**

[ Regulation : R-21 ]

**SEMESTER-IV**

SNo	Course Code	Course Title	Hours/ Week		Scheme of Examination			No of Credits
					Max Marks		Duration (hrs)	
THEORY			L	P	CIE	SEE	SEE	Cr
1	PEC**	Professional Elective –III	3	-	30	70	3	3
2	PEC**	Professional Elective –IV	3	-	30	70	3	3
3	OE**	Open Elective	3	-	30	70	3	3
PRACTICALS								
4	Proj401	Project Work	-	24	100	200	3	12
		Total	9	24	190	410	-	21

**Professional Electives**

Course Code-PEC**	Professional Elective – III
PEC411	Big Data Analytics
PEC412	Deep Learning
PEC413	Information Retrieval System
PEC414	Optimization techniques

Course Code-PEC**	Professional Elective – IV
PEC421	Block Chain Technologies
PEC422	Software Testing
PEC423	Internet of Things
PEC424	Digital Forensics

Course Code-OE**	Open Elective
OE 431	Professional Ethics
OE 432	Constitution of India
OE 433	Disaster Management
OE 434	Management Information System
OE 435	Intellectual Property & Cyber Law
OE 436	Environmental Science
OE 437	E-Commerce

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**PCC301**

With effect from academic year 2022-23  
**Software Engineering**

**Credits : 4**

Instruction 4L hrs per week  
CIE 30 marks

Duration of SEE 3 hours  
SEE 70 marks

**Course Objectives**

1. Learn the software problem and addressing it through various software processes
2. Study the SRS and software architecture
3. Understand planning and designing a software project
4. Comprehend the testing strategies and the need for performing testing
5. Learn how to carry out reengineering to the system and maintain it

**Course Outcomes – Students will learn to**

1. Apply software processes to solve software problem
2. Create SRS document and software architecture
3. Perform software planning in terms of staffing and scheduling
4. Create test cases and procedures
5. Re-engineer the developed software

**Unit I**

**The software Problem:** Cost, Schedule and Quality, Scale and change,  
**Software Processes:** Process and project, Component Software Processes,  
SoftwareDevelopment Process Models, Project management Process.

**Unit II**

**Software Requirements Analysis and Specification:** Value of a good SRS,  
RequirementsProcess, Requirements Specification, Functional Specification with Use Cases,  
Other approaches for analysis.

**Software Architecture:** Role of Software Architecture Views, Component and connector  
view,Architectural styles for C & C view, Documenting Architecture Design, Evaluating  
Architectures.

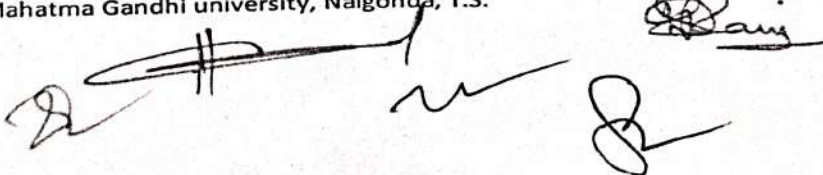
**Unit III**

**Planning a Software Project:** Effort Estimation, Project Schedule and staffing, Quality  
Planning,Risk Management Planning, Project Monitoring Plan, Detailed Scheduling. **Design:**  
Design concepts, Function oriented Design, Object Oriented Design, Detailed Design,  
Verification, Metrics.

**Unit IV**

**Coding and Unit Testing:** Programming Principles and Guidelines, incrementally  
developing code, managing evolving code, unit testing, code inspection, Metrics. **Testing:**  
Testing Concepts, Testing Process, Black Box testing, White box testing, Metrics.

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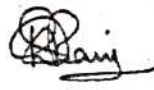
## Unit V

**Maintenance and Re-engineering:** Software Maintenance, ... supportability, Reengineering, Business process Reengineering, Software reengineering, Reverse engineering; Restructuring, Forward engineering, Economics of Reengineering.

**Software Process Improvement:** Introduction, SPI process, CMMI, PCMM, Other SPI Frameworks, SPI return on investment, SPI Trends.

### Suggested Reading

1. Pankaj Jalote, "Software Engineering- A Precise Approach", Wiley India, 2010.
2. Roger. S.Pressman , "Software Engineering - A Practitioner's Approach", 7<sup>th</sup> Edition, McGraw Hill Higher Education, 2010.
3. Deepak Jain, "Software Engineering", Oxford University Press, 2008.
4. Rajib Mall, "Fundamentals of Software Engineering", 4<sup>th</sup> Edition, PHI Learning, 2014.
5. Ian Sommerville, "Software Engineering", 10<sup>th</sup> Edition, Addison Wesley, 2015.



  
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PCC302

With effect from academic year 2022-23

**Computer Networks**

**Credits : 4**

Instruction 4L hrs per week  
CIE 30 marks

Duration of SEE 3 hours  
SEE 70 marks

**Course Objectives**

1. Comprehend the fundamentals of computer networks
2. Learn the aspects relevant to physical and datalink layer
3. Understand network layer and its significance and functionality
4. Study transport layer and its operations
5. Learn the protocols implemented at application layer

**Course Outcomes** - Upon completion of the course, students will be able to:

1. Elaborate the network model
2. Explain transmission media and functions of datalink layer
3. Create routing tables based on DVR and LSR
4. Describe TCP and UDP protocols
5. Explain application layer protocols

**Unit I**

**Data Communications:** Components - Direction of Data flow - networks - Components and Categories - types of connections - Topologies - Protocols and Standards - ISO/OSI model, TCP/IP. **Transmission Media** - Coaxial Cable - Fiber Optics - Line Coding - Modems - RS232 Interfacing.

**Unit II**

**Datalink Layer:** Error detection and correction, CRC, Hamming code, Flow Control and Error control, Stop and Wait protocol, Sliding Window protocol -go back-N ARQ - selective repeat ARQ .  
**MAC Layer:** LAN - Pure and Slotted ALOHA, Ethernet IEEE 802.3 LAN Ethernet Efficiency Calculation, Bridges. ARP, RARP

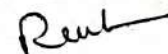
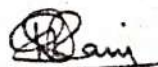
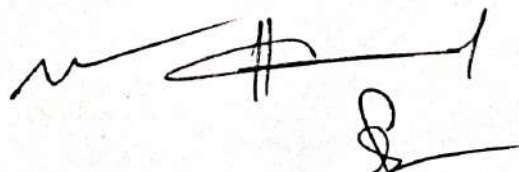
**Unit III**

**Network Layer:** - Distance Vector Routing, Link State Routing, IP v4 addressing, Subnetting, CIDR., Introduction to IPv6 ICMP, IGMP, OSPF and BGP.

**Unit IV**

**Transport Layer:** Services of transport layer, Multiplexing. Transmission Control Protocol (TCP) Congestion Control, timer management, Quality of services (QOS) and User Datagram Protocol (UDP)

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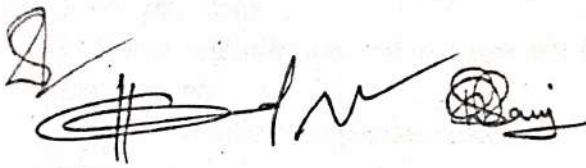
**Unit V**

**Socket Programming:** Primitive and Advance System calls, Iterative and concurrent client server programs

**Application Layer:** Domain Name Space (DNS) - SMTP - FTP - HTTP

**Suggested Readings**

1. Andrew S. Tanenbaum, "Computer Networks", Pearson Education; Fourth Edition, 2008.
2. Behrouz A. Forouzan, "Data communication and Networking", Tata McGraw-Hill, 2009.
3. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", Pearson Education, 2006.
4. W Richard Stevens, Unix Network Programming, PHI, 2003



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PCC303

With effect from academic year 2022-23

Data Science

Credits : 3

Instruction 4(3L+1T) hrs per week

Duration of SEE 3 hours

CIE 30 marks

SEE 70 marks

### Course Objectives

1. To learn basics of R Programming environment : R language , R- studio and R packages
2. To learn various statistical concepts like linear and logistic regression , cluster analysis , time series forecasting
3. To learn Decision tree induction, association rule mining and text mining

### Course Outcomes

Student will be able to

1. Use various data structures and packages in R for data visualization and summarization
2. Use linear , non-linear regression models, and classification techniques for data analysis
3. Use clustering methods including K-means and CURE algorithm

### UNIT-I

**Introduction To R:** Introduction, Downloading and Installing R, IDE and Text Editors, Handling Packages in R.

**Getting Started With R:** Introduction, Working with Directory, Data Types In R, Few Commands for Data Exploration.

**Loading and Handling Data In R:** Introduction, Challenges of Analytical Data Processing, Expression, Variables, Functions, Missing Values Treatment In R, Using '\_As' Operator To Change The Structure Of The Data, Vectors, Matrices, Factors, List, Few Common Analytical Tasks, Aggregation And Group Processing Of A Variable, Simple Analysis Using R, Methods For Reading Data, Comparison Of R GUI's For Data Input, Using R With Databases And Business Intelligence Systems.

### UNIT-II

**Exploring Data In R:** Introduction, Data Frames, R Functions for Understanding Data in Data Frames, Load Data Frames, Exploring Data, Data Summary, Finding the-Missing Values, Invalid Values And Outliers, Descriptive Statistics, Spotting Problems In Data with Visualization.

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### UNIT- III

**Linear Regression Using R:** Introduction, Model Fitting, Linear Regression, Assumptions of Linear Regression, Validating Linear Assumption.

**Logistic Regression:** Introduction, What Is Regression?, Introduction To Generalized Linear Model, Logistic Regression, Binary Logistic Regression, Diagnosing Logistic Regression, Multinomial Logistic Regression Model.

### UNIT IV

**Decision Tree:** Introduction, What Is A Decision Tree?, Decision Tree Representation In R, Appropriate Problems For Decision Tree Learning, Basic Decision Tree Learning Algorithm, Measuring Features, Hypothesis Space Search In Decision Tree Learning, Inductive Bias In Decision Tree Learning, Why Prefer Short Hypotheses, Issues In Decision Tree Learning.

**Time Series In R:** Introduction, What Is Time Series Data, Reading Time Series Data, Decomposing Time Series Data, Forecasts Using Exponential Smoothing, ARIMA Models.

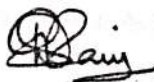
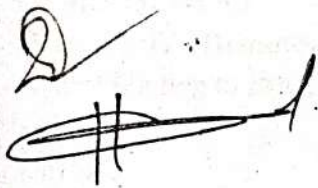
### UNIT-V

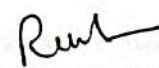
**Clustering:** Introduction, What Is Clustering, Basic Concepts in Clustering, Hierarchical Clustering, K-Means Algorithm, CURE Algorithm, Clustering in Non-Euclidean Space, Clustering for Streams and Parallelism.

**Association Rules:** Introduction, Frequent Itemset, Data Structure Overview, Mining Algorithm Interfaces, Auxiliary Functions, Sampling from Transaction, Generating Synthetic Transaction Data, Additional Measures of Interestingness, Distance Based Clustering Transaction and Association.

### Suggested Readings

1. Data Analytics using R by Seema Acharya. McGraw Hill education.
2. Practical Data Science with R, Nina Zumel and John Mount, Manning Shelter Island.
3. The R book, Crawley, Michael J. John Wiley & Sons, Ltd



  
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PCC304

Web Technologies

Credits : 3

Instruction 4(3L+1T) hrs per week  
CIE 30 marks

Duration of SEE 3 hours  
SEE 70 marks

### Course Objectives

1. Learn basics of HTML and DHTML
2. Understand the workings of event model
3. Study the java scripting language
4. Learn the VB scripts
5. Comprehend the active server pages

### Course Outcomes

1. Write HTML and DHTML programs
2. Create programs on event models
3. Implement java script programs
4. Write VB script programs
5. Create ASP programs

### Unit I

**HTML:** Markup languages, common tags, header, text styling, linking images Formatting text, Unordered lists, nested and ordered list, Tabs-and formatting, Basic forms; Complex forms linking, Meta Tags. **Dynamic HTML:** Cascading style sheets in line styles, style element, External Style sheet, text flow and Box model, user style sheets.

### Unit II

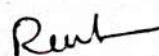
**Object model and collections:** Object referencing, collections all, children frames, navigator object. **Event model:** ONCLICK, ONLOAD, Error Handling, ON ERRORS ONMOUSEMOVE, ONMOUSEOVER, ONMOUSEOUT, ONFOCUS, ONBLUR, ONSUBMIT. **Dynamic HTML:** Filters and transitions, Data binding with Tabular data control binding to IMO, TABLE, Structured graphics, Active controls.

### Unit III

Introduction to scripting, Java Script, Data types, Arithmetic's Equality relational, assignment increment, decrement operators, Java Script Control Structures- if, if-else, while. Java Script **Control Structures:** For, Switch, Do/while, break.

Programming modules, recursion, recursion vs iteration global functions arrays, using arrays, Reference and reference parameters, passing arrays to functions, multiple subscripted arrays, objects-math, string. Boolean and number.

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#### Unit IV

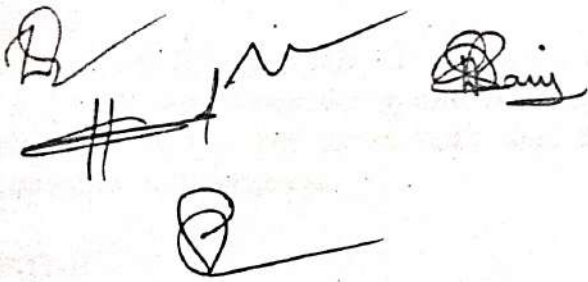
Client side scripting with VB Script, operations, Data types and control structures, Functions, Arrays, String manipulations, classes and objects. **Web Servers:** Personal Web server, Internet information server, Apache Web Server, Installation of a Web Server.

#### Unit V

Active Server Pages, Client side Scripting vs Server side Scripting, Server side Active X Component, ADO, file system objects, Session tracking, CGI and PERL5, String Processing and Regular Expressions, Server side includes, Cookies and PERL XML Document Type Definition, XML Parsers, Using XML with HTML.

#### Suggested Readings

- 1 Deitel, Deitel & NIETO, "Internet & World Wide Web - How to Program", Pearson Education, Third Edition, 2004.
- 2 Steven Holzner, "HTML Black Book - Comprehensive Problem Solver", Dream Tech Press, 2000.
- 3 B Sosinsky, V Hilley, "Programming the Web - An Introduction", MGH, 2004.



  
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PEC311

**Information Security**

**Credits : 3**

Instruction 3L hrs per week  
CIE 30 marks

Duration of SEE 3 hours  
SEE 70 marks

**Course Objectives**

1. Learn model, SDLC and components of information security
2. Comprehend the legal, ethical and professional issues
3. Understand the risk management
4. Learn planning for security and security technology
5. Study cryptography and implementation of information security

**Course Outcomes**

1. Explain the SDLC and security model
2. Describe various issues in information security
3. State the techniques for risk management
4. Elaborate the security technology
5. Specify the cryptography and implementation of information security

**UNIT-I**

**Introduction:** History, Critical characteristics of information, NSTISSC security model, Components of an information system, Securing the components, Balancing security and access, The SDLC, The security SDLC. Need for Security: Business needs, Threats, Attacks-securesoftware development.

**UNIT-II**

**Legal, Ethical and professional Issues:** Law and ethics in information security, Relevant U.S laws-international laws and legal bodies, Ethics and information security.

**Risk Management:** Overview, Risk identification, Risk assessment, Risk control strategies, selecting a risk control strategy, Quantitative versus qualitative risk control practices, Risk management discussion points, Recommended risk control practices.

**UNIT-III**

**Planning for Security:** Security policy, Standards and practices, Security blueprint, Security education, Continuity strategies.

**Security Technology:** Firewalls and VPNs, Physical design, Firewalls, Protecting Remote connections

**UNIT-IV**

**Security Technology:** Intrusion detection, access control and other security tools: Intrusion detection and prevention systems, Scanning and analysis tools, Access control devices.

**Cryptography:** Foundations of cryptology, Cipher methods, Cryptographic Algorithms, Cryptographic tools, Protocols for secure communications, Attacks on cryptosystems.

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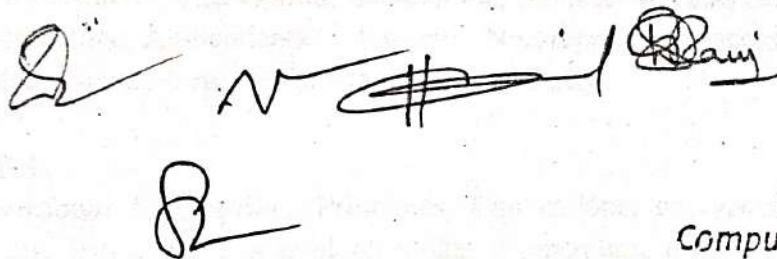
## UNIT- V

**Implementing Information Security:** Information security, project management, Technical topics of implementation, Nontechnical aspects of implementation, Security certification and accreditation.

**Security and Personnel:** Positioning and staffing security function, Employment policies and practices, Internal control strategies. Information security maintenance: Security management models, The maintenance model, Digital forensics

### Suggested Reading

1. Michel E Withman and Herbert J Mattord, Principles and Practices of Information Security, Cengage Learning, 2009.
2. Thomas R Peltier, Justin Peltier, John Blackley, Information Security Fundamentals, Auerbach Publications, 2010.
3. Detmar W Straub, Seymour Goodman, Richard L Baskerville, Information Security, Policy, Processes and Practices, PHI, 2008.
4. Mark Merkow and Jim Breithaupt, Information Security Principle and Practices, Pearson Education, 2007.



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PEC312

With effect from academic year 2022-23

**Network Security**

**Credits : 3**

Instruction 3L hrs per week  
CIE 30 marks

Duration of SEE 3 hours  
SEE 70 marks

**Course Objectives:**

- To impart knowledge on network security issues, services, goals and mechanisms.
- To analyze the security of communication systems, networks and protocols.
- To apply algorithms used for secure transactions in real world applications

**Course Outcomes:** At the end of the course students will be able to

- Demonstrate the knowledge of cryptography and network security concepts and applications.
- Ability to apply security principles in system design.
- Ability to identify and investigate vulnerabilities and security threats and mechanisms to counter them.

**UNIT- I**

**Security Attacks :** Interruption, Interception, Modification and Fabrication, Security Services Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability and Mechanisms, A model for Internetwork security.

**UNIT- II**

**Conventional Encryption:** Principles, Conventional encryption algorithms (DES, AES, RC4, and Blowfish), cipher block modes of operation, location of encryption devices, key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC.

**UNIT- III**

**Number Theory:** Modular Arithmetic, Euclid's Algorithm, Fermat's and Euler's Theorem, Chinese Remainder Theorem, Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management Kerberos, X.509 Directory Authentication Service.

**UNIT- IV**

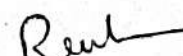
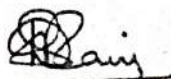
**Email privacy:** Pretty Good Privacy (PGP) and S/MIME.

**IP Security:** Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

**UNIT- V**

**Web Security:** Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET). Intruders, Viruses and related threats, Firewall Design principles, Trusted Systems, Intrusion Detection Systems.

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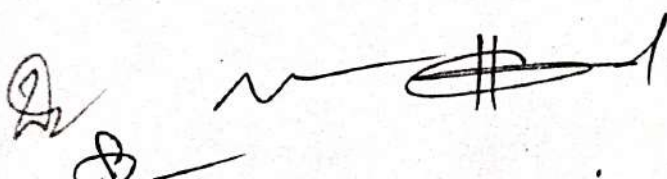
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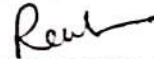
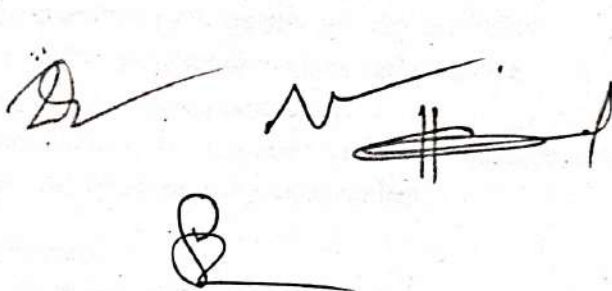
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**Suggested Readings:**

1. "Cryptography and Network Security" by William Stallings 3rd Edition, Pearson Education, 2017.
2. "Applied Cryptography" by Bruce Schneier, 2007.
3. Cryptography and Network Security by Behrouz A.Forouzan, 2015.



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PEC313

With effect from academic year 2022-23

**Cyber Security**

**Credits : 3**

Instruction 3L hrs per week

CIE 30 marks

Duration of SEE 3 hours

SEE 70 marks

**Course Objectives**

1. Understand the policies and security evolution
2. Learn cyber security objectives and guidance
3. Study policy catalog and issues
4. Comprehend cyber management and infrastructure issues
5. Learn the cyber security case studies

**Course Outcomes**

1. Explain the policies and security evolution
2. Describe cyber security objectives and guidance
3. Discuss policy catalog and issues
4. Elaborate cyber management and infrastructure issues
5. Elucidate the case studies on cyber security

**Unit I: Policies and Security Evolution**

**Introduction** - Cyber Security, Cyber Security policy, Domain of Cyber Security Policy, Laws and Regulations

**Cyber Security Evolution** - Enterprise Policy, Technology Operations, Technology Configuration, Strategy Versus, Policy, Cyber Security Evolution, Productivity, Internet, E-Commerce, Counter Measures, Challenges.

**Unit II: Cyber Security Objectives and Guidance**

**Security Objectives** - Cyber Security Metrics, Security Management Goals, Counting Vulnerabilities, Security Frameworks, E-Commerce Systems, Industrial Control Systems, Personal Mobile Devices, Security Policy Objectives, Guidance for Decision Makers, Tone at the Top, Policy as a Project.

**Catalog Approach** - Cyber Security Management, Arriving at Goals, Cyber Security Documentation, the Catalog Approach, Catalog Format, Cyber Security Policy Taxonomy

**Unit III: Policy Catalog and Issues**

**Cyber Security Policy Catalog** - Cyber Governance Issues, Net Neutrality, Internet Names and Numbers, Copyright and Trademarks, Email and Messaging, Cyber User Issues, Malvertising, Impersonation.

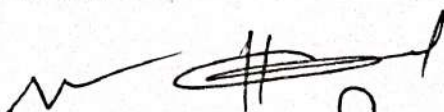
**Cyber user and conflict Issues** - Appropriate Use, Cyber Crime, Geo location, Privacy, Cyber Conflict Issues, Intellectual property Theft, Cyber Espionage, Cyber Sabotage, Cyber Welfare.

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#### Unit IV: Cyber Management and Infrastructures Issues

Cyber Management Issues - Fiduciary Responsibility – Risk Management – Professional Certification – Supply Chain – Security

Cyber Infrastructure Issues - Principles – Research and Development – Cyber Infrastructure Issue – Banking and finance – Health care – Industrial Control systems.

#### Unit V: Case Study

Government's Approach to Cyber Security Policy - Cyber security strategy-Brief history-Public policy development in the U.S Federal Government.

Espionage - The rise of cyber crime- Espionage and Nation-state Actions-Policy response to growing Espionage threats-Congressional Action.

#### Suggested Readings

1. Jennifer L. Bayuk, J. Healey, P. Rohmeyer, Marcus Sachs, Jeffrey Schmidt, Joseph Weiss "Cyber Security Policy Guidebook" John Wiley & Sons 2012.
2. Rick Howard "Cyber Security Essentials" Auerbach Publications 2011.
3. Richard A. Clarke, Robert Knake "Cyberwar: The Next Threat to National Security & What to Do About It" Ecco 2010  
Dan Shoemaker "Cyber security The Essential Body of Knowledge", 1<sup>st</sup> edition, Cengage Learning 2011.



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PEC314

With effect from academic year 2022-23  
Soft Computing

Credits : 3

Instruction 3Lhrs per week  
CIE 30 marks

Duration of SEE 3 hours  
SEE 70 marks

**Course Objectives:**

1. To understand the concepts of Neural Networks
2. To learn about Fuzzy Set theory and Adaptive Resonance Theory
3. Able to analyze various fuzzy sets, membership functions and components
4. To learn about Generic Algorithms and its applications
5. To understand the Integration of Neural Networks, Fuzzy Logic and Genetic Algorithms

**Course Outcomes:**

After completion of the subject, Students will be able to

1. Implementing the use of Generic Algorithms in Machine Learning
2. Apply Neural Networks techniques to solve problems
3. Identify the various operations on fuzzy sets, functions and components of fuzzy expert system
4. Able to combine neural networks and fuzzy logic to build Intelligent model/system

**UNIT-I**

Fundamentals of Neural Networks: Basic Concepts of Neural Networks, Human Brain, Model of an Artificial Neuron, Neural Network Architectures, Characteristics of Neural Networks, Learning Methods, Taxonomy of Neural Network Architectures, History of Neural Network Research, Early Neural Network Architectures, Some Application Domains.

Back Propagation Networks: Architecture of a Back Propagation Network, Back Propagation Learning, Illustration, Applications.

**UNIT-II**

Associative Memory: Autocorrelators, Heterocorrelators, Wang Et Al's Multiple Training Encoding Strategy, Exponential BAM, Associative Memory for Real-Coded Pattern Pairs, Applications, Recent Trends.

Adaptive Resonance Theory: Introduction, ART1, ART2, Applications, Sensitives of Ordering of Data.

**UNIT-III**


Fuzzy Set Theory: Fuzzy Versus Crisp, Crisp Sets, Fuzzy Sets, Crisp Relations, Fuzzy Relations.

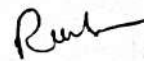
Fuzzy Systems: Crisp Logic, Predicate Logic, Fuzzy Logic, Fuzzy Rule Based Systems, Defuzzification Methods, Applications.

**UNIT-IV**

Fundamentals of Genetic Algorithms: Genetic Algorithms: History, Basic Concepts, Creation of Off springs; Working Principle, Encoding, Fitness Function, Reproduction.

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Genetic Modeling: Inheritance Operators, Cross, Over, Inversion, And Deletion, Mutation Operator, Bit-Wise Operators, Bit-Wise Operators used in GA, Generational Cycle, Convergence of Genetic Algorithms, Applications, Multi- Level Optimization, Real Life Problem, Differences and Similarities Between GA and Other Traditional Methods, Advances in GA.

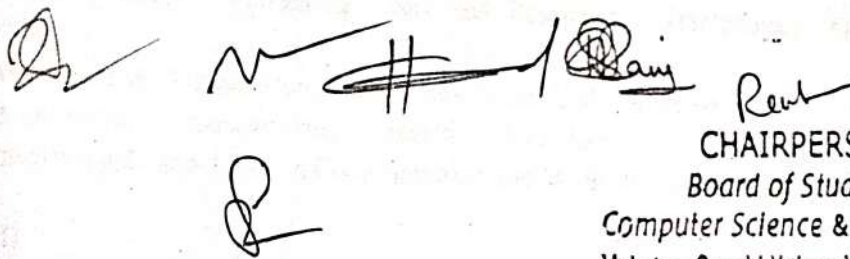
#### UNIT-V

Integration of Neural Networks, Fuzzy Logic and Genetic Algorithms: Hybrid Systems, Neural Networks, Fuzzy Logic, and Genetic Algorithms Hybrids, Preview of Hybrid Systems  
Genetic Algorithms Based Back propagation Networks: Ga Based Weight Determination, Applications.

Fuzzy Logic Controlled Genetic Algorithms: Soft Computing Tools, Problem Description of Optimum Design, Fuzzy Constraints, Illustrations, GA in Fuzzy Logic Controller Design, Fuzzy Logic Controller, FLC-GA Based Structural Optimization, Applications.

#### Suggested Readings

1. S.Rajasekaran, G.A. Vijayalakshmi Pai, Neural Networks, fuzzy logic, and genetic algorithms - Genetic Algorithm, PHI Learning Private Limited-2010
2. S.N.Sivanandam, S.N.Deepa Wiley India , Principles of SOFT COMPUTING, Second Edition 2011.



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PEC321

With effect from academic year 2022-23  
**Distributed Systems**

Instruction 3L hrs per week  
CIE 30 marks

**Credits : 3**

Duration of SEE 3 hours  
SEE 70 marks

**Course Objectives**

1. Understand the architecture, processes and communication of distributed system
2. Learn the naming and synchronization strategies
3. Study fault tolerance, and distributed object based system
4. Learn distributed file system and distributed web based system
5. Learn the Distributed Multimedia Management Strategies

**Course Outcomes**

1. Explain the architecture, processes and communication of distributed system
2. Elaborate the naming and synchronization strategies
3. Describe the fault tolerance and distributed object based system
4. Discuss the distributed file system and distributed web based system
5. Discuss the Distributed Multimedia QoS Principles

**Unit I**

**Introduction:** Goals , Connecting Users and Resources , Transparency, Openness, Scalability.

**Processes:** Threads, Virtualization, Clients, Servers, and Code Migration.

**Communication:** Fundamentals, Remote Procedure Call, Message-Oriented Communication, Stream-Oriented Communication, and Multicast Communication.

**Unit II**

**Naming:** Names, Identifiers and Addresses, Flat Naming, Structured Naming, and Attribute-Based Naming.

**Synchronization:** Clock Synchronization, Logical Clocks, Mutual Exclusion, Global Positioning of Nodes, and Election Algorithms.

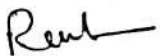
**Consistency and Replication:** Introduction, Data-Centric Consistency Models, Client-Centric Consistency Models, Replica Management, and Consistency Protocols.

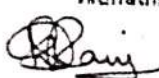

**Unit III**

**Fault Tolerance:** Introduction to Fault Tolerance, Process Resilience, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, and Recovery.

**Distributed Object-Based Systems:** Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, and Security.

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#### Unit IV

**Distributed File Systems:** Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, and Security.

**Distributed Web-Based Systems:** Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, and Security.

#### Unit V

**Distributed Multimedia Systems:** Introduction characteristics of Multimedia Data, Quality of Service Management: Quality of Service negotiation, Admission Control , Resource Management and Resource Scheduling.

#### Suggested Readings

1. Andrew S. Tanenbaum and Maarten Van Steen, —Distributed SystemsI, PHI 2nd Edition, 2009.
2. Colouris G, Dollimore Jean, Kindberg Tim, Distributed Systems Concepts and Design, 5<sup>th</sup> Edition Pearson Education 2011



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PEC322

With effect from academic year 2022-23

## Cloud Computing

Credits : 3

Instruction 3L hrs per week  
CIE 30 marks

Duration of SEE 3 hours  
SEE 70 marks

### Course Objectives

1. Learn the cloud computing services including resource virtualization
2. Study the scaling, planning and file system and storage
3. Understand database technology and security issues
4. Comprehend portability issues and programming model case study
5. Learn the enterprise architecture and its related information

### Course Outcomes

1. Elaborate the cloud computing services and resource virtualization
2. Explain the scaling, planning and file system and storage
3. Describe the database technology and security issues
4. Elucidate portability issues and programming model case study
5. Discuss the enterprise architecture and its related information

### Unit-I

Introduction, Benefits and challenges, Cloud computing services, Resource Virtualization, Resource pooling sharing and provisioning, Case study of IaaS, PaaS and SaaS

### Unit-II

Scaling in the Cloud, Capacity Planning, Load Balancing, File System and Storage, Containers

### Unit-III

Multi-tenant Software, Data in Cloud, Database Technology, Content Delivery Network, Security Reference Model, Security Issues, Privacy and Compliance Issues

### Unit-IV

Portability and Interoperability Issues, Cloud Management and a Programming Model Case Study, Popular Cloud Services

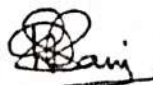
### Unit-V

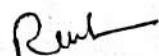
Enterprise architecture and SOA, Enterprise Software, Enterprise Custom Applications, Workflow and Business Processes, Enterprise Analytics and Search, Enterprise Cloud Computing Ecosystem.

### Suggested Reading

1. Cloud Computing - Sandeep Bhowmik, Cambridge University Press, 2017.
2. Enterprise Cloud Computing - Technology, Architecture, Applications by Gautam Shroff, Cambridge University Press, 2016.

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3. Kai Hwang, Geoffrey C.Fox, Jack J.Dongarra, "Distributed and Cloud Computing From Parallel Processing to the Internet of Things", Elsevier, 2012.



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PEC323

**Enterprise Architecture**

**Credits : 3**

Instruction 3L hrs per week  
CIE 30 marks

Duration of SEE 3 hours  
SEE 70 marks

**Course Objectives**

1. Learn the fundamentals of EA
2. Study the business architecture
3. Understand the organizational structure of EA
4. Comprehend enterprise engineering
5. Gain insights into cloud computing opportunities for EA

**Course Outcomes**

1. Know the fundamentals of EA
2. Understand the business architecture
3. Know the organizational structure of EA
4. Comprehend enterprise engineering
5. Gain insights into cloud computing opportunities for EA

**Unit I**

Introduction to EA -System analysis, general system theory, definitions and objectives of considerations, Properties of EA, system approach to EA development, principle definitions

**Unit II**

Business architecture, definition and features, BSC – balanced score card basics and its reflection in EA, Strategic governance, Event Causality effects in EA under scope of BSC

**Unit III**

Organizational structure of EA and basic models, Information and technology architecture basics, Introduction to EA structuring and modeling, Business architecture (inc. business process modeling, IBM Component business model), Information architecture, Technology architecture and integration between the layers model

**Unit IV**

Introduction to enterprise engineering (EE), Enterprise transformations (waterfall and agile), EAP, EA methodologies: PRISM, ARIS Framework, Zachmann Framework, FEAF, DODAF and TOGAF, Introduction to Service orientation in Enterprise Engineering (SOA, SoEA), Technological infrastructure for Big Data handling in EA

**Unit-V**

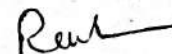
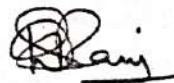
Cloud Computing Opportunities for EA, Flexible (agile) business and information architectures (SoEA).

Introduction to Spark, Spark Data Frames, SQL, Datasets through worked examples.

Spark's low level APIs, RDDs, execution of SQL & Data Frames.

How Spark Runs on a Cluster.

Structured Streaming, Spark's Stream – Processing Engine.



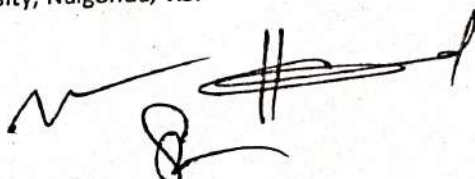
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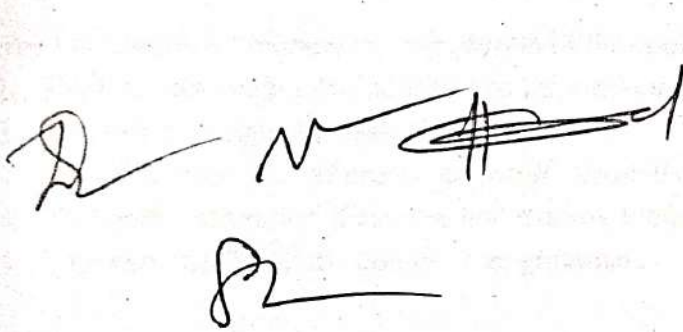
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## Suggested Reading

1. Designing Enterprise Architecture Frameworks: Integrating Business Processes with IT Infrastructure by N Zarvić, R Wieringa. Apple Academic Press (19 April 2016), 360 p. URL: <https://doi.org/10.1201/b16417>
2. Neubauer M., Stary CH., S-BPM in the Production Industry. Stakeholder approach, Springer Open, 2017. URL: <https://www.springer.com/gp/book/9783319484655>
3. A systematic literature review on Enterprise Architecture Implementation Methodologies by Babak D., Mohd N. Elsevier (June 2015), p. 1-20. URL: <https://doi.org/10.1016/j.infsof.2015.01.012>
1. Spark : The Definite Guide – Bill Chambers, MateiZaharia, 2018.



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PEC324

With effect from academic year 2022-23  
Natural Language Processing

Credits : 3

Instruction 3L hrs per week  
CIE 30 marks

Duration of SEE 3 hours  
SEE 70 marks

### Course Objectives

1. Learn elementary probability and information theory
2. Study the linguistic essentials
3. Comprehend statistical inference and word sense disambiguation
4. Understand evaluation measures and markov models
5. Learn probabilistic context free grammars

Course Outcomes – Learners on completion of the course, be able to

1. Explain elementary probability and information theory
2. Discuss the linguistic essentials
3. Describe statistical inference and word sense disambiguation
4. Elaborate evaluation measures and markov models
5. Elucidate probabilistic context free grammars

### UNIT I

Introduction of Elementary Probability Theory, Essential Information Theory. Linguistic Essentials Corpus-Based Work Collocations.

### UNIT II

Statistical Inference: Bins: Forming Equivalence Classes, Reliability vs. Discrimination, n-gram models, Building ngram models, An Information Theoretic Approach.

### UNIT III

Word Sense Disambiguation: Methodological Preliminaries, Supervised and unsupervised learning, Pseudo words, Upper and lower bounds on performance, Supervised Disambiguation, Bayesian classification.

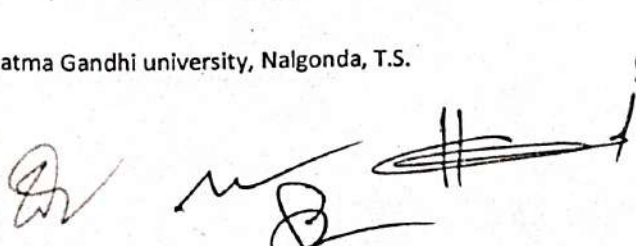
### UNIT IV

Evaluation Measures, Markov Models: Hidden Markov Models, Use, General form of an HMM Part-of-Speech Tagging

### UNIT-V

Probabilistic Context Free Grammars: Introduction of Clustering  
Information Retrieval: Background, The Vector Space Model.

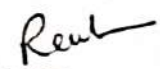
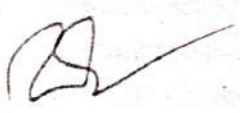
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**Suggested Reading**

1. Christopher D. Manning, Hinrich Schütze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.
2. James Allan, Natural Language Understanding, Pearson Education, 1994.
3. Tanveer Siddiqui, US Tiwary, Natural Language Processing and Information Retrieval, Oxford University Press, 2008.



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LCC351

With effect from academic year 2022-23  
Computer Networks Lab

Instruction 3P hrs per week  
CIE 25 marks

Credits : 2

Duration of SEE 3 hours  
SEE 50 marks

### Course Objectives

1. Understand basic commands of networks
2. Learn socket program implementation
3. Understand connection oriented socket programs
4. Learn connectionless socket programs
5. Understand DNS implementation


Course Outcomes - Upon completion of the course, the students will be able to:

1. Execute basic commands of networks
2. Implement socket program implementation
3. Execute connection oriented socket programs
4. Implement connection less socket programs
5. Execute DNS implementation

Programs to be written on the following concepts using any programming language like Python, C, C++, Java.

1. Understanding and using of commands like ifconfig, netstat, ping, arp, telnet, ftp, finger, traceroute, whois.
2. Socket Programming: Implementation of Connection-Oriented Service using standard ports.
3. Implementation of Connection-Less Service using standard ports.
4. Implementation of Connection-Oriented Iterative Echo-Server, date and time, character generation using user-defined ports.
5. Implementation of Connectionless Iterative Echo-server, date and time, character generation using user-defined ports.
6. Implementation of Connection-Oriented 'Concurrent Echo-server, date and time, character generation using user-defined ports.
7. Program for connection-oriented Iterative Service in which server reverses the string sent by the client and sends it back.
8. Program for connection-oriented Iterative service in which server changes the case of the strings sent by the client and sends back (Case Server).
9. Program for Connection-Oriented Iterative service in which server calculates the net-salary of an employee based on the following details sent by the client  
i) basic ii) hra iii) da iv) pt v) epf vi) net-salary=basic+hra+da-pt-epf).
10. Program for file access using sockets.
11. Program for Remote Command Execution using sockets .
12. Implementation of DNS.

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LCC352

With effect from academic year 2022-23  
Software Engineering Lab

Credits : 2

Instruction 3P hrs per week  
CIE 25 marks

Duration of SEE 3 hours  
SEE 50 marks

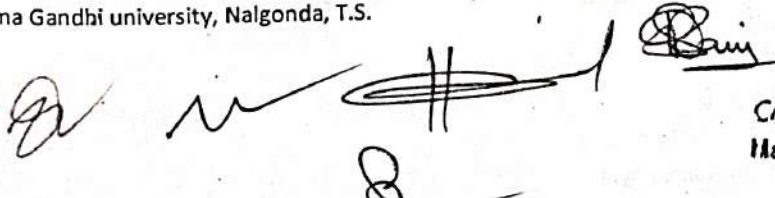
### Course Objectives

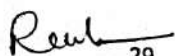
1. Learn use case diagram
2. Learn class and object diagram
3. Understand sequence and collaboration diagrams
4. Study state-chart and activity diagrams
5. Comprehend component and deployment diagrams

### Course Outcomes

1. Apply use case diagram
  2. Apply class and object diagram
  3. Apply sequence and collaboration diagrams
  4. Apply state-chart and activity diagrams
  5. Apply component and deployment diagrams
- 
1. Phases in software development project, overview, need, coverage of topics
  2. To assign the requirement engineering tasks
  3. To perform the system analysis: Requirement analysis, SRS
  4. To perform the function-oriented diagram: DFD and Structured chart
  5. To perform the user's view analysis: Use case diagram
  6. To draw the structural view diagram: Class diagram, object diagram
  7. To draw the behavioral view diagram: Sequence diagram, Collaboration diagram
  8. To draw the behavioral view diagram: State-chart diagram, Activity diagram
  9. To draw the implementation view diagram: Component diagram
  10. To draw the environmental view diagram: Deployment diagram
  11. To perform various testing using the testing tool unit testing, integration testing

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Draw UML diagrams for the following system

1. ATM application
2. Library management system
3. Railway reservation
4. E-Commerce System
5. Banking System

Perform the following tasks

**Background:** Software has made the world a global village today. The impact of software spans across almost all aspect of human life. All organizations, Institutions and companies are leveraging the potentials of software in automating the critical functions and eliminating manual interventions. Software is also a predominant area for trade and export especially for the countries like India. Domains like health care, Airlines, financial Services, Insurance, retails, Education, and many more have exploited software and still there a lot of the scope for software to create impact and add values in multiple dimensions.

**Problem Description:** In the context of this background, identify the areas (or application or systems) how software has been leveraged extensively in the following domains

1. Health Care
2. Airlines
3. Banking Insurance
4. Retail
5. Education

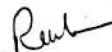
**Background:** In the early years of computers applications, the focus of the development and innovation were on hardware. Software was largely views as an afterthought. Computer programming was an art. Programmers did not follow any disciplined or formalized approaches. This way of doing things was adequate for a while, until the sophisticated of computer applications outgrow. Software soon took over and more functions which were done manually. A software houses begin to develop for widespread distribution. Software development projects produced thousands of source program statement. With the increase in the size and complexity of the software, following situation resulted is collectively termed as software crisis.

1. Time Slippage
2. Cost Slippage
3. Failure at customer Site
4. Intractable Error after delivery

**Problem Description:** In the context of this background, for each of the scenario mentioned below, identify the most appropriate problem related to software crisis and mention the same in the table provided.

**Scenario A:** Railways reservation software was delivered to the customer and was installed in one of the metro station at 12.00 AM (mid-night) as per the plan. The system worked quite fine till the next day 12.00 PM (noon). The system crashed at 12.00 PM and the railways authorities could not continue using software for reservation till 02.00 PM. It took two hours to fix the defect in the software in the software.

**Scenario B:** A polar satellite launch vehicle was scheduled for the launch on August 15th. The auto-pilot of the rocket to be delivered for integration of the rocket on May 15th. The design and development of the software for the auto-pilot more effort because of which the

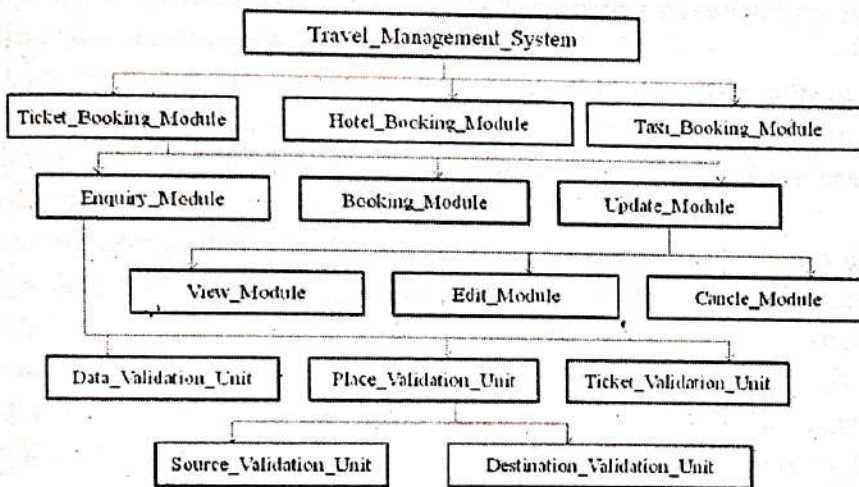


auto-pilot was delivered for the integration on June 15th (delayed by a month). The rocket was launched on Sep 15th (delayed by a month).

**Scenario C:** Software for financial systems was delivered to the customer. Customer informed the development team about a mal-function in the system. As the software was huge and complex, the development team could not identify the defect in the software.

## INTEGRATION TESTING

**Background:** Integration testing is carried out after the completion of unit testing and before the software is delivered for system testing. In top down integration testing, dummy stubs are required for bottom level modules. Similarly, in bottom up testing, dummy drivers are required for top level modules



**Problem Description:** Consider the scenario of development of software for Travel, Management System (TMS) is in progress. The TMS software has 3 major modules namely Ticket\_Booking\_Module, Hotel\_Booking\_Module and Taxi\_Booking\_Module. The Ticket\_Booking\_Module has 3 sub modules namely Enquiry\_Module, Booking\_Module and Update\_Module. The enquiry module uses Date\_Validation\_Unit, Ticket\_Validation\_Unit and Place\_Validation\_Unit.

In the context of the given scenario, identify the usage of stub or driver for the following situations.

1. Except the Ticket\_validation\_Unit, the coding and unit testing of all other modules, sub modules and units of TMS are completed. The top-down integration is in progress for the TMS software. To carry out the integration testing, which among the following is necessary?
2. The coding and unit testing of all the module, sub modules and units of TMS are completed except the Update\_Module (coding and testing for Edit\_Module, Cancel\_Module and View\_Module are also completed). The bottom-up integration is to be started for the TMS software. Mention any stub or driver needed to carry out the integration testing?
3. Except the Taxi\_Booking\_Module, the coding and unit testing of all other modules, sub modules and units of TMS are completed. The top-down integration is to be started for the TMS software. Mention any stub or driver needed to carry out the integration testing.

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**Background:** Performance testing tests the non-functional requirements of the system. The different types of performance testing are load testing, stress testing, endurance testing and spike testing.

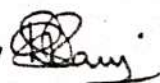

**Problem Description:** Identify the type of performance testing for the following:

1. A space craft is expected to function for nearly 8 years in space. The orbit control system of the spacecraft is a real-time embedded system. Before the launch, the embedded software is to be tested to ensure that it is capable of working for 8 years in the space. Identify the suitable performance testing category to be carried out to ensure that the space craft will be functioning for 8 years in the space as required.
2. Global Education Centre (GEC) at Infosys Mysore provides the training for fresh entrants. GEC uses an automated tool for conducting objective type test for the trainees. At a time, a maximum of 2000 trainees are expected to take the test. Before the tool is deployed, testing of the tool was carried out to ensure that it is capable of supporting 2000 simultaneous users. Indicate the performance testing category?
3. A university uses its web-based portal for publishing the results of the students. When the results of an examination were announced on the website recently on a pre-planned date, the web site crashed. Which type of performance testing should have been done during web-site development to avoid this unpleasant situation?
4. During unexpected terrorist attack, one of the popular websites crashed as many people logged into the web-site in a short span of time to know the consequences of terrorist attack and for immediate guidelines from the security personnel. After analyzing the situation, the maintenance team of that website came to know that it was the consequences of unexpected load on the system which had never happened previously. Which type of performance testing should have been done during web-site development to avoid this unpleasant situation?

**Background:** Enhancements are introduction of new features to the software and might be released in different versions. Whenever a version is released, regression testing should be done on the system to ensure that the existing features have not been disturbed.

**Problem Description:** Consider the scenario of development of software for Travel Management System (TMS) discussed in previous assignment. TMS has been developed by Infosys and released to its customer Advance Travel Solutions Ltd. (ATSL). Integration testing, system testing and acceptance testing were carried out before releasing the final build to the customer. However, as per the customer feedback during the first month of usage of the software, some minor changes are required in the Enquiry Module of the TMS. The customer has approached Infosys with the minor changes for upgrading the software. The development team of Infosys has incorporated. Those changes, and delivered the software to testing team to test the upgraded software. Which among the following statement is true?

- a. Since minor changes are there, integration of the Enquiry Module and quick system testing on Enquiry module should be done.
- b. The incorporation of minor changes would have introduced new bugs into other modules, so regression testing should be carried out.
- c. Since the acceptance testing is already carried out, it is enough if the team performs sanity testing on the Enquire module.
- d. No need of testing any module.





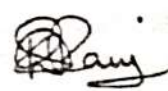
**Background:** There are some metrics which are fundamental and the rest can be derived from these. Examples of basic (fundamental) measures are size, effort, defect, and schedule. If the fundamental measures are known, then we can derive others. For example if size and effort are known, we can get Productivity ( $=\text{size}/\text{effort}$ ). If the total numbers of defects are known we can get the Quality ( $=\text{defect}/\text{size}$ ) and so on.

**Problem Description:** Online loan system has two modules for the two basic services, namely Car loan service and House loan service.

The two modules have been named as Car\_Loan\_Module and House\_Loan\_Module. Car\_Loan\_Module has 2000 lines of uncommented source code. House\_Loan\_Module has 3000 lines of uncommented source code. Car\_Loan\_Module was completely implemented by Mike. House\_Loan\_Module was completely implemented by John. Mike took 100 person hours to implement Car\_Loan\_Module. John took 200 person hours to implement House\_Loan\_Module. Mike's module had 5 defects. John's module had 6 defects. With respect to the context given, which among the following is an INCORRECT statement?

Choose one:

1. John's quality is better than Mike.
2. John's productivity is more than Mike.
3. John introduced more defects than Mike.
4. John's effort is more than Mike.



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**Course Objectives**

1. Learn R programming basics
2. Study descriptive statistics
3. Understand reading and writing datasets
4. Learn correlation, covariance and regression model
5. Comprehend multiple regression model and its use for prediction

**Course Outcomes**

1. Execute R programming basics
2. Implement descriptive statistics
3. Execute reading and writing datasets
4. Implement correlation, covariance and regression model
5. Execute multiple regression model and its use for prediction

**SNo Programs**

- 1 **R AS CALCULATOR APPLICATION** a. Using with and without R objects on console b. Using mathematical functions on console c. Write an R script, to create R objects for calculator application and save in a specified location in disk.
- 2 **DESCRIPTIVE STATISTICS IN R**  
a. Write an R script to find basic descriptive statistics using summary, str, quartile function on mtcars & cars datasets.  
b. Write an R script to find subset of dataset by using subset (), aggregate () functions on iris dataset.
- 3 **READING AND WRITING DIFFERENT TYPES OF DATASETS**  
a. Reading different types of data sets (.txt, .csv) from Web and disk and writing in file in specific disk location. b. Reading Excel data sheet in R. c. Reading XML dataset in R.
- 4 **VISUALIZATIONS** a. Find the data distributions using box and scatter plot. b. Find the outliers using plot. c. Plot the histogram, bar chart and pie chart on sample data.
- 5 **CORRELATION AND COVARIANCE**  
a. Find the correlation matrix.  
b. Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data.  
c. Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data.
- 6 **REGRESSION MODEL** Import a data from web storage. Name the dataset and now do Logistic Regression to find out relation between variables that are affecting the admission of a student in a institute based on his or her GRE score, GPA obtained and

rank of the student. Also check the model is fit or not. Require (foreign), require (MASS).

7 **MULTIPLE REGRESSION MODEL**

Apply multiple regressions, if data have a continuous Independent variable. Apply on above dataset.

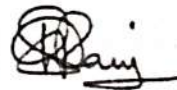
8 **REGRESSION MODEL FOR PREDICTION** Apply regression Model techniques to predict the data on above dataset.

9 **CLASSIFICATION MODEL**

- a. Install relevant package for classification.
- b. Choose classifier for classification problem.
- c. Evaluate the performance of classifier.

10 **CLUSTERING MODEL**

- a. Clustering algorithms for unsupervised classification.
- b. Plot the cluster data using R visualizations.



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PS 354

Instruction (2P) hrs per week  
CIE25 Marks

With effect from academic year 2022-23  
**PROJECT SEMINAR**

Oral presentation is an important aspect of technical education. The objective of the Seminar Course is to motivate a student to do a systematic and independent study of state-of-topics in a broad area of his/her interest.

Students are to be exposed to following aspects of seminar presentations.

- Literature survey
- Organization of material to be presented
- Preparation of power point Presentation
- Technical writing

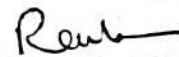
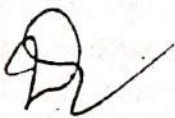
Seminar topics may be chosen by the student with the suggestions from the faculty members.

**Each student is required to**

- Submit one page synopsis of the seminar talk two days before for display on notice board of the department.
- Give a 20 minutes presentation with the aid of a PC, followed by a 10 minutes discussion.
- Submit the report on the seminar topic presented along with list of reference and slides used.

Seminar is to be scheduled from the third week to the last week of the semester and any change in schedule should be discouraged.

CIE marks will be awarded jointly or independently by at least two faculty members. The award will be on the basis of the oral presentation made, written materials submitted, active participation of the student in the presentation as well as involvement in the discussions.



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PEC411

With effect from academic year 2022-23  
**Big Data Analytics**

**Credits : 3**

Instruction 3L hrs per week  
CIE 30 marks

Duration of SEE 3 hours  
SEE 70 marks

### Course Objectives

1. Understand big data fundamentals
2. Understand Learn hadoop ecosystem
3. Understand mapreduce and hbase fundamentals
4. Understand database concepts related to big data
5. Understand NoSQL fundamentals

### Course Outcomes

1. Learn how to handle big data
2. Learn hadoop ecosystem
3. Learn mapreduce and hbase fundamentals
4. Learn database concepts related to big data
5. Learn NoSQL fundamentals

### UNIT- I

**Getting an overview of Big Data:** Introduction to Big Data, Structuring Big Data, Types of Data, Elements of Big Data, Big Data Analytics, Advantages of Big Data Analytics.

**Introducing Technologies for Handling Big Data:** Distributed and Parallel Computing for Big

Data, Cloud Computing and Big Data, Features of Cloud Computing, Cloud Deployment Models, Cloud Services for Big Data, Cloud Providers in Big Data Market.

### UNIT- II

**Understanding Hadoop Ecosystem:** Introducing Hadoop, HDFS and MapReduce, Hadoop functions, Hadoop Ecosystem.

**Hadoop Distributed File System-**

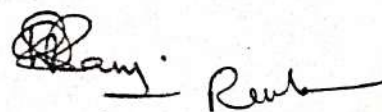
HDFS Architecture, Concept of Blocks in HDFS Architecture, Name nodes and Data nodes, Features of HDFS. MapReduce.

**Introducing HBase -** HBase Architecture, Regions, Storing Big Data with HBase, Combining HBase and HDFS, Features of HBase, Hive, Pig and Pig Latin, Sqoop, ZooKeeper, Flume, Oozie.

### UNIT-III

**Understanding MapReduce Fundamentals and HBase:** The MapReduce Framework, Exploring

the features of MapReduce, Working of MapReduce, Techniques to optimize MapReduce Jobs, Hardware/Network Topology, Synchronization, File system, Uses of MapReduce, Role of HBase in Big Data Processing- Characteristics of HBase.

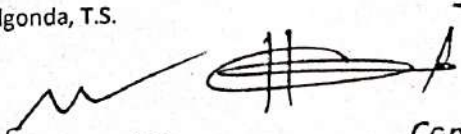
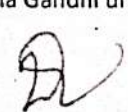


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**Understanding Big Data Technology Foundations:** Exploring the Big Data Stack, Data Sources Layer, Ingestion Layer, Storage Layer, Physical Infrastructure Layer, Platform Management Layer, Security Layer, Monitoring Layer, Visualization Layer.

#### UNIT- IV

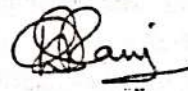
**Storing Data in Databases and Data Warehouses:** RDBMS and Big Data, Issues with Relational Model, Non-Relational Database, Issues with Non-Relational Database, Polyglot Persistence, Integrating Big Data with Traditional Data Warehouse, Big Data Analysis and Data Warehouse.

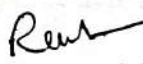
#### UNIT-V

**NoSQL Data Management:** Introduction to NoSQL, Characteristics of NoSQL, History of NoSQL, Types of NoSQL Data Models- Key Value Data Model, Column Oriented Data Model, Document Data Model, Graph Databases, Schema-Less Databases, Materialized Views, CAP Theorem.

#### Suggested Reading

1. BIGDATA, BlackBookTM, DreamTechPress, 2016 Edition.
2. Seema Acharya, Subhasni Chellappan, "BIG DATA and ANALYTICS", Wiley publications, 2016
3. Nathan Marz and James Warren, "BIGDATA-Principles and Best Practices of Scalable Real-Time Systems", 2010



  
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PEC412

With effect from academic year 2022-23

**Deep Learning**

**Credits : 3**

Instruction 3L hrs per week

CIE 30 marks

Duration of SEE 3 hours

SEE 70 marks

### Course Objectives

1. Learn deep learning basics and optimization algorithms
2. Understand deep learning computation, CNNs and modern CNNs
3. Study recurrent neural networks and its modern versions
4. Learn computer vision
5. Comprehend GANs

### Course Outcomes

1. Learn deep learning basics and optimization algorithms
2. Understand deep learning computation, CNNs and modern CNNs
3. Study recurrent neural networks and its modern versions
4. Learn computer vision
5. Comprehend GANs

### Unit I

**Introduction** – A motivating example, the key components – data, models, and algorithms, kinds of machine learning, the road to deep learning, success stories, Linear regression, multilayer perceptrons, model selection, underfitting and overfitting, weight decay, dropout, forward propagation, backward propagation and computational graphs, numerical stability and initialization, considering the environment, predicting house prices on Kaggle

**Optimization algorithms** – optimization and deep learning, convexity, gradient descent, momentum, adagrad, RMSProp, Adadelta, Adam, learning rate scheduling

### Unit II

**Deep learning computation** – layers and blocks, parameter management, deferred initialization, custom layers, file I/O, GPUs

**Convolutional neural networks** – from dense layers to convolutions, convolutions for images, padding and stride, multiple input and output channels, pooling, convolutional neural networks(LeNet)

**Modern Convolutional neural networks** – deep Convolutional neural networks(AlexNet), Networks using blocks(VGG), Networks with parallel concatenations(GoogleNet), batch normalization, residual networks(ResNet), densely connected networks(DenseNet)

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### Unit III

**Recurrent neural networks** – sequence models, text processing, language models and the dataset, recurrent neural networks, back propagation through time

**Modern Recurrent neural networks** – gated recurrent units(GRU), long short term memory(LSTM), deep recurrent neural networks, bidirectional recurrent neural networks, machine translation and the dataset, encoder-decoder architecture, sequence to sequence

**Attention mechanisms** – attention mechanism, sequence to sequence with attention mechanism, transformer

### Unit IV

**Computer vision** – Image augmentation fine tuning, object detection and bounding boxes, anchor boxes, multiscale object detection, the object detection dataset, single shot multibox detection(SSD), region based CNNs(R-CNNs), semantic segmentation and the dataset, transposed convolution, fully convolutional networks(FCN), neural style transfer, image classification(CIFAR-10) on kaggle, dog breed identification (Imagenet dogs) on kaggle

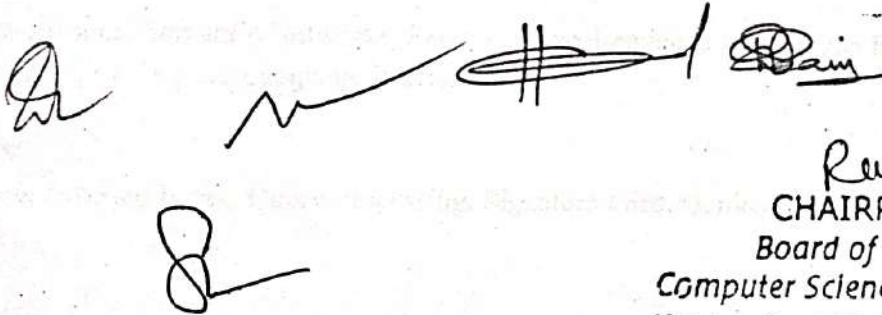
### Unit V

**Generative adversarial networks** – Generative adversarial networks, deep convolutional generative adversarial networks

**Tools for deep learning** – using jupyter, using amazon sagemaker, using AWS EC2 instances, using google colab, selecting servers and GPUs

### Suggested Reading

1. Ian goodfellow, Yoshuaabengio, Aaron courville, "Deep learning"  
Zhang, Aston, et al. "Dive into deep learning." arXiv preprint  
arXiv:2106.11342 (2021).



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PEC413

With effect from academic year 2022-23  
Information Retrieval System

Instruction 3Lhrs per week  
CIE 30 marks

Credits : 3

Duration of SEE 3 hours  
SEE 70 marks

### Course Objectives

1. Understand IR strategies
2. Study basic retrieval utilities
3. Learn cross language IR
4. Comprehend efficiency aspects
5. Learn distributed IR

### Course Outcomes

1. Explain IR strategies
2. Elucidate basic retrieval utilities
3. Discuss cross language IR
4. Describe efficiency aspects
5. Elaborate distributed IR

### UNIT-I

Introduction to Retrieval. Strategies: Vector Space model, Probabilistic Retrieval.  
Strategies Language Models: Simple Term Weights, Non Binary Independence Model.

### UNIT-II

Retrieval Utilities: Relevance Feedback, Clustering, N-grams, Regression Analysis, Thesauri.

### UNIT-III

Retrieval Utilities: Semantic Networks, Parsing, Cross-Language Information Retrieval:  
Introduction, Crossing the Language Barrier.

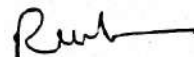
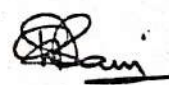
### UNIT-IV

Efficiency: Inverted Index, Query Processing, Signature Files, Duplicate Document  
Detection.

### UNIT - V

Integrating Structured Data and Text: A Historical Progression, Information Retrieval as a  
Relational Application, Semi-Structured Search using a Relational Schema.

Distributed Information Retrieval: A Theoretical Model of Distributed Retrieval, Web  
Search.






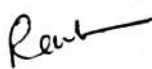


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**Suggested Reading:**

1. David A. Grossman, Ophir Frieder. "Information Retrieval - Algorithms and Heuristics", Springer, 2nd Edition (Distributed by Universities Press), 2004.
2. Gerald J Kowalski, Mark T Maybury. "Information Storage and Retrieval Systems", Springer, 2000.
3. Soumen Chakrabarti, "Mining the Web: Discovering Knowledge. from Hypertext Data", Morgan-Kaufmann Publishers, 2002.
4. Christopher D. Manning, Prabhakar Raghavan, Hinrich SchGtze, "An Introduction to Information Retrieval", Cambridge University Press, Cambridge, England,-2009.

     
   
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With effect from academic year 2022-23  
**Optimization Techniques**

PEC414

Instruction 3L hrs per week  
CIE 30 marks

Credits : 3

Duration of SEE 3 hours  
SEE 70 marks

**Course Objectives**

1. Understand the optimization basics
2. Understand optimization using calculus
3. Understand dynamic programming and its applications
4. Understand integer programming
5. Understand advanced optimization techniques

**Course Outcomes**

1. Learn the optimization basics
2. Learn optimization using calculus
3. Learn dynamic programming and its applications
4. Learn integer programming
5. Learn advanced optimization techniques

**Unit I**

**Introduction and Basic Concepts**

Historical Development; Engineering applications of Optimization; Art of Modeling Objective function; Constraints and Constraint surface; Formulation of design problems as Optimization techniques –classical and advanced techniques

**Unit II**

**Optimization using Calculus**

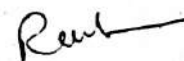
Stationary points; Functions of single and two variables; Global Optimum Convexity and concavity of functions of one and two variables Optimization of function of one variable and multiple variables; Gradient vectors; Examples Optimization of function of multiple variables subject to equality constraints; Lagrangian function Optimization of function of multiple variables subject to equality constraints; Hessian matrix formulation; Eigen values Kuhn-Tucker Conditions; Examples

**Unit III**

**Dynamic Programming**

Sequential optimization; Representation of multistage decision process; Types of multistage decision problems; Concept of sub optimization and the principle of Optimality Recursive equations –Forward and backward recursions; Computational procedure in dynamic programming (DP) Discrete versus continuous dynamic programming; Multiple state variables; curse of dimensionality in DP

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## Unit IV

### Dynamic Programming Applications

Problem formulation and application in Design of continuous beam and Optimal geometric layout of a truss Water allocation as a sequential process Capacity expansion and Reservoir operation

### Integer Programming

Integer linear programming; Concept of cutting plane method Mixed integer programming; Solution algorithms; Examples

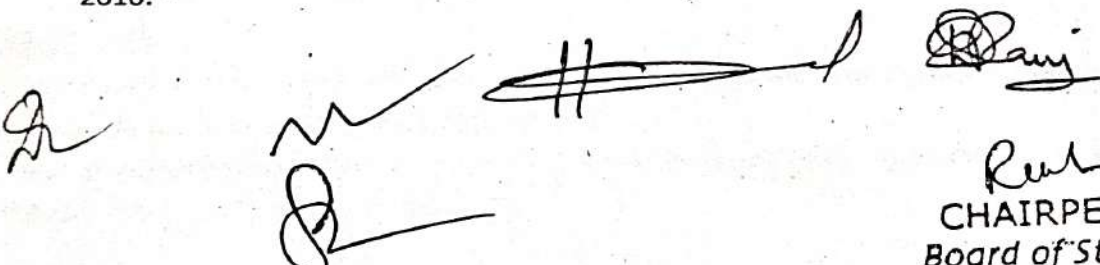
## Unit V

### Advanced Topics in Optimization

Piecewise linear approximation of a nonlinear function Multi objective optimization – Weighted and constrained methods; Multi level optimization Direct and indirect search Methods Evolutionary algorithms for optimization and search Applications in civil engineering

### Suggested Reading

1. S.S. Rao, "Engineering Optimization: Theory and Practice", New Age International Pvt.Ltd., New Delhi, 2000.
2. G. Hadley, "Linear programming", Narosa Publishing House, New Delhi, 1990.
3. H.A. Taha, "Operations Research: An Introduction", 5th Edition, Macmillan, New York, 1992.
4. K. Deb, "Optimization for Engineering Design-Algorithms and Examples", Prentice-Hall of India Pvt. Ltd., New Delhi, 1995.
5. K. Srinivasa Raju and D. Nagesh Kumar, "Multicriterion Analysis in Engineering and Management", PHI Learning Pvt. Ltd., New Delhi, India, ISBN 978-81-203-3976-7, pp.288, 2010.



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PEC421

With effect from academic year 2022-23  
**Block Chain Technologies**

Instruction 3L hrs per week  
CIE30 marks

**Credits : 3**

Duration of SEE3 hours  
SEE70 marks

**Course Objectives**

1. Learn the basic concept of Cryptographic Hash Functions, Hash Pointers
2. Study Elliptic Curve Digital Signature Algorithm.
3. A technical overview of decentralized digital currencies like Bitcoin, as well as their broader economic, legal and financial context.
4. To get an insight into the working of the Bitcoin network Wallet
5. Comprehend Bitcoin mining and distributed consensus for reliability.

**Course Outcomes**

1. Learn the basics of hash functions
2. Learn the importance of digital signature
3. Understand the structure of a blockchain.
4. Learn different ways of storing Bitcoin keys, security measures.
5. Learn how Bitcoin relies on mining.

**UNIT – I**

**Introduction to Cryptography:** Cryptographic Hash Functions, SHA-256, Hash Pointers and Data Structures, Merkle tree.

**UNIT – II**

**Digital Signatures:** Elliptic Curve Digital Signature Algorithm (ECDSA), Public Keys as identities, A Simple Cryptocurrency.

**UNIT – III**

Centralization vs Decentralization, Distributed consensus, Consensus without identity using a block chain, Incentives and proof of work.

**Mechanics of Bitcoin:** Bitcoin Transactions, Bitcoin Scripts, Applications of Bitcoin Scripts, Bitcoin Blocks, The Bitcoin Network.

**UNIT – IV**

**Storage and Usage of Bitcoins:** Simple Local Storage, Hot and Cold Storage, Splitting and Sharing Keys, Online Wallets and Exchanges, Payment Services, Transaction Fees, Currency Exchange Markets.

**UNIT – V**

**Bitcoin Mining:** The Task of Bitcoin miners, Mining Hardware, Mining pools, Mining incentives and strategies.

**Bitcoin and Anonymity:** Anonymity Basics, Mixing, Zerocoin and Zerocash.  
Applications of Block Chain Technologies.

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**Suggested Reading**

1. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction by Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Princeton Press, 2016.
2. Mastering Bitcoin: Programming the Open Blockchain by Andreas M. Antonopoulos Shroff, O'Reilly; 2nd Edition, 2017.



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PEC422

With effect from academic year 2022-23

**Software Testing**

**Credits : 3**

Instruction 3L hrs per week  
CIE 30 marks

Duration of SEE 3 hours  
SEE 70 marks

**Course Objectives**

1. Learn Functional Testing
2. Learn Structural Testing
3. Discuss Integration and System Testing
4. Learn Object-Oriented Testing
5. Discuss to do software testing

**Course Outcomes**

1. Understand the Functional Testing
2. Understand the Structural Testing
3. Comprehend the Integration and System Testing
4. Understand the object-Oriented Testing
5. Comprehend to do software testing

**Unit-I**

A Mathematical Context: A Perspective on Testing, Examples  
Functional Testing: Boundary Value Testing, Equivalence Class Testing, Decision Table-Based Testing, Retrospective on Functional Testing.

**Unit-II**

Structural Testing: Path Testing, Dataflow Testing, Retrospective on Structural Testing.

**Unit-III**

Integration and System Testing: Levels of Testing, Integration Testing, System Testing, Interaction Testing.

**Unit-IV**

Object-Oriented Testing: Issues in Object-Oriented Testing, Class Testing, Object-Oriented Integration Testing, GUI Testing, Object-Oriented System Testing.

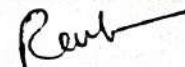
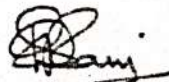
**Unit-V**

Millennium Testing: Exploratory Testing, Model-Based Testing, Test-Driven Development, All Pairs Testing, Software Testing Excellence.

**Suggested Reading:**

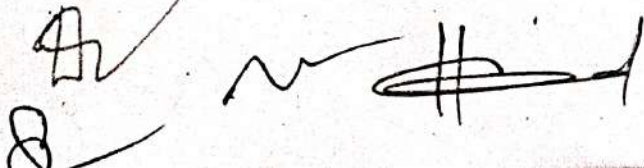
1. Paul C. Jorgensen, Software Testing: A Craftsman's Approach, 3rd Edition, CRC Press, 2007.
2. Boris Beizer, Software Testing Techniques, Dreamtech, 2009.

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PEC423

With effect from academic year 2022-23

**Internet of Things**

**Credits : 3**

Instruction 3L hrs per week  
CIE 30 marks

Duration of SEE 3 hours  
SEE 70 marks

**Course Objectives**

1. Discuss fundamentals of IoT and its applications and requisite infrastructure
2. Describe Internet principles and communication technologies relevant to IoT
3. Discuss hardware and software aspects of designing an IoT system
4. Describe concepts of cloud computing and Data Analytics
5. Discuss business models and manufacturing strategies of IoT products

**Course Outcomes**

Student will be able to

1. Understand the various applications of IoT and other enabling technologies.
2. Comprehend various protocols and communication technologies used in IoT
3. Design simple IoT systems with requisite hardware and C programming software
4. Understand the relevance of cloud computing and data analytics to IoT
5. Comprehend the business model of IoT from developing a prototype to launching a product.

**UNIT- I**

**Introduction to Internet of Things**

IOT vision, Strategic research and innovation directions, Iot Applications, Related future technologies, Infrastructure, Networks and communications, Processes, Data Management, Security, Device level energy issues.

**UNIT- II**

**Internet Principles and communication technology**

Internet Communications: An Overview – IP, TCP, IP protocol Suite, UDP. IP addresses – DNS, Static and Dynamic IP addresses, MAC Addressess, TCP and UDP Ports, Application Layer Protocols HTTP, HTTPS, Cost Vs Ease of Production, Prototypes and Production, Open Source Vs Closed Source.

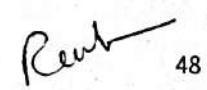
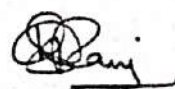
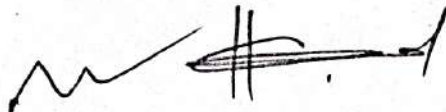
**UNIT- III**

**Prototyping and programming for IoT**

Prototyping Embedded Devices – Sensors, Actuators, Microcontrollers, SoC, Choosing a platform, Prototyping, Hardware platforms – Arduino, Raspberry Pi. Prototyping the physical design – Laser Cutting, 3D printing, CNC Milling.

Techniques for writing embedded C code: Integer data types in C, Manipulating bits - AND, OR, XOR, NOT, Reading and writing from I/ O ports. Simple Embedded C programs for LED Blinking, Control of motor using switch and temperature sensor for arduino board.

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## UNIT- IV

### Cloud computing and Data analytics

Introduction to Cloud storage models -SAAS, PAAS, IAAS. Communication APIs, Amazon webservices for IoT, Skynet IoT Messaging Platform.

Introduction to Data Analytics for IoT - Apache hadoop- Map reduce job execution workflow.

## UNIT- V

### IoT Product Manufacturing - From prototype to reality

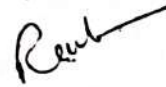
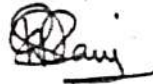
Business model for IoT product manufacturing, Business models canvas, Funding an IoT

Startup, Mass manufacturing - designing kits, designing PCB,3D printing, certification,

Scaling up software, Ethical issues in IoT- Privacy, Control, Environment, solutions to ethical issues.

### Suggested Readings

1. Internet of Things - Converging Technologies for smart environments and Integrated ecosystems, River Publishers.
2. Designing the Internet of Things , Adrian McEwen, Hakim Cassimally. Wiley India Publishers
3. Fundamentals of embedded software: where C meets assembly by Daneil W lewies, Pearson.
4. Internet of things -A hands on Approach, ArshdeepBahga, Universities press.



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PEC424

With effect from academic year 2022-23  
Digital Forensics

Credits : 3

Instruction 3L hrs per week  
CIE 31 marks

Duration of SEE 3 hours  
SEE 70 marks

### Course Objectives

1. Understand the basic digital forensics and techniques for conducting the forensic examination on different digital devices.
2. Understand how to examine computing investigations
3. Understand data acquisition
4. Understand processing crimes
5. Understand forensics tools

### Course Outcomes

1. Know how to apply forensic analysis tools to recover important evidence for identifying computer crime.
2. To be well-trained as next-generation computer crime investigators.
3. Learn data acquisition
4. Learn processing crimes
5. Learn forensics tools

### Unit -I

Computer forensics fundamentals, Benefits of forensics, computer crimes, computer forensics evidence and courts, legal concerns and private issues.

### Unit- II

Understanding Computing Investigations – Procedure for corporate High-Tech investigations, understanding data recovery work station and software, conducting and investigations.

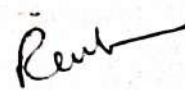
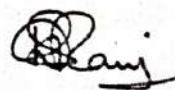
### Unit-III

Data acquisition- understanding storage formats and digital evidence, determining the best acquisition method, acquisition tools, validating data acquisitions, performing RAID data acquisitions, remote network acquisition tools, other forensics acquisitions tools.

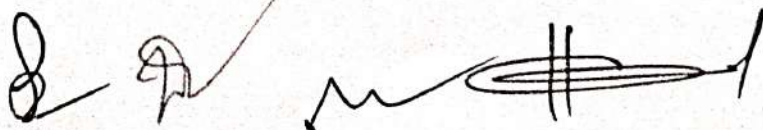
### Unit-IV

Processing crimes and incident scenes, securing a computer incident or crime, seizing digital evidence at scene, storing digital evidence, obtaining digital hash, reviewing case.

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## Unit-V

Current computer forensics tools- software, hardware tools, validating and testing forensic software, addressing data-hiding techniques, performing remote acquisitions, E-Mail investigations- investigating email crime and violations, understanding E-Mail servers, specialized E-Mail forensics tool.

### Suggested Readings

1. Warren G. Kruse II and Jay G Heiser, "Computer Forensics: Incident Response Essentials", Addison Wesley, 2002
2. Nelson, B, Phillips, A, Enfinger, F, Stuart, C., "Guide to Computer Forensics and Investigations, 2nd ed., Thomson Course Technology, 2006, ISBN: 0-619-21706-5.
3. Vacca, J, *Computer Forensics, Computer Crime Scene Investigation*, 2<sup>nd</sup> Ed, Charles River Media, 2005, ISBN: 1-58450-389.



  
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OE431

With effect from academic year 2022-23  
Professional Ethics

Credits : 3

Instruction 3L hrs per week  
CIE 30 marks

Duration of SEE 3 hours  
SEE 70 marks

### Course Objectives

1. Learn the developments of legal profession in India
2. Study the seven lamps of advocacy
3. Understand disciplinary proceedings
4. Comprehend the accountancy for lawyers
5. Gain insights into safety and risk

### Course Outcomes

1. Explain the developments of legal profession in India
2. Describe the seven lamps of advocacy
3. Elaborate disciplinary proceedings
4. Elucidate the accountancy for lawyers
5. Discuss insights into safety and risk

### UNIT-I

Development of Legal Profession in India — Advocates Act, 1961 — Right to Practice — a right or privilege? -- Constitutional guarantee under Article 19(1) (g) and its scope — Enrolment and Practice — Regulation governing enrolment and practice — Practice of Law — Solicitors firm — Elements of Advocacy.

### UNIT-II

Seven lamps of advocacy — Advocates duties towards public, clients, court, and other advocates and legal aid ; Bar Council Code of Ethics.

### UNIT-III

Disciplinary proceedings --- Professional misconduct — Disqualifications — Functions of Bar Council of India/State Bar Councils in dealing with the disciplinary proceedings — Disciplinary Committees -- Powers and functions - Disqualification and removal from rolls.

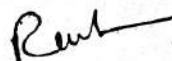
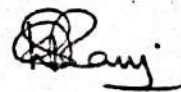
### UNIT-IV

Accountancy for Lawyers - Nature and functions of accounting — Important branches of accounting — Accounting and Law – Bar - Bench Relations.

### UNIT- V

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

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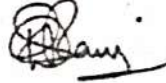
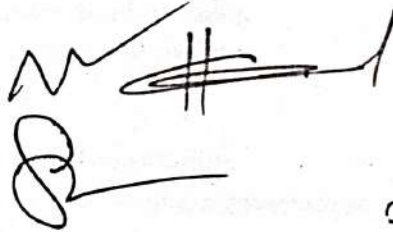
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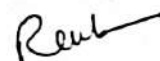
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### Suggested Readings

1. Myneni S.R, Professional Ethics, Accountancy for Lawyers and Bench-Bar Relation, Asia
2. Gupta S.P, Professional Ethics, Accountancy for Lawyers and Bench-Bar Relation, Asia Law House, Hyderabad.
3. Kailash Rai, Professional Ethics, Accountancy for Lawyers and Bench-Bar Relation, Allahabad Law Agency.
4. Siroh, Professional Ethics, Central Law Publications, Allahabad.
5. Ramachandra Jha, Selected Judgements on Professional Ethics, Bar Council of India Trust.



  
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OE432

With effect from academic year 2022-23  
Constitution of India

Instruction 3L hrs per week  
CIE 30 marks

Credits : 3

Duration of SEE 3 hours  
SEE 70 marks

### Course Objectives

1. Learn the basics of the constitution
2. Understand the structure of the union government
3. Comprehend the state government structure
4. Gain insights into local administration
5. Study about the election commission

### Course Outcomes

1. Explain the basics of the constitution
2. Elucidate the structure of the union government
3. Elaborate the state government structure
4. Describe the local administration
5. Discuss the election commission

### Unit 1 – The Constitution - Introduction

- The History of the Making of the Indian Constitution
- Preamble and the Basic Structure, and its interpretation
- Fundamental Rights and Duties and their interpretation
- State Policy Principles

### Unit 2 – Union Government

- Structure of the Indian Union
- President – Role and Power
- Prime Minister and Council of Ministers
- Lok Sabha and Rajya Sabha

### Unit 3 – State Government

- Governor – Role and Power
- Chief Minister and Council of Ministers
- State Secretariat

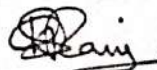
### Unit 4 – Local Administration

- District Administration
- Municipal Corporation
- Zila Panchayat

### Unit 5 – Election Commission

- Role and Functioning
- Chief Election Commissioner
- State Election Commission

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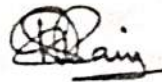

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### Suggested Readings

1. Ethics and Politics of the Indian Constitution Rajeev Bhargava Oxford University Press, New Delhi, 2008
2. The Constitution of India B.L. Fadia Sahitya Bhawan; New edition (2017)
3. Introduction to the Constitution of India DD Basu Lexis Nexis; Twenty-Third 2018 edition

### Suggested Software/Learning Websites

1. <https://www.constitution.org/cons/india/const.html>
2. <http://www.legislative.gov.in/constitution-of-india>
3. <https://www.sci.gov.in/constitution>
4. <https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/>



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With effect from academic year 2022-23

OE433

**Disaster Management**

**Credits : 3**

Instruction 3L hrs per week

Duration of SEE 3 hours

CIÉ 30 marks

SEE 70 marks

**Course Objectives**

1. To learn about various types of natural and man-made disasters.
2. To know pre- and post-disaster management for some of the disasters.
3. To know about various information and organisations in disaster management in India.
4. To get exposed to technological tools and their role in disaster management.

**Course Outcomes**

After competing this course, student will be

1. Acquainted with basic information on various types of disasters
2. Knowing the precautions and awareness regarding various disasters
3. Decide first action to be taken under various disasters
4. Familiarised with organisation in India which are dealing with disasters
5. Able to select IT tools to help in disaster management

**Unit – I: Understanding Disaster**

Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity, Disaster and Development, and disaster management.

**Unit – II: Types, Trends, Causes, Consequences and Control of Disasters -**

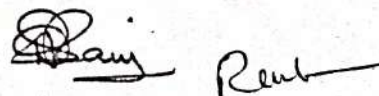
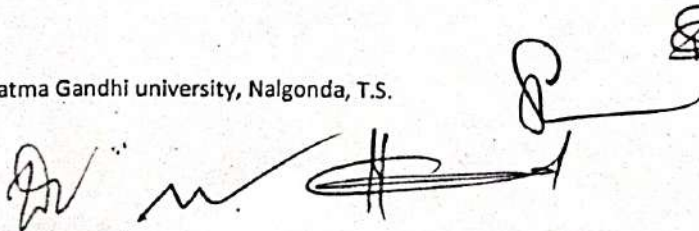
Geological Disasters (earthquakes, landslides, tsunamis, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire); Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters) Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters.

**Unit- III: Disaster Management Cycle and Framework**

Disaster Management Cycle – Paradigm Shift in Disaster Management.

Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness. During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation – Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action.

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#### Unit- IV: Disaster Management in India

Disaster Profile of India – Mega Disasters of India and Lessons Learnt.

Disaster Management Act 2005 – Institutional and Financial Mechanism,

National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national), Non-Government and Inter Governmental Agencies

#### Unit- V: Applications of Science and Technology for Disaster Management

Geo-informatics in Disaster Management (RS, GIS, GPS and RS). Disaster Communication

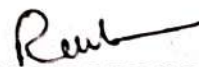
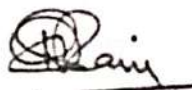
System (Early Warning and Its Dissemination). Land Use Planning and Development

Regulations, Disaster Safe Designs and Constructions, Structural and Non Structural

Mitigation of Disasters, S&T Institutions for Disaster Management in India

#### Suggested Readings

1. Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management
2. Bhandani, R. K., An overview on natural & man-made disasters and their reduction, CSIR, New Delhi
3. Srivastava, H. N., and Gupta G. D., Management of Natural Disasters in developing countries, Daya Publishers, Delhi
4. Alexander, David, Natural Disasters, Kluwer Academic London
5. Ghosh, G. K., Disaster Management, A P H Publishing Corporation
6. Murthy, D. B. N., Disaster Management: Text & Case Studies, Deep & Deep Pvt. Ltd.



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OE434

With effect from academic year 2022-23  
Management Information System

Instruction 3L hrs per week  
CIE 30 marks

Credits : 3

Duration of SEE 3 hours  
SEE 70 marks

**Course Objectives :** The students will be able to

1. To understand the basic principles and working of information technology
2. Describe the role of Information technology in business
3. To understand knowledge representation methods to make business more competitive.

**Course Outcomes:** After completing the course, the students will be able to

1. Understand and apply the fundamental concepts of information systems.
2. Develop the knowledge about management of information systems.
3. Recommend the use of information technology to solve business problems.

#### UNIT-I

An Introduction to concepts of System and Organizations. Strategic uses of Information Technology, Business Process in Engineering and Information Technology.

#### UNIT-II

Applications of Operational Information Systems to Business, Tactical and Strategic Information System to Business.

#### UNIT-III

Information Systems Planning, approach to System Building Alternative Application Development.

#### UNIT-IV

Managing Knowledge, Knowledge Management in the Organization, Enhancing Management Decision-Making, DSS, GDSS, and ESS.

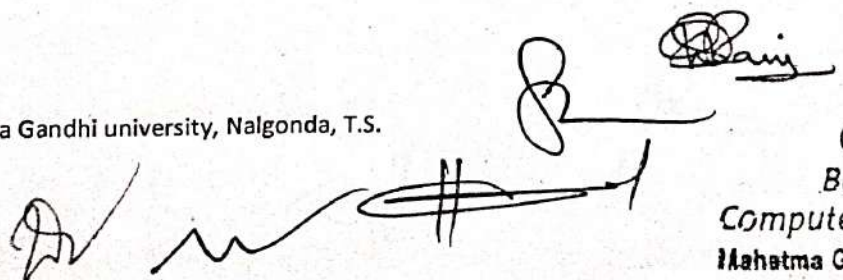
#### UNIT-V

Management of Information Systems, Information System security and control, Ethical issue, managing firm infrastructure and Enterprise system.

#### Suggested Reading:

1. Robert Schultheis, Mary Summer, "Management Information Systems – The Manager's view", Tata McGraw Hill, Fourth Edition, 2006.
2. Kenneth G. Loudon, Jane P Loudon, "Management Information System", Prentice Hall, 2008.
3. Ralph Stair, George Reynolds "Principles of Information Systems", Cengage Learning 2008.
4. James A, O'Brien, "Management Information Systems", Tata McGraw Hill, Sixth Edition, 2004.

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OE435

With effect from academic year 2022-23  
**Intellectual Property and Cyber Law**

Credits : 3

Instruction 3L hrs per week  
CIE 30 marks

Duration of SEE 3 hours  
SEE 70 marks

### Course Objectives

1. Learn the fundamentals of intellectual property
2. Study the basics of international instruments of IPR
3. Understand the laws concerning copyright in India
4. Comprehend the IP in trademarks
5. Gain insights into the concept of patent

### Course Outcomes

1. Explain the fundamentals of intellectual property
2. Elaborate the basics of international instruments of IPR
3. Describe the laws concerning copyright in India
4. Discuss the IP in trademarks
5. Explain the concept of patent

### UNIT-I

Meaning, Nature, Classification and protection of Intellectual Property, The main forms of Intellectual Property, Copyright, Trademarks, Patents, Designs (Industrial and Layout), Geographical Indications Plant Varieties Protection and Biotechnology

### UNIT-II

Introduction to the leading International instruments concerning Intellectual Property Rights, The Berne Convention, Universal Copyright Convention, The Paris Union, Patent Cooperation Treaty, The World Intellectual Property Organization (WIPO) and the UNEESCO, International Trade Agreements concerning IPR, WTO, TRIPS.

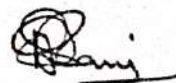
### UNIT-III

Select aspects of the Law of Copyright in India The Copy Right Act, 1957 Historical evolution, Meaning of copyright, Copyright in literary, dramatic and musical works, computer programmes and cinematograph films, Neighbouring rights, Rights of performers and broadcasters, etc., Ownership and Assignment of copyright, Author's special rights, Notion of infringement, Criteria of infringement Infringement of copyright in films, literary and dramatic works, Authorities under the Act, Remedies for infringement of copyright.

### UNIT-IV

Intellectual Property in Trademarks and the rationale of their protection - The Trade Marks Act. 1999 — Definition of Trademarks — Distinction between Trademark and Property Mark - Registration — Passing off — Infringement of Trademark — Criteria of Infringement — Remedies. The Designs Act, 2000 -- Definition and characteristics of Design — Law in India

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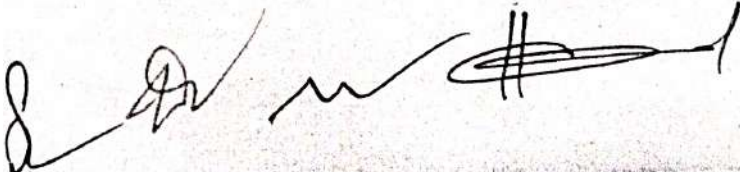
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— Protection and rights of design holders -- Copyright in design — Registration — Remedies for infringement.

#### UNIT-V

Patents — Concept of Patent — Historical overview of the Patents Law in India — Patentable Inventions — Kinds of Patents — Procedure for obtaining patent — The Patents Act, 1970 — Rights and obligations of a patentee — Term of patent protection — Use and exercise of rights — Exclusive Marketing Rights — Right to Secrecy — The notion of 'abuse' of patent rights — Infringement of patent rights and remedies available.

#### Suggested Readings

1. P. Narayanan, Patent Law, Eastern Law House, 1995.
2. Roy Chowdhary, S.K. & Other, Law of Trademark, Copyrights, Patents and Designs, Kamal Law House, 1999.
3. Dr. G.B. Reddy, Intellectual Property Rights and the Law, 5<sup>th</sup> Edition, Gogia Law Agency, 2005.



  
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OE436

Instruction 3L hrs per week  
CIE 30 marks

With effect from academic year 2022-23  
**Environmental Science**

Credits : 3

Duration of SEE 3 hours  
SEE 70 marks

### Course Objectives

1. Learn the scope and importance of environmental studies
2. Study about the environment and natural resources
3. Understand the environmental pollution
4. Comprehend the regional and sectoral issues concerning environment
5. Gain insights into social issues and the environment

### Course Outcomes

1. Explain the scope and importance of environmental studies
2. Elaborate the environment and natural resources
3. Describe the environmental pollution
4. Discuss the regional and sectoral issues concerning environment
5. Explain the social issues and the environment

### UNIT-I

Environmental Studies: Introduction - Definition, Scope and Importance - Basic principle of ecosystem functioning - Concept of ecosystem, structure and functioning of ecosystem, introduction and characteristic features, structures and functions, different ecosystems. Biodiversity and its conservation: Introduction - Bio-geographical classification of India. Value of biodiversity - consumptive and predictive use, social, ethical and optional values. Biodiversity - Global, National and local levels. Hot spots of biodiversity - Threats to biodiversity - Endangered and endemic species of India - Conservation of biodiversity - In-situ and Ex-situ conservant.

### UNIT-II

Environmental and Natural Resources: Forest resources - Use and over-exploitation, Deforestation, Timber extraction, Mining and dams - their effects on forests and tribal people. Water resources - Use and over-utilization of surface and ground water, floods, droughts, conflicts over water, dams - effects of extracting and using mineral resources. Food resources - World food problems - change caused by agricultural and overgrazing, effects of modern agricultural fertilizer pesticide problems, water logging and salinity. Environmental Valuation: Welfare measure and environmental values, definition and classification of environmental values, valuation methods. Environmental Economics: Economic approach to environmental preservation and conservation, property rights and externalities, management of natural resources.

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### UNIT-III

Environmental Pollution: Causes, effects and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution.

Environmental Problems in India: Effects of human activities on the quality of life, Water and River, Ground water, Wasteland reclamation.

### UNIT-IV

Regional and Sectoral Issues: Urbanization, Agro-forestry, Dry lands, Goods and services, Mountain development, River basin water resources management. sustainable tourism, and Costal zone management. Environment and Development: The economy and environment interaction, State of the Environment - Economics of development; Preservation and conservation.

Sustainability: Theory and Practice, Equitable use of resources for sustainable life styles - Role of an individual in prevention of pollution.

Human Population and the Environment: Population growth and environment - Human Rights.

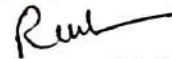
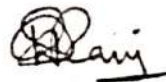
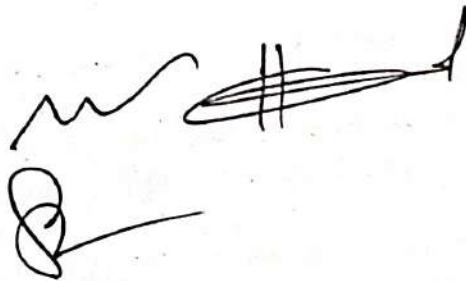
### UNIT-V

Social Issues and the Environment: Sustainable Development - Resettlement and rehabilitation of people and its problems and concerns.

Environmental ethics: Issues and possible solutions-Consumerism and waste products - Public awareness. Sustainable resources management. Design of Environmental Policy -- Direct regulation by Government - Command and control instrumentation.

### Suggested Readings

1. B. Sudhakara Reddy, T. Sivaji Rao, U. Tataji & K. Purushottam Reddy, An Introduction to Environmental Studies, Maruti Publications.
2. C. Manohar Chary and P. Jayaram Reddy, Principles of Environmental Studies, B.S. Publications, Hyderabad.
3. Y. Anjaneyulu, Introduction to Environmental Science, B.S. Publications, Hyderabad.



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OE437

With effect from academic year 2022-23

E-Commerce

Credits : 3

Instruction 3L hrs per week  
CIE 30 marks

Duration of SEE 3 hours  
SEE 70 marks

**Course Objectives:**

1. Discuss the E-Commerce Process.
2. Identify the major Electronic Payment issues and options.
3. To discuss challenging needs of society in the field of E-Commerce online transactions by innovative problem solving, eradicating threats.

**Course Outcomes:**

After completion of the subject, Students will be able to

1. Understand the foundations and importance of E-Commerce.
2. Analyze the impact of E-Commerce on business models and strategies
3. Understand legal issues and privacy in E-Commerce

**UNIT – I**

Electronic Commerce – Electronic Commerce Frame Work , Electronic Commerce and Media Convergence, Anatomy of E- Commerce appellations, Electronic Commerce Consumer applications, Electronic Commerce Organization Applications.  
Consumer Oriented Electronic Commerce – Consumer- Oriented Applications, Mercantile Process Models, Mercantile Models from the Consumers's Perspective., Mercantile Models from the Merchants's Perspective.

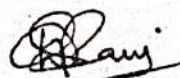
**UNIT – II**

Electronic Payment systems – Types of Electronic Payment Systems, Digital Token – Based Electronic Payment Systems , Smart Cards Electronic Payment Systems, Credit Card- Based Electronic Payment Systems, Risk and Electronic Payment systems , Designing Electronic Payment Systems .

**UNIT – III**

Inter Organizational Commerce And EDI- Electronic Data Interchange , EDI applications in business, EDI :Legal, Security, and Privacy issues, EDI and Electronic Commerce EDI Implementation, MIME , and Value added net works.-Standardization and EDI, EDI Software Implementation, EDI Envelope for Message Transport, Value-Added Networks, Internet-Based EDI.  
Intra organizational Electronic Commerce – Internal Information Systems, Work Flow Automation and Coordination, Customization and internal Commerce, Supply chain Management.

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#### UNIT – IV

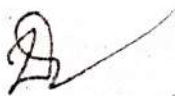
Corporate Digital Library – Dimensions of Internal electronic Commerce Systems, Types of Digital Documents, Issues behind Document Infrastructure, Corporate Data Warehouse Advertising and Marketing on the Internet – Information based marketing, advertising on Internet, on-line marketing process, market research.

#### UNIT –V

Consumer Search and Resource Discovery – Search and Resource Discovery paradigms, Information search and Retrieval, Electronic Commerce catalogues or Directories, information filtering, Consumer-Data Interface: Emerging Tools. Multimedia and Digital Video- key multimedia concepts, Digital Video and Electronic Commerce, Desktop video processing, Desktop video conferencing.

#### Suggested Readings

1. Ravi Kalakota & A . B. Whinston – “ *Frontiers of Electronic Commerce*”, Pearson Education, India, 2006
2. Daniel Minoli, Emma Minoli: “ *Web Commerce Technology Handbook*” Tata McGraw Hill 2007
3. J Christopher W, Theodore HKC, Global Electronic Commerce: Theory and Case Studies. Universities Press, 2001



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Proj401

With effect from academic year 2022-23

Project Work

Credits : 12

Instruction 24hrs per week  
CIE 50 marks

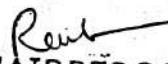
Duration of SEE 3 hours  
SEE 100 marks

Project has to be carried out by each student individually in a period of 15 weeks of duration. Students should submit a synopsis at the end of 2<sup>nd</sup> week in consultation with the Project Guide. The synopsis should consist of definition of the problem, scope of the problem and plan of action. After completion of eight weeks students are required to present a Project Seminar on the topic covering the aspects of analysis, design and implementation of the project work.

At the end of the semester the students are required to present themselves for a University Viva-voce examination. Evaluation guidelines for the award of SEE marks are mentioned in the Rules and Regulations book.

A committee consisting of two faculty members of the respective college along with a guide will evaluate the project and award CIE marks.



  
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