



Osmania University

Faculty of Informatics

- Two years MCA Program
Master of Computer Applications

Syllabi for Semesters – III and IV
With Effect from Academic Year 2023 – 2024

Osmania University
Hyderabad

With effect from the academic year 2023-2024

SCHEME OF INSTRUCTION
MASTER OF COMPUTER APPLICATIONS (MCA)
SEMESTER- III

SN o	Course Code	Course Title	Hours/ Week			Scheme of Examination		No of Credits	
						Max Marks	Durati on (hrs)		
THEORY					P			SEE	Cr
1	PCC301	Software Engineering	4	-	-	30	70	3	4
2	PCC302	Computer Networks	4	-	-	30	70	3	4
3	PCC303	Artificial Intelligence	4	-	-	30	70	3	4
4	PCC304	Web Technologies	4	-	-	30	70	3	4
5	PEC**	Professional Elective-I	3	-	-	30	70	3	3
6	PEC**	Professional Elective-II	3	-	-	30	70	3	3
PRACTICALS									
7	LCC351	Computer Networks Lab	-	-	3	25	50	3	1.5
8	LCC352	Software Engineering Lab	-	-	3	25	50	3	1.5
9	LCC353	Web Technologies Lab	-	-	3	25	50	3	1.5
10	SIP321	Summer Internship	-	-	-	50		-	1.5
			20	-	9	305	570	-	28

	Course Code PEC**	Professional Elective -1	
Professional	PEC311	Software Quality & Testing	
Electives	PEC312	Distributed Systems	
	PEC313	Internet of Things	
	PEC314	Image Processing	
	Course Code PEC**	Professional Elective – II	
	PEC321	Network Security	
Professional Electives	PEC322	Cyber Security	

	PEC323	Information Retrieval System	
	PEC324	Natural Language Processing	
Abbreviation	Full Form	Abbrevia	
PCC	Professional Core Course	CIE	Continuous Internal Evaluation
PEC	Professional Elective Course	SEE	Semester End Evaluation
MGC	Management Course	L	Lecture
LCC	Laboratory Core Course	P	Practical

With effect from the academic year 2023-2024

SCHEME OF INSTRUCTION

MASTER OF COMPUTER APPLICATIONS (MCA)

SEMESTER- IV

SN o	Course Code	Course Title	Hours/ Week		Scheme of Examination		No of Credits	
					Max Marks	Durati on (hrs)		
THEORY			L	P		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	2	-	30	70	3	2
PRACTICALS								
4	Proj401	Project Work	-	24	50	100	3	12
		Total	8	24	140	310	-	20

Professional Electives

Course Code PEC**	Professional Elective – III
PEC411	Block Chain Technologies

PEC412	Big Data Analytics
PEC413	Cloud Computing
PEC413	Deep Learning

Course Code PEC**	Professional Elective – IV
PEC421	Distributed Database Systems
PEC422	Digital Forensics
PEC423	Optimization Techniques
PEC424	Enterprise Architecture

Course Code

OE** Open Elective

OE 431 Professional Ethics

OE 432 Constitution of India

OE 433 Disaster Management

OE 434 Organization Behaviour

OE 435 Intellectual Property & Cyber Law OE 436 Environmental Science

With effect from academic year 2023-2024

PCC301 Software Engineering

Credits : 4

Instruction 4L hrs per week Duration of SEE3 hours

CIE30 marks SEE70 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, Software Development Process Models, Project management Process.

Unit II

Software Requirements Analysis and Specification: Value of a good SRS, Requirements Process, 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.

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", 7th Edition, McGraw Hill Higher Education, 2010.
3. Deepak Jain, "Software Engineering", Oxford University Press, 2008.
4. Rajib Mall, "Fundamentals of Software Engineering", 4th Edition, PHI Learning, 2014.
5. Ian Sommerville, "Software Engineering", 10th Edition, Addison Wesley, 2015.

With effect from academic year 2023-2024

PCC302 Computer Networks

Credits : 4

Instruction 4L hrs per week Duration of SEE 3 hours CIE 30 marks 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)

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

With effect from academic year 2023-2024

PCC303 Artificial Intelligence

Credits : 4

Instruction 4L hrs per week Instruction 4L hrs per week CIE 30 marks CIE 30 marks

Course Objectives:

- To familiarize the principles of Artificial Intelligence
- To study the techniques for knowledge representation and inference
- To learn the techniques involved in the creation of intelligent systems
- To study different applications like Game Playing Expert Systems, machine learning and

Course outcomes :

Student will be able to

- Identify problems that are amenable to solution by AI method
- Understand and analyze working of an AI technique
- Formalize a given problem in the language/framework of different AI methods

UNIT-I

Introduction, History, Intelligent Systems, Foundations of AI, Sub-areas of AI, Applications, Problem Solving. State-Space Search and Control Strategies: Introduction, General Problem Solving, Characteristics of Problem, Exhaustive Searches, Heuristic Search Techniques, Iterative-Deepening, A*, Constraint Satisfaction. Game Playing, Bounded Look-ahead Strategy and use of Evaluation Functions, Alpha-Beta Pruning

UNIT – II

Logic Concepts and Logic Programming: Introduction, Propositional Calculus, Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Tableau System in Propositional Logic, Resolution Refutation in Propositional Logic, Predicate Logic, Logic Programming.

Knowledge Representation: Introduction, Approaches to Knowledge Representation, Knowledge Representation using Semantic Network, Knowledge Representation using Frames

UNIT – III

Expert System and Applications: Introduction, Phases in Building Expert Systems, Expert System Architecture, Expert Systems vs Traditional Systems, Truth Maintenance Systems, Application of Expert Systems, List of Shells and Tools. Uncertainty Measure-Probability Theory: Introduction, Probability Theory, Bayesian Belief Networks, Certainty Factor Theory, Dempster-Shafer Theory.

UNIT – IV

Machine-Learning Paradigms: Introduction, Machine Learning Systems, Supervised and Unsupervised Learning, Inductive Learning, Learning Decision Trees (Suggested Reading 2), Deductive Learning, Clustering, Support Vector Machines.

Artificial Neural Networks: Introduction, Artificial Neural Networks, Single-Layer Feed-Forward Networks, Multi-Layer Feed-Forward Networks, Radial-Basis Function Networks, Design Issues of Artificial Neural Networks, Recurrent Networks.

UNIT – V

Advanced Knowledge Representation Techniques: Case Grammars, Semantic Web.

Natural Language Processing: Introduction, Sentence Analysis Phases, Grammars and Parsers, Types of Parsers, Semantic Analysis, Universal Networking Knowledge.

Suggested Readings:

1. Saroj Kaushik, Artificial Intelligence, Cengage Learning, 2011
2. Russell, Norvig, Artificial Intelligence- A Modern Approach, Pearson Education, 2nd Edition, 2004
3. Rich, Knight, Nair, Artificial Intelligence, Tata McGraw Hill, 3rd Edition, 2009

With effect from academic year 2023-2024

PCC304 Web Technologies

Credits : 3

Instruction 4(3L+1T) hrs per week Duration of SEE 3 hours CIE 30 marks 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.

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 Sever 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 Deiterl, Deitel& NIETO, "Internet & World Wide Web - How to Program", Pearson Education, Third Edition, 2004.
- 2 Steven Holzner, "HTML Black Book - Comprehensive Problem Server", Dream Tech Press, 2000.
- 3 B Sosinsky, V Hilley, "Programming the Web - An Introduction", MGH, 2004.
With effect from academic year 2023-2024

PEC311 Software Quality & Testing

Credits : 3

Instruction 3L hrs per week Duration of SEE 3 hours CIE 30 marks 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 secure software 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 blue print, 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.

UNIT- V

Implementing Information Security: Information security, project management, Technical topics of implementation, Non-technical 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.

With effect from academic year 2023-2024

PEC312 Distributed Systems

Credits : 3

Instruction 3L hrs per week Duration of SEE 3 hours CIE 30 marks 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. Comprehend the distributed coordination based system and map reduce

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. Explain distributed coordination based system and map reduce

Unit I

Introduction: Goals and Types of Distributed Systems

Architectures: Architectural Styles, System Architectures, Architectures versus Middleware, and Self

Management in Distributed Systems.

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.

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 Coordination-Based Systems: Introduction to Coordination Models, Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, and Security.

Map-Reduce: Example, Scaling, programming model, Apache Hadoop, Amazon Elastic Map Reduce, Mapreduce.net, Pig and Hive.

Suggested Readings

1. Andrew S. Tanenbaum and Maarten Van Steen, —Distributed Systems‖, PHI 2nd Edition, 2009.
2. R.Hill, L.Hirsch, P.Lake, S.Moshiri, —Guide to Cloud Computing, Principles and Practicell, Springer, 2013.
3. R.Buyya, J.Borberg, A.Goscinski,‖Cloud Computing-Principles and Paradigms‖,Wiley 2013.
With effect from academic year 2023-2024

PEC313 Internet of Things

Credits : 3

Instruction 3L hrs per week Duration of SEE 3 hours CIE 30 marks 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.

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.

With effect from academic year 2023-2024

Credits : 3

Instruction 3L hrs per week Duration of SEE 3 hours CIE 30 marks SEE 70 marks

Course Objectives

1. Understand image processing fundamentals
2. Understand image transforms
3. Understand image enhancement
4. Understand image restoration and feature extraction
5. Understand image reconstruction

Course Outcomes

1. Learn image processing fundamentals
2. Learn image transforms
3. Learn image enhancement
4. Learn image restoration and feature extraction
5. Learn image reconstruction

Unit I

Fundamentals- Need for DIP- Fundamental steps in DIP – Elements of visual perception -Image sensing and Acquisition – Image Sampling and Quantization – Imaging geometry, discrete image mathematical characterization.

Unit II

Image Transforms - Two dimensional Fourier Transform- Properties – Fast Fourier Transform – Inverse FFT, Discrete cosine transform and KL transform.-Discrete Short time Fourier Transform Wavelet Transform- Discrete wavelet Transform- and its application in Compression.

Unit III

Image Enhancement - Spatial Domain: Basic relationship between pixels- Basic Gray level Transformations – Histogram Processing – Smoothing spatial filters- Sharpening spatial filters.
Frequency Domain: Smoothing frequency domain filters- sharpening frequency domain filters Homomorphic filtering.

Unit IV

Image Restoration:- Overview of Degradation models –Unconstrained and constrained restorations Inverse Filtering ,WienerFilter.

Feature Extraction: - Detection of discontinuities – Edge linking and Boundary detection Thresholding- -Edge based segmentation-Region based Segmentation- matching-Advanced optimal border and surface detection- Use of motion in segmentation. Image Morphology – Boundary descriptors- Regional descriptors.

Unit V

Image Reconstruction from Projections: - Need- Radon Transform – Back projection operator Projection Theorem- Inverse Radon Transform.

Suggested Reading

1. Rafael C.Gonzalez& Richard E.Woods – Digital Image Processing – Pearson Education- 2/e – 2004.
2. Anil.K.Jain – Fundamentals of Digital Image Processing- Pearson Education-2003. 3.

B.Chanda&D.DuttaMajumder – Digital Image Processing and Analysis – Prentice Hall of India – 2002

4. William K. Pratt – Digital Image Processing – John Wiley & Sons-2/e, 2004

With effect from academic year 2023-2024

PEC321 Network Security

Credits : 3

Instruction 3L hrs per week Duration of SEE 3 hours CIE 30 marks SEE 70 marks

CourseObjectives

1. Understand the significant aspects of network security
2. Comprehend secret and public key cryptography
3. Learn hash functions and digital signatures
4. Study the digital signatures and smart cards
5. Comprehend the applications of network applications

CourseOutcomes

1. Explain the fundamentals of network security
2. Elaborate the concepts secret and public key cryptography
3. Elucidate the hash functions digital signatures
4. Describe the digital signatures and smart cards
5. Explain the applications of network security

UNIT-I

Introduction: Attributes of Security, Integrity, Authenticity, Non-repudiation, Confidentiality Authorization, Anonymity, Types of Attacks, DoS, IP Spoofing, Replay, Man-in-the-Middle attacks General Threats to Computer Network, Worms, Viruses, -Trojans

UNIT-II

Secret Key Cryptography :DES, Triple DES, AES, Key distribution, Attacks **Public Key Cryptography:** RSA, ECC, Key Exchange (Diffie-Hellman), Java Cryptography Extensions, Attacks

UNIT-III

Integrity, Authentication and Non-Repudiation :Hash Function (MD5, SHA5), Message Authentication Code (MAC), Digital Signature (RSA, DSA Signatures), Biometric Authentication.

UNIT-IV

PKI Interface: Digital Certificates, Certifying Authorities, POP Key Interface, System Security using Firewalls and VPN's.

Smart Cards: Application Security using Smart Cards, Zero Knowledge Protocols and their use in Smart Cards, Attacks on Smart Cards

UNIT-V

Applications: Kerberos, Web Security Protocols (SSL), IPSec, Electronic Payments, E-cash, Secure Electronic Transaction (SET), Micro Payments, Case Studies of Enterprise Security (.NET and J2EE)

Suggested Reading

1. William Stallings, Cryptography and Network Security, 4th Edition. Pearson,. 2009.
2. Behrouz A Forouzan, Cryptography and Network Security, TMH, 2009
3. Joseph MiggaKizza, A Guide to Computer Network Security, Springer, 2010
4. Dario Cataiano, Contemporary Cryptology, Springer, 2010.

With effect from academic year 2023-2024

PEC421 Cyber Security

Credits : 3

Instruction 3L hrs per week Duration of SEE 3 hours CIE 30 marks 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.

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|, 1st edition, Cengage Learning 2011.

With effect from academic year 2023-2024

PEC314 Information Retrieval System

Credits : 3

Instruction 3Lhrs per week Duration of SEE 3 hours CIE 30 marks 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

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. SoumenChakrabarti, —Mining the Web: Discovering Knowledge. from Hypertext Data", Morgan-Kaufmann Publishers, 2002.
4. Christopher D. Manning, PrabhakarRaghavan, HinrichSchGtze, —An Introduction to Information Retrieval, Cambridge University Press, Cambridge, England,-2009.

With effect from academic year 2023-2024

PEC324 Natural Language Processing

Credits : 3

Instruction 3L hrs per week Duration of SEE 3 hours CIE 30 marks 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.

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.

With effect from academic year 2023-2024

LCC351 Computer Networks Lab

Credits : 2

Instruction 3P hrs per week Duration of SEE 3 hours CIE 25 marks 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.

With effect from academic year 2023-2024

LCC352 Software Engineering Lab

Credits : 2

Instruction 3P hrs per week Duration of SEE 3 hours CIE 25 marks 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

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.

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?

- Since minor changes are there, integration of the Enquiry Module and quick system testing on Enquiry module should be done.
- The incorporation of minor changes would have introduced new bugs into other modules, so regression testing should be carried out.
- Since the acceptance testing is already carried out, it is enough if the team performs sanity testing on the Enquire module.
- 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:

- John's quality is better than Mike.
- John's productivity is more than Mike.
- John introduced more defects than Mike.
- John's effort is more than Mike.

With effect from academic year 2023-2024

LCC351 Web Technologies Lab

Credits : 2

Instruction 3P hrs per week Duration of SEE 3 hours CIE 25 marks SEE 50 marks

1. Develop College Website using XHTML and CSS.
 2. Develop HTML form with client validations using Java Script.
 3. Publishing XML document using XSLT
 4. XML document processing using SAX and DOM.
 5. Text processing using Regular expressions and pattern matching.
 6. Develop form processing application using CGI.pm
 7. Develop CGI-Perl Web application with State and Session Tracking. 8.
- Develop a simple Java servlet application.
9. Develop Java servlet application with session tracking
 10. Develop a simple JSP application.
 11. Creation of an application access database with JDBC
 12. Develop full fledged web application with database access spreading over to 3 sessions.

SIP321 Summer Internship*

Credits : 2

Instruction 6-week
CIE 50 marks

Program Description

The Internship Program allows MCA students to gain practical experience in the workplace before receiving their graduate degrees. The internship is a required academic course. The student identifies companies willing to hire him/her on a full time basis for a 6-week period (minimum required), usually in the summer. The Internship Program supervises the students and awards academic credits (2) upon successful completion of all the required assignments.

Intended Learning Outcomes

Upon successful completion of the internship, you should be able to

1. Communicate a practical understanding of how a technology actually operates
2. Demonstrate the ability to integrate and apply theoretical knowledge and skills developed in various courses to real-world situations in a business organization
3. Exhibit the ability to effectively work in a professional environment and demonstrate work ethic and commitment in a work-based environment
4. Demonstrate the ability to successfully complete internship assignments.
5. Reflect on personal and professional development needs and set strategic goals for advancing along an intended career path
6. Communicate effectively in a professional environment in both English and regional language, orally

and in writing.

OU-MCA Submitted for Approval With effect from the academic year 2023-2024

SCHEME OF INSTRUCTION
MASTER OF COMPUTER APPLICATIONS (MCA)
SEMESTER- IV

SN o	Course Code	Course Title	Hours/ Week		Scheme of Examination		No of Credits	
					Max Marks	Durati on (hrs)		
THEORY			L	P			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	2	-	30	70	3	2
PRACTICALS								
4	Proj401	Project Work	-	24	50	100	3	12
		Total	8	24	140	310	-	20

Professional Electives

Course Code PEC**	Professional Elective – III
PEC411	Block Chain Technologies
PEC412	Big Data Analytics
PEC413	Cloud Computing
PEC413	Deep Learning

Course Code PEC**	Professional Elective – IV
PEC421	Distributed Database Systems
PEC422	Digital Forensics
PEC423	Optimization Techniques
PEC424	Enterprise Architecture

Course Code

OE** Open Elective

OE 411 Professional Ethics

OE 412 Constitution of India

OE 413 Disaster Management

OE 414 Organization Behaviour

OE 415 Intellectual Property & Cyber Law OE 416 Environmental Science

With effect from academic year 2023-2024

PEC411 Block Chain Technologies

Credits : 3

Instruction 3L hrs per week Duration of SEE3 hours CIE30 marks 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.

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.

With effect from academic year 2023-2024

PEC412 Big Data Analytics

Credits : 3

Instruction 3L hrs per week Duration of SEE 3 hours CIE 30 marks 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 MapReduceFramework ,Exploring thefeaturesofMapReduce,WorkingofMapReduce,TechniquestooptimizeMapReduceJobs,Hardware/Network Topology, Synchronization, File system, Uses of MapReduce, Role of HBase in BigDataProcessing-Characteristics ofHBase.

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

UNIT- IV

Storing Data in Databases and Data Warehouses:RDBMS and Big Data, Issues with RelationalModel,Non-RelationalDatabase,IssueswithNonRelationalDatabase,PolyglotPersistence,IntegratingBig DatawithTraditional Data Warehouse, BigDataAnalysis andData 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 DataModel,Graph Databases,Schema-Less Databases,MaterializedViews,CAPTheorem.

SuggestedReading

1. BIGDATA, BlackBookTM, DreamTechPress, 2016Edition.
2. Seema Acharya, SubhasniChellappan , —BIG DATA and ANALYTICS|,Wiley publications,2016
3. NathanMarzandJamesWarren,—BIGDATA PrinciplesandBestPracticesofScalableReal-TimeSystemsl, 2010
With effect from academic year 2023-2024

PEC413 Cloud Computing

Credits : 3

Instruction 3L hrs per week Duration of SEE 3 hours CIE 30 marks SEE 70 marks

CourseObjectives

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

CourseOutcomes

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,Benefitsandchallenges,Cloudcomputingservices,ResourceVirtualization,Resourcepoolingsha

ring and provisioning, Case study of Iaas, Paas and Saas

Unit-II

ScalingintheCloud,CapacityPlanning,LoadBalancing,FileSystemandStorage, Containers

Unit-III

Multi

tenantSoftware,DatainCloud,DatabaseTechnology,ContentDeliveryNetwork,SecurityReferenceModel , SecurityIssues, Privacyand ComplianceIssues

Unit-IV

Portabilityand InteroperabilityIssues,CloudManagementandaProgrammingModelCaseStudy,Popular Cloud Services

Unit-V

EnterprisearchitectureandSOA,EnterpriseSoftware,EnterpriseCustomApplications,Workflow and Business Processes, Enterprise Analytics and Search, Enterprise CloudComputingEcosystem.

SuggestedReading

1. CloudComputing-Sandeep Bhowmik, Cambridge UniversityPress, 2017.
2. EnterpriseCloudComputing-Technology,Architecture,ApplicationsbyGautamShroff,Cambridge UniversityPress, 2016.
3. Kai Hwang, Geoffrey C.Fox, Jack J.Dongarra, —Distributed and Cloud Computing FromParallelProcessing to theInternet of Things, Elsevier,2012.

With effect from academic year 2023-2024

PEC414 Deep Learning

Credits : 3

Instruction 3L hrs per week Duration of SEE 3 hours CIE 30 marks 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)

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, Yoshuabengio, Aaron courville, —Deep learning

Zhang, Aston, et al. "Dive into deep learning." arXiv preprint arXiv:2106.11342 (2021).

PE 624CS

DISTRIBUTED DATABASES SYSTEMS (Professional Elective-II)

Instruction: 3L hrs per week CIE: 30 Marks

Credits: 3

Course Objectives:

Duration of SEE: 3 hours

SEE: 70 Marks

The aim of the course is to

With effect from academic year 2023-2024

- Enhance the previous knowledge of database systems by deepening the understanding of the theoretical and practical aspects of the database technologies, and showing the need for distributed database technology to tackle deficiencies of the centralized database systems;
- Introduce basic principles and implementation techniques of distributed database systems, • Expose active and emerging research issues in distributed database systems and application development,
- Apply theory to practice by building and delivering a distributed database query engine, subject to remote Web service calls.

Course Outcomes:

After the completion of the course, the students are expected to

1. Get familiar with the currently available models, technologies for and approaches to building distributed database systems and services;
2. Have developed practical skills in the use of these models and approaches to be able to select and apply the appropriate methods for a particular case;
3. Be aware of the current research directions in the field and their possible outcomes;
4. Be able to carry out research on a relevant topic, identify primary references, analyze them, and come up with meaningful conclusions
5. Be able to apply learned skills to solving practical database related tasks.

UNIT- I

Introduction: Database-System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Design, Object-Based and Semistructured Databases, Data Storage and Querying, Transaction Management, Data Mining and Analysis, Database Architecture, Database Users and Administrators, History of Database Systems.

Relational Model: Structure of Relational Databases, Fundamental Relational-Algebra Operations, Additional Relational-Algebra Operations, Extended Relational-Algebra Operations, Null Values, Modification of the Database.

UNIT-II

Query Processing: Overview, Measures of query cost, Selection operation, sorting, Join operation, other operations, Evaluation of Expressions.

Query Optimization: Overview, Transformation of Relational expressions, Estimating statistics of expression results, Choice of evaluation plans, Materialized views.

UNIT-III

Parallel Systems: Speedup and Scaleup, Interconnection Networks, Parallel Database Architectures.

Parallel Databases: Introduction, I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Interoperation Parallelism, Intraoperation Parallelism, Design of Parallel Systems.

UNIT-IV

Distributed Databases: Reference architecture for DDB, Types of Data Fragmentation, Distribution Transparency for Read-only applications, Distribution Transparency for Update

applications, Distributed

Database Access Primitives, Integrity Constraints in DDB.

Distributed Database Design: A frame work for Distributed Database Design, The design of Database fragmentation, The allocation of fragmentation.

UNIT-V

Translation of Global Queries to Fragment Queries: Equivalence transformations for queries, Transforming global queries into fragment queries, Distributed grouping and aggregate function evaluation, Parametric queries.

Optimization of Access Strategies: Access Control Models, Database Security, A framework for query optimization, Join queries, General queries.

Suggested Reading:

1. Silberschatz A, Korth HF, Sudarshan S, *Database System Concepts*, McGraw-Hill International Edition, 5th Edition, 2006.

2. Ceri S, Pelagatti G, *Distributed Databases: Principles and Systems*, McGraw-Hill International Edition, 1984.

With effect from academic year 2023-2024

PEC422 Digital Forensics

Credits : 3

Instruction 3L hrs per week Duration of SEE 3 hours CIE 30 marks 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*, 2nd Ed, Charles River Media, 2005, ISBN: 1-58450-389.

PEC423

With effect from academic year 2023-2024 **Optimization Techniques**

Credits : 3

Instruction 3L hrs per week Duration of SEE 3 hours CIE 30 marks 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

Unit IV

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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 P)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.

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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With effect from academic year 2023-2024

PEC424 Enterprise Architecture

Credits : 3

Instruction 3L hrs per week Duration of SEE 3 hours CIE 30 marks 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. 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

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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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>
5. Spark : The Definite Guide – Bill Chambers, Matei Zaharia, 2018.

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With effect from academic year 2023-2024

OE431 Professional Ethics

Credits : 2

Instruction 2L hrs per week Duration of SEE 3 hours CIE 30 marks 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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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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With effect from academic year 2023-2024

OE432 Constitution of India

Credits : 2

Instruction 2L hrs per week Duration of SEE 3 hours CIE 30 marks 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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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 2023-2024

OE433 Disaster Management

Credits : 2

Instruction 2L hrs per week Duration of SEE 3 hours CIE 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, tsunami, 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.

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

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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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With effect from academic year 2023-2024

OE434 Organization Behaviour

Credits : 2

Instruction 2L hrs per week Duration of SEE 3 hours CIE 30 marks SEE 70 marks

Course Objectives

1. Learn management process and functions
2. Study decision making and negotiations
3. Comprehend psychological contract
4. Understand models of organization behaviour
5. Gain insights into organization design

Course Outcomes

1. Explain management process and functions
2. Discuss decision making and negotiations
3. Describe psychological contract
4. Elaborate models of organization behaviour
5. Elucidate the organization design

UNIT I

Management Process and Functions, Scientific and Modern Management, 3D Model of

Managerial Behavior - MBO - MBWA - Line and Staff - The Peter's Principle - Parkinson's Law - Approaches to Organization Structure-Management - Classical, Human Relations, Systems and Contingency Approaches, Hawthorne's Experiments - Human Engineering.

UNIT II

Decision Making and Negotiations: Approaches to Decision making - Rational, Behavioral, Practical, and Personal Approaches - Open and Closed Models of Decision Making, Types and steps in planning, Authority, Responsibility, Centralization, Decentralization and Recentralization, Bureaucracy.

UNIT III

Psychological contract - Personality Traits, Big 5 personality traits, MBTI inventory, the Process of Perception - Perceptual distortions and errors, Kelly's personal construct Theory, Motivation-Content Theories: Maslow, Alderfer, Herzberg, McClelland. Process Theories: Vroom, Potter and Lawler, Equity Theory - Goal Theory - Attribution Theory.

UNIT IV

Models of Organization Behavior - Autocratic, Custodial, Supportive, Collegial and System Models, Transactional Analysis, Johari Window. Group Dynamics: Typology of Groups - Conflicts in groups - The nature, of conflict - Reactions to conflict - A model of conflict. Trait and Behavioral Approaches to Leadership, Managerial Grid, Path-Goal Theory, Vroom's Decision Tree Approach to Leadership - Hersey and Blanchard Model.

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UNIT V

Organization Design, Organization culture and organization climate, Stress Management and Counseling, Management of change and organization development. Communication - Emerging aspects of OB.

Suggested Readings

1. Harold Koontz and Heinz Weihrich, Essentials of Management, 9th Edition, McGraw Hill Education, 2015.
2. Curtis W. Cook and Phillip L. Hunsaker, Management and Organizational Behavior, 3rd Edition, McGraw-Hill, 2010.

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With effect from academic year 2023-2024

OE435 Intellectual Property and Cyber Law

Credits : 2

Instruction 2L hrs per week Duration of SEE 3 hours CIE 30 marks 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 UNESCO, 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

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Act, 2000 -- Definition and characteristics of Design — Law in India — 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 ,5th Edition, Gogia Law Agency, 2005.

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With effect from academic year 2023-2024

OE436 Environmental Science

Credits : 2

Instruction 2L hrs per week Duration of SEE 3 hours CIE 30 marks 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.

UNIT-III

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

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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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With effect from academic year 2023-2024

Proj401 Project Work

Credits : 12

Instruction 24hrs per week Duration of SEE 3 hours CIE 50 marks 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 2nd 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.

Each student will be required to:

1. Submit one page of synopsis on the project work for display on notice board.
2. Give a 20 minutes presentation followed by 10 minutes discussion.
3. Submit a technical write-up on the project.

At least two teachers will be associated with the Project Seminar to evaluate students for the

award of CIE marks which will be on the basis of performance in all the 3 items stated above.

The project seminar presentations should include the following components of the project:

- Problem definition and specification.
- Literature survey, familiarity with research journals.
- Broad knowledge of available techniques to solve a particular problem.
- Planning of the work, preparation of bar (activity) charts, Presentation both oral and written.

Course Objectives:

The aim of the course is to

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- Enhance the previous knowledge of database systems by deepening the understanding of the theoretical and practical aspects of the database technologies, and showing the need for distributed database technology to tackle deficiencies of the centralized database systems; Introduce basic principles and implementation techniques of distributed database systems
- Expose active and emerging research issues in distributed database systems and application development, Apply theory to practice by building and delivering a distributed database query engine,
- • subject to remote Web service calls. Course Outcomes: After the completion of the course, the students are expected to 1. Get familiar with the currently available models, technologies for and approaches to building distributed database systems and services; 2. Have developed practical skills in the use of these models and approaches to be able to select and apply the appropriate methods for a particular case; 3. Be aware of the current research directions in the field and their possible outcomes; 4. Be able to carry out research on a relevant topic, identify primary references, analyze them, and come up with meaningful conclusions 5. Be able to apply learned skills to solving practical database related tasks.

