Syllabus For

5-Year PG Programme in Computer Applications

Master of Computer Applications [Integrated MCA]

as per

NATIONAL EDUCATION POLICY–2020

Aryavart School of Computer Science and Engineering

Aryavart International University

Tilthai, Dharmanagar, North Tripura-799260

Introduction

In the 21st century, information technology and computer applications have emerged as the foremost drivers of digital transformation, innovation, and economic growth across the globe. Recognising the need for a seamless, industry-aligned pathway into advanced computing careers, Aryavart International University (AIU) offers the Integrated Master of Computer Applications (Integrated MCA) — a five-year (ten-semester) programme admitting students directly after Class XII. The Programme combines undergraduate and postgraduate computing education into a single, continuous academic journey, enabling students to build strong foundational knowledge before progressing to advanced, specialised, and research-oriented coursework.

Aligned with the National Education Policy (NEP) 2020, the Integrated MCA Programme is structured on a multiple entry and multiple exit framework, allowing students to exit with a Certificate, Diploma, Bachelor's Degree, Bachelor's Degree with Honours, or continue through to the Integrated Master's degree. Students may specialise in domains such as Software Engineering, Data Science, Artificial Intelligence & Machine Learning, or Cloud Computing & Cybersecurity. The Programme integrates theoretical learning with industry-oriented practical training, IBM-certified skill modules, live projects, a Minor Project, and a Major Project undertaken in collaboration with leading industry partners.

Programme Objectives

The objectives of the five-year Integrated MCA Programme are:

- To provide students entering directly after Class XII with a strong, progressively built foundation in computing fundamentals, programming paradigms, and software development practices.
- To develop analytical, logical, and algorithmic problem-solving abilities required for effective software design and development.
- To offer a seamless undergraduate-to-postgraduate academic pathway with multiple entry and exit options, in line with NEP 2020.
- To foster an entrepreneurial mindset and innovation through project-based learning, incubation support, and industry interaction.
- To equip students with skills in data structures, database systems, cloud computing, and emerging technologies such as AI and machine learning.
- To build progressive project-execution capability through a Minor Project in the middle years and a Major Project in the final year.
- To inculcate ethical values, data privacy awareness, and professional integrity essential for responsible software practice.
- To prepare students for doctoral research (Ph.D.), competitive examinations, and senior technical leadership roles while facilitating direct industry placement.
- To develop effective communication, teamwork, and project-management skills through seminars, workshops, and group activities.
- To promote research aptitude and knowledge generation through project reports, case studies, and software development assignments across all five years.

Programme Learning Outcomes

On the completion of the Integrated MCA Programme, students will be able to:

✓ Demonstrate comprehensive understanding of core computing functions including programming, databases, networks, and software engineering, built progressively over five years.

✓ Apply computing theories and design frameworks to real-world software development challenges.

✓ Analyse large datasets and generate strategic insights using modern tools and data science techniques.

✓ Design, develop, and document independent software solutions through a Minor Project and a Major Project.

✓ Design and implement software products and start-up ventures, supported by AIU's incubation centre and industry network.

✓ Exhibit professional communication, presentation, and leadership skills essential for technical and managerial roles.

✓ Demonstrate awareness of emerging technology trends, cloud infrastructure, and cybersecurity practices.

✓ Uphold ethical standards and data-protection responsibility in professional conduct.

✓ Qualify for national competitive examinations and pursue doctoral research and advanced technical roles directly after completing the integrated degree.

Need for Curriculum Development

The Integrated MCA curriculum at Aryavart International University is framed in alignment with the UGC guidelines and NEP 2020 to produce industry-ready software professionals and future technology leaders through a single, cohesive five-year pathway. The following factors necessitate a contemporary and flexible curriculum:

Rapidly Evolving Technology Landscape

Rapid changes in programming frameworks, cloud platforms, and user expectations demand that students be trained in emerging technology domains such as artificial intelligence, cybersecurity, DevOps, and full-stack development. The curriculum integrates these evolving domains to bridge the gap between academia and industry, right from the foundational years.

Multiple Entry and Exit Options

In accordance with NEP 2020, the Integrated MCA Programme is designed on a multiple entry and multiple exit framework, allowing students to exit at the end of Year I, II, III, or IV with an appropriate certificate, diploma, or degree, or continue seamlessly to complete the Integrated Master's degree in Year V.

Progressive Project-Based Learning

In place of a mid-programme internship, the curriculum builds project competency through a structured, two-stage approach: a Minor Project undertaken in the later undergraduate years to develop independent design and implementation skills, followed by a comprehensive Major Project in the final year that consolidates learning across the entire programme.

Credit Transfer and Academic Mobility

In line with the UGC's credit transfer provisions under NEP 2020, the Programme enables students to transfer credits between programmes and institutions through the Academic Bank of Credits (ABC), pursue interdisciplinary electives, and take vocational/skill enhancement courses from approved platforms such as IBM SkillsBuild.

Skill Enhancement and Employability

The curriculum places strong emphasis on industry-oriented skill development, IBM-certified modules, hackathons, and live software projects distributed across all five years. Aryavart School of Computer Applications at AIU maintains active collaborations with IBM to ensure that students are trained on tools and competencies demanded by recruiters.

Career Options

The Integrated MCA Programme opens diverse and rewarding career pathways from an early stage. Graduates of AIU's Integrated MCA Programme are equipped to pursue technical and leadership careers including:

- Software Developer / Full-Stack Engineer
- Data Scientist / Data Analyst
- Cloud Engineer / DevOps Engineer
- Artificial Intelligence & Machine Learning Engineer
- Database Administrator / Data Engineer
- Cybersecurity Analyst / Ethical Hacker
- Systems Analyst / IT Consultant
- Mobile Application Developer
- Entrepreneur / Start-up Founder (supported by AIU Incubation Centre)
- Project Manager / Scrum Master

Pedagogy

The Integrated MCA pedagogy at Aryavart International University is designed to create practice-oriented, industry-aligned software professionals and future technology leaders across a five-year continuum. The curriculum employs a blend of traditional and experiential learning methodologies, with increasing depth and specialisation as students progress from Year I to Year V.

Integration of Theory and Practice

Each course balances conceptual foundations with hands-on application. Students engage in coding labs, software project work, hackathons, and industry case studies to translate theoretical knowledge into professional development competencies, beginning in the foundational years and deepening through the senior years.

ICT-Enabled Teaching

Smart classrooms, computing labs, cloud-based development environments, and IBM-powered training platforms are integrated into the instructional design to promote digital fluency and higher-order thinking.

Research-Based Learning

Students undertake year-wise project work — culminating first in a Minor Project and finally in a Major Project — under faculty supervision, fostering analytical rigour and a research temperament consistent with NEP 2020's emphasis on inquiry-based education.

Methods of Instruction

- Lectures by subject experts and industry practitioners
- Seminars, workshops, and guest lectures
- Hands-on programming labs and coding sessions
- Case study analysis and software design exercises
- Minor and Major Project work under faculty mentorship
- IBM SkillsBuild and online certification modules

Methods of Evaluation

- Internal Sessional Examinations (Internal Assessment Exams)
- End Semester Examinations (Theory / Practical)
- Assignments, presentations, and project reports
- Lab-based and software project submissions
- Viva-voce and practical evaluations
- Attendance and class participation

Scheme of Evaluation

A. Integrated MCA — Scheme of Evaluation (Theory Courses)

Component	Sub-component	Marks
Internal Assessment (30 Marks)	Continuous Mode	15
	Internal Assessment Examination (2 Hours)	15
End Semester Examination (Theory)	3 Hours Written Examination	70
TOTAL		**100**

B. Scheme of Evaluation (Practical / Lab Courses)

Applicable to all practical and lab-based courses across all five years of the Integrated MCA Programme:

Component	Sub-component	Lab Exam / Viva	Marks
Internal Assessment (30 Marks)	Assignment / Presentation	Lab-Based Exam	30
End Semester Examination	Practical / Report	Viva-Voce	70
TOTAL			**100**

C. Minor Project — Scheme of Evaluation (100 Marks)

Applicable to students in Year III/IV of the Integrated MCA Programme. The Minor Project is undertaken under faculty guidance to build independent design, development, and documentation skills ahead of the Major Project, and is evaluated for a total of 100 marks.

Component	Sub-component	Mode of Evaluation	Marks
Internal Assessment (30 Marks)	Progress Review / Continuous Mentoring	Continuous Evaluation	30
End Semester Evaluation (70 Marks)	Project Report & Working Model / Application	Presentation & Viva-Voce	70
TOTAL			**100**

D. Seminar — Scheme of Evaluation (100 Marks)

The seminar component is evaluated on a 70:30 basis, comprising 30 marks of internal (continuous) assessment and 70 marks of end-semester evaluation, with the viva-voce forming an integral part of the final seminar presentation.

Component	Sub-component	Mode of Evaluation	Marks
Internal Assessment (30 Marks)	Continuous Mode / Review Presentations	Continuous Evaluation	30
End-Semester Evaluation (70 Marks)	Final Seminar Presentation including Viva-Voce	Presentation & Viva-Voce	70
TOTAL			**100**

E. Major Project — Scheme of Evaluation (200 Marks, External Assessment)

Applicable to students in the 10th Semester (Year V) of the Integrated MCA Programme. The final semester is reserved exclusively for the Major Project, undertaken under faculty guidance and evaluated entirely through external assessment for a total of 200 marks; no internship component is scheduled in this semester.

Component	Sub-component	Mode of Evaluation	Marks
External Assessment (200 Marks)	Project Report Evaluation	External Examiner	140
	Presentation & Viva-Voce	External Viva	60
TOTAL			**200**

Exit Options and Credit Requirements

As per NEP 2020 provisions, students of the five-year Integrated MCA Programme may exit at the end of each year and are awarded the corresponding certificate/degree, or may continue seamlessly through to the Integrated Master's degree:

Exit Option / Completion	Credits	Certificate / Award
Successful completion of Year I (2 Semesters)	40	Undergraduate Certificate in Computer Applications
Successful completion of Year II (4 Semesters)	80	Undergraduate Diploma in Computer Applications
Successful completion of Year III (6 Semesters)	120	Bachelor of Computer Applications (BCA)
Successful completion of Year IV (8 Semesters)	160	BCA (Honours)
Successful completion of Year V (10 Semesters)	200	**Integrated Master of Computer Applications (Integrated MCA)**

Note: Students who exit after Year III (BCA) or Year IV (BCA Honours) and wish to re-enter to complete the Integrated MCA may do so within the maximum permissible period as per AIU's re-admission and Academic Bank of Credits (ABC) policy. The Minor Project is completed prior to exit at Year III/IV; the Major Project is undertaken only by students continuing to Year V.

Internal Assessment: Continuous Mode

The Internal Assessment for the Integrated MCA includes two components: (i) Internal Assessment Examinations and (ii) Continuous Mode Evaluation. The Continuous Mode constitutes 15 marks per theory/practical course and is assessed on an ongoing basis throughout each semester, across all five years, as detailed below.

Integrated MCA — Continuous Mode Assessment (15 Marks)

The Continuous Mode Assessment for the Integrated MCA is conducted on an ongoing basis throughout the semester and comprises the following components, emphasising broad-based computing knowledge, regular engagement, and all-round participation across core technical disciplines:

Sl. No.	Component	Criteria / Basis	Marks
1	Attendance	≥95%: 5 | 94-90%: 4 | 85-89%: 3 | 80-84%: 2 | 75-79%: 1 | <75%: 0	5
2	Assignment / Lab Task / Quiz	Written assignments, coding tasks, or class quiz/test assigned by the course faculty	5
3	Teacher–Student Interaction / Presentation / Viva	Oral interaction, seminar/topic presentation, group discussion, or class participation	5
TOTAL			**15**

Note: Internal Assessment Examinations are conducted twice per semester. The average of the two sessional exams (each of 50 marks, averaged to 15) is taken for the purpose of Internal Assessment. The course faculty shall announce the schedule and modalities of Continuous Mode Assessment at the commencement of each semester.

Course Structure for the Integrated Masters of Computer Application Program as Per NEP 2020								
Semester	**Major Subject (Core Subject) (4 + 2 Credits)**	**Additional/ Interdisciplinary subject/ Multidisciplinary (4 Credits)**	**Skill Course/ Vocational Course (2 Credits)**	**Ability Enhancement Courses (2 Credits)**	**Discipline specific/ Open Elective/Project (4 + 2 Credits)**	**Extracurricular Courses (2 Credits)**	**Value Added Courses/ VAC (2 Credits)**	**Total Credits**
I	Fundamentals of IT with Lab C-Programming with Lab	HTML (with LAB)	PC Hardware/ Office Automation	Business Communication	Not Applicable	Life Skills and Personality Development	Not Applicable	22
II	Object Oriented Programming with C++ with Lab Computer Organisation & Architecture with Lab	Computer Based Numerical Techniques	Linux Programming/ Cyber Security	Environmental Studies	Not Applicable	Not Applicable	Health & Wellness	22
Exit option with Certificate in Computer Application (44 Credits)								
Semester	**Major Subject (Core Subject) (4 + 2 Credits)**	**Additional/ Interdisciplinary subject/ Multidisciplinary (4 Credits)**	**Skill Course/ Vocational Course (2 Credits)**	**Ability Enhancement Courses (2 Credits)**	**Discipline specific/ Open Elective/Project (4 + 2 Credits)**	**Extracurricular Courses (2 Credits)**	**Value Added Courses/ VAC (2 Credits)**	**Total Credits**
III	Data Structure & Algorithm using C with Lab Database Management System with Lab	Fundamentals of Data Science	Modelling & Simulation/ Graph Theory	Not Applicable	Not Applicable	Indian Knowledge System	Human Values & Ethics	22
IV	Computer Networks with Lab Operating Systems with Lab	Python Programming	Software Engineering/ Software Testing	Not Applicable	Not Applicable	Indian Constitution	Drug Abuse, Road Safety & Traffic Rules	22
Exit option with Diploma in Computer Application (88 Credits)								

Semester	Major Subject (Core Subject) (4 + 2 Credits)	Additional/ Interdisciplinary subject/ Multidisciplinary (4 Credits)	Skill Course/ Vocational Course (2 Credits)	Ability Enhancement Courses (2 Credits)	Discipline specific/ Open Elective/Project (4 + 2 Credits)	Extracurricular Courses (2 Credits)	Value Added Courses/ VAC (2 Credits)	Total Credits
V	Automata & Compiler Design with Lab Computer Graphics with Lab	Multimedia Applications	Not Applicable	Not Applicable	DSE-I (Choose any one paper)	Not Applicable	Not Applicable	22
VI	Introduction to Artificial Intelligence with Lab Design Analysis & Algorithm with Lab	E-Commerce	Not Applicable	Not Applicable	DSE-II (Choose any one paper)	Not Applicable	Not Applicable	22
Exit option with a Bachelor of Computer Application (132 Credits)								
VII	Cryptography with Lab Cloud Computing with Lab	R-Programming	Community Engagement	Not Applicable	DSE-III (Choose any one paper)	Not Applicable	Not Applicable	24
VIII	Deep Learning with Lab Wireless & Mobile Computing with Lab	Computer Vision	Not Applicable	Seminar/ Conference	Minor Project*	Not Applicable	Not Applicable	20
Exit option with a Bachelor's Degree in Computer Application with Honours (174 Credits)								
Semester	**Major Subject (Core Subject) (4 + 2 Credits)**	**Additional/ Interdisciplinary subject/ Multidisciplinary (4 Credits)**	**Skill Course/ Vocational Course (2 Credits)**	**Ability Enhancement Courses (2 Credits)**	**Discipline specific/ Open Elective/Project (4 + 2 Credits)**	**Extracurricular Courses (2 Credits)**	**Value Added Courses/ VAC (2 Credits)**	**Total Credits**
IX	Data Warehousing & Mining with Lab Android App Development with Lab	Management Information System	Not Applicable	Not Applicable	Natural Language Processing/ Big Data Analytics	Not Applicable	Not Applicable	22
X	Blockchain Technology with Lab Soft Computing with Lab	Not Applicable	Not Applicable	Not Applicable	Major Project*	Not Applicable	Not Applicable	20
Exit option with an Integrated Masters of Computer Application Degree (216 Credits)								

*Minor Project carries 2 credits and Major Project carries 8 credits.

#One Research/Review Paper to be published in peer-reviewed journal in both 9th and 10th Sem.

Discipline Specific Elective (DSE- I): Choose any one paper

Course Code	Paper Name	L	T	P	Credit	Theory Marks	Internal Marks	Practical Marks	Total Marks
26CS531	ASP.Net	4	0	0	4	70	30	0	100
26CS593	ASP.Net Lab	0	0	2	2	0	30	70	100
26CS532	Java Programming	4	0	0	4	70	30	0	100
26CS594	Java Programming Lab	0	0	2	2	0	30	70	100

Discipline Specific Elective (DSE- II): Choose any one paper

Course Code	Paper Name	L	T	P	Credit	Theory Marks	Internal Marks	Practical Marks	Total Marks
26CS631	Image Processing	4	0	0	4	70	30	0	100
26CS693	Image Processing Lab	0	0	2	2	0	30	70	100
26CS632	Parallel Programming	4	0	0	4	70	30	0	100
26CS694	Parallel Programming Lab	0	0	2	2	0	30	70	100

Discipline Specific Elective (DSE- III): Choose any one paper

Course Code	Paper Name	L	T	P	Credit	Theory Marks	Internal Marks	Practical Marks	Total Marks
26CS731	Internet of Things	4	0	0	4	70	30	0	100
26CS793	Internet of Things Lab	0	0	2	2	0	30	70	100
26CS732	Introduction to Machine Learning	4	0	0	4	70	30	0	100
26CS794	Machine Learning Lab	0	0	2	2	0	30	70	100

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Integrated MCA

1st Semester

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DETAILED SYLLABUS

FUNDAMENTALS OF IT

Code: 26CS101
Max Marks: 70

Course Objectives: The objective of the course is to understand basic computer hardware and software components, learn operating systems, networks, and data storage concepts and develop skills in using common IT tools and applications.

UNIT I **(10 Hrs)**

Fundamentals of Computers: Definition and Characteristics of Computer System. Computer Generation from First Generation to Fifth Generation. Classifications of Computers: Micro, Mini, Mainframe and super computers.

Computer Hardware: Major Components of a digital computer, Block Diagram of a computer, Input-output devices, Description of Computer Input Units, Output Units, CPU.

Computer Memory: Memory Hierarchy, Primary Memory – RAM and its types, ROM and its types, Secondary Memory, Cache memory. Secondary Storage Devices - Hard Disk, Compact Disk, DVD, Flash memory.

UNIT II **(10 Hrs)**

Interaction with Computers: Computer Software: System software: Assemblers, Compilers, Interpreters, linkers, loaders.

Application Software: Introduction to MS Office (MS-Word, MS Power point, MS-Excel).

Operating Systems: Elementary Operating System concepts, Different types of Operating Systems.

DOS: Booting sequence; Concepts of File and Directory, Types of DOS commands.

Computer Languages: Introduction to Low-Level Languages and High-Level Languages.

UNIT III **(10 Hrs)**

Computer Number System: Positional and Non-positional number systems, Binary, Decimal, Octal and Hexadecimal Number Systems and their inter-conversion.

Binary Arithmetic: Addition, subtraction, multiplication and division. Use of complement method to represent negative binary numbers, 1's complement, 2's complement, subtraction using 1's complement and 2's complement. Introduction to Binary Coded Decimal (BCD), ASCII Codes, EBCDIC codes.

UNIT IV **(10 Hrs)**

Computer Network & Internet: Basic elements of a communication system, Data transmission modes, Data Transmission speed, Data transmission media, Digital and Analog Transmission, Network topologies, Network Types (LAN, WAN and MAN), Basics of Internet and Intranet.

Internet: Terminologies related to Internet: Protocol, Domain name, Internet Connections, IP address, URL, World Wide Web. Introduction to Client-Server Model, Search Engine, Voice over Internet Protocol (VOIP), Repeater, Bridge, Hub, Switch, Router, Gateway, Firewall, Bluetooth technology.

Advanced Trends in IT Applications: Brief Introduction to Cloud Computing, Internet of Things, Data Analytics, AI and Machine Learning.

Text Books:

1. P. K. Sinha & Priti Sinha, "Computer Fundamentals", BPB Publications, 1992.
2. Anita Goel "Computer Fundamentals", Pearson.

Suggested Readings:

1. B. Ram, "Computer fundamentals Architecture and Organization", New Age Intl.
2. Alex Leon & Mathews Leon, "Introduction to Computers", Vikas Publishing.
3. Norton Peter, "Introduction to Computers", 4th Ed., TMH, 2001.
4. Vikas Gupta, "Comdex Computer Kit", Wiley Dreamtech, Delhi, 2004.

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C PROGRAMMING

Code: 26CS102
Max Marks: 70

Course Objectives: The objective of the course is to learn the syntax and structure of the C programming language, develop problem-solving and logic-building skills through coding and write, compile, debug, and execute C programs.

UNIT I **(8 Hrs)**

Computer Programming: Basic Programming concepts, Modular programming and structured programming, Problem solving using Computers, Concept of flowcharts and algorithms.
Overview of C: Introduction, Importance of C, Sample C Programs, Basic structure of C programs, Programming style, Executing a C Program.
Constants, Variables and Data types: C Tokens, keywords, and identifiers, constants, variables, datatypes, declaration of variables, assigning values to variables, defining symbolic constants.
Operators and Expressions: Arithmetic operators, Relational operators, Logical operators, Assignment operators, increment and decrement operators, conditional operator, bitwise operators, type conversion in expressions, operator precedence and associativity.
Mathematical functions.

UNIT II **(8 Hrs)**

Input and Output statements, reading a character, writing a character, formatted input, formatted output statements.
Decision-making, Branching and Looping : Decision making with IF statement, simple IF statement, The IF-ELSE statement, nesting of IF .. ELSE statements, The ELSE -IF ladder, The switch statement, The operator, The GOTO statement, The WHILE statement, The DO statement, The FOR statement, Jumps in loops.

UNIT III **(8 Hrs)**

Arrays: One dimensional arrays, Two-dimensional arrays, Initializing arrays, Programs based on arrays such as sorting, Fibonacci sequence, Matrix operations, etc.
Handling of Characters and Strings: Declaring and initializing string variables, Reading string from terminal, Writing string to screen, Arithmetic operations on characters, Putting strings together. Comparison of two strings, Character and string handling functions.

UNIT IV **(8 Hrs)**

User defined functions: Need for user-defined functions, A multi-functional program, The form of 'C' function, Return values and their types, Calling a function, Category of functions: No arguments and no return values, Arguments but no return values, Arguments with return values, Nesting of functions, Recursion, Functions with arrays as parameters.

UNIT V **(8 Hrs)**

Structure and Union: Structure definition, Giving values to members, Structure initialization; Comparison of structure variables, Array of structures, Array within structure, Union.
Pointers: Understanding pointers, Accessing the address of variables, Declaring and initializing pointers, Accessing a variable through its pointer.

Text Book:

1. Kamthane, Programming with ANSI and Turbo C; Pearson Education 2003

Suggested Readings:

1. E. Balaguruswamy. : Programming in ANSI C", Tata McGraw-Hill (1998)
2. Yeshvant Kanetkar: "Let us C"
3. V. Rajaraman.: "Programming in C", PHI (EEE) (2000)
4. Rajesh Hongal : "Computer Concepts & C language"
5. Brain Kernighan & Dennis M. Ritchie "ANSI C Programming" (PHI)

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HTML (WITH LAB)

Code: 26CS111
Max Marks: 70

Course Objective: The Internet Technologies course aims to provide participants with a comprehensive understanding of the foundational concepts and technologies that underpin the modern internet. Participants will explore the layers of the internet stack, from networking protocols and web technologies to security and emerging trends. The course covers web development essentials, including HTML, CSS, and JavaScript, enabling participants to create interactive and responsive web pages. Participants will gain insights into server-side scripting languages, database integration, and server deployment.

UNIT I: Introduction to Internet Technologies **(10 Hrs)**
Overview of the Internet and its evolution, Internet protocols: TCP/IP, HTTP, DNS, SMTP, etc., IP addressing and subnetting, Domain Name System (DNS), Hypertext Markup Language (HTML) and Cascading Style Sheets (CSS).

UNIT II: Client-Side Web Technologies **(10 Hrs)**
JavaScript programming fundamentals, Document Object Model (DOM) manipulation, Client-side form validation, Introduction to Web development frameworks (e.g., React, Angular).

UNIT III: Server-Side Web Technologies **(10 Hrs)**
Server-side scripting languages (e.g., PHP, Python, Node.js), handling HTTP requests and responses, Database connectivity and management, Session and cookies management.

UNIT IV: Web Security and Emerging Technologies **(10 Hrs)**
Web security fundamentals: Cross-Site Scripting (XSS), Cross-Site Request Forgery (CSRF), etc., Secure Socket Layer (SSL) and Transport Layer Security (TLS), Introduction to Web services and APIs, Emerging technologies and trends in Internet Technologies.

Suggested Readings:

1. "HTML and CSS: Design and Build Websites" by Jon Duckett.
2. "JavaScript and JQuery: Interactive Front-End Web Development" by Jon Duckett.

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PC HARDWARE

Code: 26CS121
Max Marks: 70

Course Objective: The "PC Hardware" course aims to provide participants with a comprehensive understanding of computer hardware components and their functionality. By the course's conclusion, students will be able to assemble, troubleshoot, and maintain personal computer systems. The objective is to equip students with practical skills for hardware configuration, upgrades, and diagnostics in various computing environments.

UNIT I: Introduction to PC Hardware Components (05 Hrs)
Overview of PC hardware architecture, Motherboard and BIOS setup, Central Processing Unit (CPU) and Memory.

UNIT II: Storage Devices and Input-Output Devices (05 Hrs)
Hard Drives: HDD, SSD, Hybrid Drives, Storage Interfaces: SATA, NVMe, SCSI, Disk Partitions and File Systems, Data Storage Technologies: RAID, NAS, Cloud, Data Backup and Recovery Strategies, Diagnosing and Repairing Storage Problems

UNIT III: Expansion Cards and Power Supply (05 Hrs)
Expansion cards: Graphics cards, Sound cards, etc., Network Interface Cards (NIC) and Connectivity, USB and Other Port Types: Thunderbolt, Firewire, etc., Power supply and cooling systems.

UNIT IV: PC Assembly, Troubleshooting, and Maintenance (05 Hrs)
PC assembly and hardware installation, troubleshooting common hardware issues, Hardware maintenance and upgrades. BIOS and UEFI: Configuration and Upgrading

Suggested Readings:

1. "CompTIA A+ Certification All-in-One Exam Guide" by Mike Meyers.
2. "Upgrading and Repairing PCs" by Scott Mueller.

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OFFICE AUTOMATION

Code: 26CS122
Max Marks: 70

Course Objective: The objective of an Office Automation course is to provide students with the necessary skills and knowledge to effectively use various computer software applications and technologies for streamlining and enhancing office tasks and processes. The course aims to equip students with practical abilities to automate routine office functions, improve efficiency, and facilitate communication and collaboration within an office environment.

UNIT I: Introduction to Office Automation **(04 Hrs)**
Overview of office automation and its benefits, Office Suite applications and their features. Ethical and Legal Considerations in Office Automation

UNIT II: Word Processing and Spreadsheets **(05 Hrs)**
Word processing: Formatting, Styles, Mail Merge, Spreadsheets: Formulas, Functions, Charts. Styles, Templates, and Document Automation, Collaboration Tools: Track Changes and Comments

UNIT III: Presentation Tools and Email Management **(02 Hrs)**
Creating and delivering presentations, Email and Calendaring: Managing emails and appointments.

UNIT IV: Database Management and Workflow Automation **(05 Hrs)**
Database management: Creating and querying databases, Document collaboration and version control, Workflow automation using macros and scripts.

UNIT V: Streamlining Workflows and Future Trends **(04 Hrs)**
Making Tasks Easier: Workflow Automation, Looking Ahead: Modern Trends in Office Automation, Adapting to New Technologies, Enhancing Efficiency in the Digital Age

Suggested Readings:

1. "Microsoft Office 365 & Office 2019: Introductory" by Misty E. Vermaat.
2. "Office 2019 All-in-One for Dummies" by Peter Weverka.

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BUSINESS COMMUNICATION

Code: 26GN102
Max Marks: 70

Course Objectives: The objective of the course is to develop effective verbal and written communication skills, understand professional communication in business settings and improve interpersonal and presentation skills.

UNIT I **(05 Hrs)**

Concepts and Fundamentals: Introduction to Technical Communication, Need and importance of communication, Channel, Distinction between general and technical communication, Nature and features of technical communication, Seven Cs of communication, Types of Technical communication, Style in technical communication, Technical communication skills, Language as a tool of Communication, History of development of Technical Communication, Computer Aided Technical Communication

UNIT II **(05 Hrs)**

Oral Communication: Principles of effective oral communication, Introduction of Self and others, Greetings, Handling Telephone Calls Interviews: Meaning & Purpose, Art of interviewing, Types of interview, Interview styles, Essential, Techniques of interviewing, Guidelines for Interviewer, Guidelines for interviewee. Meetings: Definition, Kind of meetings, Agenda, Minutes of the Meeting, Advantages and disadvantages of meetings/ committees, Planning and organization of meetings. Project Presentations: Advantages & Disadvantages, Executive Summary, Charts, Distribution of time (presentation, questions & answers, summing up), Visual presentation, Guidelines for using visual aids, Electronic media (power-point presentation). The technique of conducting Group Discussion and JAM session.

UNIT III **(05 Hrs)**

Written Communication: Overview of Technical Writing: Definition and Nature of Technical Writing, Basic Principles of Technical Writing, Styles in Technical Writing.
Note – Making, Notice, E-mail Writing.
Writing Letters: Business letters, Persuasive letters- Sales letters and complaint letters, Office memorandum, Good news and bad news letters.
Report Writing: Definition & importance; categories of reports, Elements of a formal report, style and formatting in report.
Special Technical Documents Writing: Project synopsis and report writing, Scientific Article and Research Paper writing, Dissertation writing: Features, Preparation and Elements.
Proposal Writing: Purpose, Types, characteristics and structure.
Job Application: Types of application, Form & Content of an application, Drafting the application, Preparation of resume.

UNIT IV **(05 Hrs)**

Soft Skills: Business Etiquettes – Professional Personality, Workplace Protocols, Cubicle. Non-Verbal Communication: Kinesics and Proxemics, Paralanguage.
Interpersonal Skills.
Language Skills: Improving command in English, improving vocabulary, Choice of words, Common problems with verbs, Adjectives, adverbs, Pronouns, Tenses, Conjunctions, Punctuations, Prefix, Suffix, Idiomatic use of prepositions. Sentences and paragraph construction, Improve spellings, Common errors and misappropriation, Building advanced Vocabulary (Synonyms, Antonyms), Introduction to Business English.

Text Books:

1. Kavita Tyagi and Padma Misra , "Advanced Technical Communication", PHI, 2011
2. P. D. Chaturvedi and Mukesh Chaturvedi, "Business Communication – Concepts, Cases and Applications", Pearson, second edition.
3. Rayudu, "C. S- Communication", Himalaya Publishing House, 1994.
4. Asha Kaul, "Business Communication", PHI, second edition.

Suggested Readings:

1. Raymond Murphy, "Essential English Grammar- A self-study reference and practice book for elementary students of English" , Cambridge University Press, second edition.
2. Manalo, E. & Fermin, V. (2007). Technical and Report Writing. ECC Graphics. Quezon City.
3. Kavita Tyagi and Padma Misra , "Basic Technical Communication", PHI, 2011.
4. Herta A Murphy, Herbert W Hildebrandt and Jane P Thomas, "Effective Business Communication", McGraw Hill, seventh edition.

LIFE SKILLS & PERSONALITY DEVELOPMENT

Code: 26GN101
Max Marks: 70

Course Objective: The Life Skills and Personality Development Course aim to equip participants with essential skills and knowledge to enhance their personal growth, interpersonal relationships, and overall well-being. The course is designed to empower individuals to navigate various life situations effectively, develop a positive self-image, and foster the traits necessary for a successful and fulfilling life.

UNIT I: Career and Professional Skills Career and Professional Skills (04 Hrs)

Listening Skills, Reading Skills, Writing Skills, Effective Resume preparation, Interview Skills, Group Discussion Skills, Exploring Career Opportunities, Psychometric Analysis and Mock Interview Sessions Team Skills: Cognitive and Non-Cognitive Skills, Presentation Skills, Trust and Collaboration, Listening as a Team Skill, Brainstorming, Social and Cultural Etiquettes, Digital Skills: Computer skills, Digital Literacy and social media, Digital Ethics and Cyber Security

UNIT II: Attitude and Motivation Attitude (04 Hrs)

Concept, Significance, Factors affecting attitudes, Positive attitude - Advantages, Negative attitude-Disadvantages, Ways to develop a positive attitude, Difference between personalities having positive and negative attitudes. Motivation: Concept, Significance, Internal and external motives - Importance of self- motivation-Factors leading to de-motivation, Maslow's Need Hierarchy Theory of Motivation

UNIT III: Stress-management and Development of Capabilities (04 Hrs)

Development of will power, imagination through yogic lifestyle, Development of thinking, emotion control and discipline of mind through Pranayama, Improvement of memory through meditation. Stress: meaning, causes, and effects of stress in life management, Stress: psycho-physical mechanism, management of stress through Yoga.

UNIT IV: Other Aspects of Personality Development (04 Hrs)

Body language - Problem-solving - Conflict and Stress Management - Decision-making skills -Leadership and qualities of a successful leader - Character-building -Team-work - Time management -Work ethics – Good manners and etiquette.

UNIT V: Health and Hygiene (04 Hrs)

Health and Hygiene- Meaning and significance for Healthy Life, Exercise and Nutrition and Immunity. Obesity-Meaning, Types and its Hazards. - Physical Fitness and Health Related Physical Fitness- Concept, Components and Tests, Adventure Sports.

Suggested Readings:

1. Barun K. Mitra, "Personality Development & Soft Skills", Oxford Publishers, Third impression, 2017.
2. Ghosh, Shantikumar. 2004. Universal Values. Kolkata: The Ramakrishna Mission Larry James, "The First Book of Life Skills"; First Edition, Embassy Books, 2016.

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IT LAB

Code: 26CS191
Max. Marks: 70

Core Practicals (Implement minimum 10 out of 15 practicals)

1. To explore the System settings - Personalisation, System, Devices, Apps, Network & Internet.
2. To practice basic DOS commands like cd, md, dir, erase, cls, copy, date etc.
3. To explore Windows Explorer functionalities like create, rename, move, delete folder and files etc.
4. To practice the use of basic formatting features - Format Painter, Indentation, Line spacing, background color, find, replace, dictate commands.
5. To practice the use of Bullets, numbering, multilevel lists and use of Table Feature- Insert table with rows and columns, draw tables, excel spreadsheet and quick tables etc.
6. To practice the use of Insert Features – add picture, Chart, SmartArt, WordArt, Equation, Symbols, Header and Footer, Page Numbering etc. and the use of Design Features – Watermark, Page color, Page Border, Themes implementation etc.
7. To practice the use of Layout Features – Margins, Orientation, Size, Columns, Indent, Spacing etc.
8. To practice the use of Mail Merge Feature to generate Envelops and Labels.
9. To practice the use of Excel basic formatting features – Wrap Text, Insert and Delete (Cells, Sheet, Row or Column), Format – Cell Height, Cell Width, Hide, Un Hide Cell, Protection, Freeze and Unfreeze panes, Macros etc.
10. To practice the use of Insert Features- Pivot Table, Pivot Chart, Picture, Chart and its formatting and Design and the use of Page Layout Features- Margins, Orientation, Page Break , Background, Height and Width of Cells.
11. To practice the use of Formula Features – user defined function, pre-defined functions – Logical, Date, Time, Maths and the use of Data Manipulation Features – Sort, Filter, Advanced Filters, Whatif analysis.
12. To practice the creation of Blank presentation and Selecting Themes and the use of the basic design features – Adding New Slides, Reuse slides, Slides layout etc.
13. To practice the use of Insert Features – add pictures, screenshots, shapes, wordart, audio, video, date-time etc. and use of Design Features- Changing the theme of presentation, format background and design ideas.
14. To practice the use of Transition features to be applied on Slides content, setting sound, duration etc. and the use of Animation Features to be applied on presentation of Slide, set animation timings and rehearse etc.
15. To practice the use of Slide Show Features – Custom Slide Show, Rehearse Timing etc.

Application Based Practicals (Implement minimum 5 out of 8 practicals)

16. Create a Folder by your name in your system, store all the work done in this semester inside that folder.
17. Create your Resume using basic formatting features like : table, bullets, wordart etc.
18. Design an Invitation to Birthday Party using mail merge features send the invitation to 10 friends.
19. Write an Article for Magazine with 3 columns and hyperlink.
20. Create your own marksheet using basic formatting features.
21. Create a list of marks of 10 students create charts and pivot table.
22. Prepare a Sales summary and use features like sort, filter etc. to manipulate the data.
23. Create a Power Point Presentation on any topic of your choice using animation and transition features.

Note:

1. **In total 15 practical to be implemented. 2 additional practicals may be given by the course instructor.**
2. **This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.**

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C PROGRAMMING LAB

Code: 26CS192
Max. Marks: 70

Core Practicals (Implement minimum 8 out of 10 practical)

1. Write a program to convert temperature from Celsius to Fahrenheit by taking input from the user.
2. Write a program to find the greatest number among 3 numbers given by the user.
3. Write a program to check if a given number is a prime number or not.
4. Write a program to display the following pattern up to N rows, taking the value of N from the user:

```
1
2    3
4    5    6
7    8    9    10
```

5. Write a program to input marks of 50 students using an array and display the average marks of the class.
6. Write a program to search for a number entered by the user in a given array and display the array in ascending order.
7. Write a program to check if a string is palindrome or not.
8. Write a program to add, subtract, multiply and divide two numbers using pointers.
9. Write a program to create a structure for employees containing the following data members: Employee ID, Employee Name, Age, Address, Department and Salary. Input data for 10 employees and display the details of the employee from the employee ID given by the user.
10. Write a program to create two files with names EvenFile and OddFile. Input 20 numbers from the user and save even numbers in EvenFile and odd numbers in OddFile.

Application Based Practicals (Implement minimum 5 out of 10 practicals)

11. Write a menu driven program to construct a calculator for following arithmetic operations: addition, subtraction, multiplication, division, average and percentage.
12. Write a menu driven program to perform the following operations:
    (i) Print armstrong numbers upto N,
    (ii) Display prime numbers between 1 to N,
    (iii) Reverse of an integer
13. Write a program to convert a hexadecimal number into a binary number.
14. Write a program to calculate factorial of a number and display fibonacci series upto N terms using recursive functions.
15. Write a program to perform
    (i) matrix addition,
    (ii) matrix multiplication, and
    (iii) Matrix transpose on 2D arrays.
16. Write a program to make use of arrays with structures in the following ways:
    (i) Use array as a structure data member
    (ii) Create array of structure variables
17. Write a program to compare the contents of two files by taking names of the files through command line arguments.
18. WAP to perform I/O and make use of file positioning functions on Binary files. (using fseek, ftell, rewind functions)
19. Write a menu driven program to implement the following string operations:
    (i) Calculate length of a string
    (ii) Concatenate at the end of a given
    (iii) Copy one string to another
    (iv) Compare contents of two strings
    (v) Copy nth character string to another
20. Write a program to read time in string format and extract hours, minutes and second also check time validity

Note:

1. **In total 15 practicals to be implemented. 2 additional practicals may be given by the course instructor.**
2. **This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.**

Integrated MCA

2nd Semester

ARYAVART INTERNATIONAL UNIVERSITY
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DETAILED SYLLABUS

OBJECT-ORIENTED PROGRAMMING WITH C++

Code: 26CS201
Max Marks: 70

Course Objectives: The objective of the course is to understand OOP principles like classes, inheritance, and polymorphism, develop modular and reusable code using C++ and implement real-world problem solutions using OOP techniques

UNIT I **(10 Hrs)**
Object-Oriented Paradigm: Procedural vs. object-oriented development, Basic concepts of object-oriented programming, Applications and benefits of OOP, Comparison between C and C++.
Beginning with C++: Stream-based I/O, Literals- constant qualifiers, Operators in C++, Reference variable, Functions, Default arguments, Parameter passing by value, Reference and pointer, Inline functions, Type conversion, Basic C++ programs, New, Delete operators- basic use and dynamic memory allocation for arrays.

UNIT II **(10 Hrs)**
Classes and Objects: C++ class declaration, Access specifiers, Member functions, Arrays within a class, Array of objects, Memory allocation of objects, passing objects as arguments, Returning objects from functions, Function overloading, Static data and member functions, Friend function and friend class, This pointer.
Constructors & Destructors: Introduction to constructors and destructors, Parameterised constructor, Constructor with default arguments, Multiple constructors in a class, Copy constructor.

UNIT III **(10 Hrs)**
Inheritance: Types of inheritance, Derivation – public, private & protected, Ambiguity resolution (function overriding), Aggregation, Composition v/s Classification, Virtual base class, Constructor and destructor in derived classes.
Polymorphism: Types of polymorphism, early v/s late binding, Virtual Functions: Need for virtual functions, Pointer to derived class objects, Pure virtual functions, Abstract classes.
Operator Overloading: Overloading unary operators, Nameless objects, Overloading binary operators, Overloading with friend functions, Conversion between basic types and user-defined types.

UNIT IV **(10 Hrs)**
Parametric polymorphism: Generic Programming with Templates, Introduction, Function templates/generic functions, Characteristics, Overloading of template functions, Class templates, Template arguments.
Exception Handling: Exception-handling model, Types of exception, Catching and Handling exceptions, Generic catch, Rethrowing an exception, Specifying exceptions for a function.
Streams & Files: C++ Streams, Basic stream classes, C++ predefined streams, I/O operations, Unformatted console I/O operations, Manipulators, Opening and closing a file- different modes and methods, Error handling during file operations, File pointers and their manipulations, Sequential access to file, Random input and output operations, Persistent objects, Command line arguments.

Text Books:

1. K.R. Venugopal, Rajkumar, T. Ravishanker, "Mastering C++", TMH
2. E. Balagurusamy, "Object Oriented Programming with C++", McGraw-Hill Education

Suggested Readings:

1. Ashok N. Kamthane, "Object-Oriented Programming with ANSI And Turbo C++", Pearson Education.
2. Schildt Herbert, "C++: The Complete Reference", Tata McGraw Hill.
3. R. Lafore, "Object Oriented Programming using C++", Galgotia Publications.

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COMPUTER ORGANIZATION AND ARCHITECTURE

Code: 26CS202
Max Marks: 70

Course Objectives: The objective of the course is to learn the structure and functioning of computer hardware, understand instruction sets, memory hierarchy, and CPU organisation, and analyse performance and system-level operations.

UNIT I **(10 Hrs)**
Boolean Algebra and Logic: Basics, Laws of Boolean Algebra, Logic Gates, Simplifications of Boolean equations using K-maps SOP and POS, Don't Care condition.
Arithmetic Circuits: Adder, Subtractor, Parallel binary adder/Subtractor.

UNIT II **(10 Hrs)**
Combinational Circuits: Multiplexers, De-Multiplexers, Decoders, Encoders.
Flip-flops: S-R, D, J-K, T, Clocked Flip-flop, Race around condition, Master slave Flip-Flop, Realisation of one flip-flop using other flip-flop, Applications of flip-flop: Latch, Registers, Counters (elementary treatment to be given).

UNIT III **(10 Hrs)**
Data Transfer Operations: Register Transfer, Bus and Memory Transfer, Registers and micro-operations.
Basic Computer Organisations and Design: Instruction Codes, Computer Registers, Instruction Cycle, General Register Organisation, Stack Organisation, Instruction Formats, Addressing Modes.

UNIT IV **(10 Hrs)**
Input-Output Organisation: Peripheral Devices, Input-Output Interfaces, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA).
Memory Organisation: Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

Text Books:

1. Morris Mano, Computer System Architecture, 3rd Edition, Prentice-Hall of India Private Limited, 1999.
2. Morris Mano, "Digital Logic and Computer Design", PHI Publications, 2002

Suggested Readings:

1. R. P. Jain, "Modern Digital Electronics", TMH, 3rd Edition, 2003.
2. William Stallings, Computer Organisation and Architecture, 4th Edition, Prentice Hall of India Private Limited, 2001
3. Subrata Ghosal," Computer Architecture and Organisation", Pearson, 2011
4. Malvino, "Digital Computer Electronics: An Introduction to Microcomputers", McGraw-Hill.

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COMPUTER-BASED NUMERICAL TECHNIQUES

Code: 26CS211
Max Marks: 70

Course Objective: The objective of this course is to provide students with an understanding of numerical techniques and algorithms for solving mathematical problems encountered in computer-based applications. The course aims to develop students' skills in applying numerical methods to practical problems.

UNIT I: Introduction to Numerical Techniques **(08 Hrs)**
Overview of numerical methods and their applications, Errors in numerical computations and methods to reduce them.

UNIT II: Solving Equations **(08 Hrs)**
Bisection method, Newton-Raphson method, Secant method, Root-finding techniques and convergence criteria.

UNIT III: Interpolation and Approximation **(08 Hrs)**
Interpolation methods: Lagrange interpolation, Newton's divided difference, Curve fitting techniques: Least squares approximation.

UNIT IV: Numerical Integration and Differentiation **(08 Hrs)**
Numerical integration methods: Trapezoidal rule, Simpson's rule, Numerical differentiation techniques.

UNIT V: Linear Algebraic Equations and Eigenvalue Problems **(08 Hrs)**
Solving systems of linear equations: Gaussian Elimination, LU Decomposition, Eigenvalues and Eigenvectors using numerical methods.

Suggested Readings:

1. "Numerical Methods: Principles, Analysis, and Algorithms" by Roland W. Freund and Gene H. Golub.
2. "Numerical Recipes: The Art of Scientific Computing" by William H. Press, Saul A. Teukolsky, William T. Vetterling, and Brian P. Flannery.

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LINUX PROGRAMMING LAB

Code: 26CS293
Max Marks: 70

Core Practical:

1. Connect to the Linux Server and understand the basic Directory Structure of Linux.
2. To understand help commands like: -man, info, help, what is, apropos
3. To understand basic directory navigation commands like cat, cd, mv, cp, rm, mkdir, rmdir, file, pwd command.
4. To understand basic commands like: - date, cal, echo, bc, ls, who, whoami, hostname, uname, tty, aliase.
5. To understand vi basics, three modes of vi Editor, how to write, save, execute a shell script in vi editor.
6. To understand process related commands like: -ps, top, pstree, nice, renice in Linux.
7. To understand how to examine and change File permissions.
8. Set a file to be read-only with the chmod command. Interpret the file permissions displayed by the ls -l command.
9. Delete one or more directories with the rmdir command. See what happens if the directory is not empty. Experiment (carefully!) with the rm -r command to delete a directory and its content
10. Change your directory to the directory exercises. Create a file in that directory, named the file as example1 using the cat command containing the following text: water, water everywhere and all the boards did shrink; water, water everywhere, no drop to drink.
11. Write basic shell script to display the table of a number.
12. Write basic shell script to input a character from user and then check whether it is uppercase, lowercase or digit.
13. Write basic shell script to calculate factorial of a number.
14. Write basic shell script to input the month number and generate corresponding calendar.
15. Write basic shell script to list all directories.
16. Write basic shell script to display greatest of three numbers.
17. Write basic shell script to check whether the number entered by user is prime or not.

Note:

1. **In total 15 practical to be implemented. 2 additional practicals may be given by the course instructor.**
2. **This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.**

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CYBER SECURITY

Code: 26CS221
Max Marks: 70

Course Objective: This course is geared towards generating and enhancing awareness about cyber security challenges and the concepts of cyber security and cyber ethics among the students to help them become responsible cyber citizens and participate safely and securely in the rapidly evolving information-age society

UNIT I: Fundamentals of Cyber Security and Threat Landscape (04 Hrs)
Importance and challenges in Cyber Security, Cyberspace, and Cyber threats, Cyber warfare, CIA Triad, Cyber Terrorism, Cyber Security of Critical Infrastructure

UNIT II: Cyber Attacks and Intrusion Techniques (04 Hrs)
Types of Hackers - Hackers and Crackers, Cyber-Attacks and Vulnerabilities, Malware threats, Sniffing, Gaining Access - Escalating Privileges, Executing Applications, Hiding Files, Covering Tracks. Worms, Trojans, Viruses, Backdoors

UNIT III: Ethical Hacking and Information Security Practices (04 Hrs)
Ethical Hacking Concepts and Scopes, Threats and Attack Vectors, Information Assurance, Threat Modeling, Enterprise Information Security Architecture, Vulnerability Assessment and Penetration Testing

UNIT IV: Social Engineering and Insider Threats (04 Hrs)
Types of Social Engineering - Insider Attack - Preventing Insider Threats - Social engineering Targets and Defence Strategies

UNIT V: Legal Framework and Countermeasures in Cyber Security (04 Hrs)
IT Act, Hackers-Attacker-Countermeasures, Web Application Security, Counter Cyber Security Initiatives in India, Cyber Security Incident Handling, Cyber Security Assurance

Suggested Readings:

1. Cyber Security and Cyber Laws Nilakshi Jain Wiley
2. Cyber Security Nina Godbole Wiley

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ENVIRONMENTAL STUDIES

Code: 26GN201
Max Marks: 70

Course Objectives: The course will empower the students by gaining in-depth knowledge on natural processes that sustain life and govern economy, predicting the consequences of human actions on the web of life, global economy and quality of human life, developing critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development, acquiring values and attitudes towards understanding complex environmental economic-social challenges, and participating actively in solving current environmental problems and preventing the future ones and adopting sustainability as a practice in life, society and industry.

UNIT I: Introduction to Environmental Studies (5 Hrs)

- Environmental studies: Nature, Scope and Importance; Components of environment: atmosphere, hydrosphere, lithosphere, and biosphere; Concept of sustainability and sustainable development.
- Emergence of environmental issues: Climate change, Global warming, Ozone layer depletion, Acid rain etc.; International agreements and programmer: Earth Summit, UNFCCC, Montreal and Kyoto protocols, Convention on Biological Diversity (CBD), Ramsar convention, UNEP, CITES, etc.

UNIT II: Ecosystems and Natural Resources: (5 Hrs)

- Definition and concept of Ecosystem; Structure of ecosystem (biotic and abiotic components); Functions of Ecosystem: Physical (energy flow), Biological (food chains, food web, ecological succession), ecological pyramids and homeostasis; Types of Ecosystems: Tundra, Forest, Grassland, Desert, Aquatic (ponds, streams, lakes, rivers, oceans, estuaries); importance and threats with relevant examples from India.
- Ecosystem services (Provisioning, Regulating, Cultural, and Supporting); Ecosystem preservation and conservation strategies; Basics of Ecosystem restoration.
- Energy resources: Renewable and non-renewable energy sources; Use of alternate energy sources; Growing energy needs; Energy contents of coal, petroleum, natural gas and bio gas; Agro-residues as a biomass energy source.

UNIT III: Biodiversity and Conservation (5 Hrs)

- Definition of Biodiversity; Levels of biological diversity: genetic, species and ecosystem diversity.
- India as a mega-biodiversity nation; Biogeographic zones of India; Biodiversity hotspots; Endemic and endangered species of India; IUCN Red list criteria and categories.
- Value of biodiversity: Ecological, economic, social, ethical, aesthetic, and informational values of biodiversity with examples.
- Threats to biodiversity: Habitat loss, degradation, and fragmentation; Poaching of wildlife; Man-wildlife conflicts; Biological invasion with emphasis on Indian biodiversity; Current mass extinction crisis.
- Biodiversity conservation strategies: in-situ and ex-situ methods of conservation (National Parks, Wildlife Sanctuaries, and Biosphere reserves.

UNIT IV: Environmental Pollution and Control Measures: (5 Hrs)

- Environmental pollution (Air, water, soil, thermal, and noise): causes, effects, and controls; Primary and secondary air pollutants; Air and water quality standards.
- Nuclear hazards and human health risks.
- Solid waste management: Control measures for various types of urban, industrial waste, Hazardous waste, E-waste, etc.; Waste segregation and disposal.

Text Books:

1. Sanjay Kumar Batra, Kanchan Batra, Harpreet Kaur; "Environmental Studies"; Taxmann's, Fifth Edition.
2. M. M. Sulphey; "Introduction to Environment Management"; PHI Learning, 2019.

3. S. P. Mishra, S. N. Pandey; "Essential Environmental Studies"; Ane Books Pvt. Ltd.; Sixth Edition.

Suggested Readings:

1. Asthana, D. K. (2006). "Text Book of Environmental Studies". S. Chand Publishing.
2. Basu, M., Xavier, S. (2016). "Fundamentals of Environmental Studies", Cambridge University Press, India.
3. Bharucha, E. (2013). "Textbook of Environmental Studies for Undergraduate Courses". Universities Press.
4. Mahapatra, R., Jeevan, S. S., Das, S. (Eds) (2017). "Environment Reader for Universities", Centre for Science and Environment, New Delhi.
5. Masters, G. M. & Ela, W. P. (1991). "Introduction to environmental engineering and science". Englewood Cliffs, NJ: Prentice Hall.
6. Odum, E. P., Odum, H. T. & Andrews, J. (1971). "Fundamentals of Ecology". Philadelphia: Saunders.
7. Sharma, P. D. & Sharma, P. D. (2005). "Ecology and Environment". Rastogi Publications.

HEALTH & WELLNESS

Code: 26GN202
Max Marks: 70

Course Objectives: The objective of the course is to introduce learners to the concept of health and wellness and its relevance in daily life; to introduce the relation between mind and body and its relevance; and to introduce learners to health behaviour and the promotion of human strengths for well-being.

UNIT I: INTRODUCTION TO HEALTH & WELLNESS **(10 Hrs)**

- Definition of health- WHO definition
- Importance of health in everyday life
- Components of health- physical, social, mental, spiritual and its relevance
- Concept of wellness
- Mental Health & wellness
- Determinants of health behaviours
- Using the mass media for health promotion

UNIT II: MIND – BODY AND WELL-BEING **(10 Hrs)**

- Mind- Body connection in health- concept and relation
- Implications of mind-body connections.
- Wellbeing- why it matters?
- Digital wellbeing
- Understanding health beliefs, and perspectives of indigenous people about Assam and North East India
- Promoting Human strengths and life enhancement: Classification of human strengths and virtues; cultivating inner strengths: Hope and optimism

Suggested Readings:

1. Carr, A. (2004). Positive Psychology: The science of happiness and human strength. UK: Routledge.
2. Forshaw, M. (2003). Advanced psychology: Health psychology. London: Hodder and Stoughton. Hick,
3. J.W. (2005).Fifty signs of Mental Health. A Guide to understanding mental health. Yale University Press.
4. Snyder, C.R., &Lopez, S.J.(2007). Positive psychology: The scientific and practical explorations of human strengths. Thousand Oaks, CA: Sage.

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C++ LAB

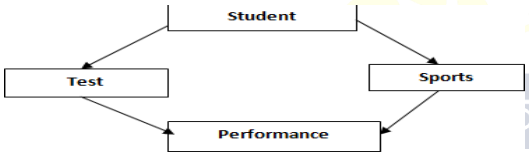
Code: 26CS291
Max Marks: 70

Core Practical (Implement minimum 8 out of 10 practical)

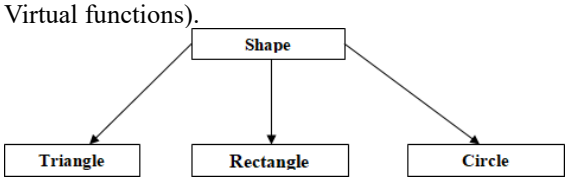
1. WAP to implement 'Inline function'.
2. WAP to implement call by reference and return by reference using class. [Hint. Assume necessary functions].
3. WAP to implement friend function by taking some real-life examples.
4. WAP to implement 'Function Overloading'.
5. WAP to implement Parameterized Constructor, Copy Constructor and Destructor.
6. WAP to show the usage of constructor in base and derived classes, in multiple inheritance.
7. WAP to show the implementation of 'containership'.
8. WAP to show swapping using template function (Generic).
9. WAP to implement 'Exception Handling'.
10. WAP to read and write values through object using file handling.

Application Based Practical (Implement minimum 5 out of 10 practical)

11. Create a class employee which have name, age and address of employee, include functions getdata() and showdata(), getdata() takes the input from the user, showdata() display the data in following format:
    Name:
    Age:
    Address:
12. Write a class called **C Account** which contains two private data elements, an integer **Account Number** and a floating-point **account Balance** and three-member functions:
    - A constructor that allows the user to set initial values for **Account Number** and **Account Balance** and a default constructor that prompts for the input of the values for the above data numbers.
    - A function called **Input Transaction**, which reads a character value for **Transaction Type** ('D' for deposit and 'W' for withdrawal) and a floating-point value for **Transaction Amount**, which updates **Account Balance**.
    - A function called **Print Balance**, which prints on the screen the **Account Number** and **Account Balance.**
13. Define a class *Counter* which contains an int variable *count* defined as static and a static function Display () to display the value of *count*. Whenever an o b j e c t of this class is created *count* is incremented by 1. Use this class in main to create multiple objects of this class and display value of count each time.
14. WAP to add and subtract two complex numbers using classes.
15. Write program to overload Binary + to add two similar types of objects. (Both with and without using friend functions)
16. WAP to implement += and = operator
17. Implement the following class hierarchy considering appropriate data members and member functions:



18. Implement the following hierarchy considering appropriate data members and member functions (use Virtual functions).



19. WAP to convert meter to centimetre and vice versa, using data conversions and operator overloading
20. WAP to count digits, alphabets and spaces, stored in a text file, using streams.

Note:

1. **In total 10 practicals to be implemented. 2 additional practicals may be given by the course**

instructor.

2. **This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.**

COMPUTER ORGANISATION & ARCHITECTURE LAB

Code: 26CS292
Max Marks: 70

Exercises in Digital Logic Design:

1. Implement Logic gates using NAND and NOR gates
2. Design a Full adder using gates
3. Design and implement the 4:1 MUX, 8:1 MUX using gates /ICs.
4. Design and Implement a 3 to 8 decoder using gates
5. Design a 4 bit comparator using gates/IC
6. Design and Implement a 4 bit shift register using Flip flops
7. Design and Implement a Decade counter

Exercises in Computer Organization:

8. Implement a C program to convert a Hexadecimal, octal, and binary number to decimal number vice versa.
9. Implement a C program to perform Binary Addition & Subtraction.
10. Implement a C program to perform Multiplication of two binary numbers
11. Implement a C program to perform Multiplication of two binary numbers (signed) using Booth's Algorithms.
12. Implement a C program to perform division of two binary numbers (Unsigned) using restoring division algorithm.
13. Implement a C program to perform division of two binary numbers (Unsigned) using non-restoring division algorithm.

Note:

1. **In total 15 practicals to be implemented. 2 additional practicals may be given by the course instructor.**
2. **This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.**

ARYAVART INTERNATIONAL UNIVERSITY
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Integrated MCA

3rd Semester

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

DETAILED SYLLABUS

DATA STRUCTURE AND ALGORITHM USING C

Code: 26CS301
Max Marks: 70

Course Objectives: The objective of the course is to learn fundamental data structures and their applications, implement algorithms for searching, sorting, and recursion in C and analyze algorithm efficiency and performance.

UNIT I **(14 Hrs)**
Linear Data Structures- Static: Introduction to Algorithms- Attributes, Design Techniques, Time Space Trade Off, Data Structures, Classification and Operations of Data Structures.
Arrays: Single Dimension, Two-Dimension and Introduction to Multi-Dimensional, Memory Representation, Address Calculation, Sparse Matrices- Types, Representation.
Searching and Sorting: Linear and Binary Search, Selection Sort, Bubble Sort, Insertion Sort, Merge Sort, Elementary Comparison of Searching and Sorting Algorithms.
Hashing: Hash Table, Hash Functions, and Collision Resolution.

UNIT II **(10 Hrs)**
Linear Data Structures- Dynamic
Introduction: Dynamic Memory Allocation, Dynamic Memory versus Static Memory Allocation.
Linked List Types: Singly Linked List, Doubly Linked List, Header Linked List, Circular Linked List.
Operations: Creation, Insertion, Deletion, Modification, Searching, Sorting, Reversing, and Merging.

UNIT III **(06 Hrs)**
Abstract Data Types:
Stacks: Introduction, Static and Dynamic Implementation, Operations, Applications- Evaluation and Conversion between Polish and Reverse Polish Notations.
Queues: Introduction, Static and Dynamic Implementation, Operations, Types- Linear Queue, Circular Queue, Doubly Ended Queue, Priority Queue.

UNIT IV **(10 Hrs)**
Non-Linear Data Structures:
Introduction to Graphs: Notations & Terminologies, Representation of Graphs- Adjacency Matrix, Incidence Matrix and Linked Representation.
Trees: Notations & Terminologies, Memory Representation, Binary Trees Types- Complete, Full, Strict, Expression Binary Tree, Tree Traversals (Recursive), Binary Search Tree and Basic Operations.
Introduction and Creation (Excluding Implementation): AVL Tree, Heap Tree, M- Way Tree, and B Tree.

Text Books:

1. Schaum's Outline Series, "Data Structures", TMH, Special Indian Ed., Seventeenth Reprint, 2014.
2. Y. Langsam, M. J. Augenstein and A.M. Tanenebaum, "Data Structures using C and C++", Pearson Education India, Second Edition, 2015.
3. D. Samanta, "Classic Data Structures", PHI, Second Edition, 2009.

Suggested Readings:

1. Ashok N Kamthane "Introduction to Data Structures in C", Pearson, Third Edition, 2009.
2. E. Horowitz and S. Sahni, "Fundamentals of Data Structures in C". Universities Press, Second edition, 2008.
3. D. Malhotra and N. Malhotra, "Data Structures and Program Design using C", Laxmi Publications, Indian adapted edition from Mercury Learning and Information-USA, First edition, 2018.
4. Y. Kanetkar "Data Structures through C", BPB Publication, Third Edition, 2019.
5. R.F Gilberg, and B A Frouzan- "Data Structures: A Pseudocode Approach with C", Thomson Learning, Second Edition, 2004.
6. A. K. Rath, and A.K. Jagadev, "Data Structures and Program Design Using C", Scitech Publications, Second Edition, 2011.

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

DATABASE MANAGEMENT SYSTEM

Code: 26CS302
Max Marks: 70

Course Objectives: The objective of the course is to understand database concepts, models, and architectures, design and implement relational databases using SQL and learn normalization, indexing, and transaction management.

UNIT I **(10 Hrs)**
Introduction: An overview of database management system, Characteristics of database approach, DBMS architecture, client/server, data Models, Introduction to Distributed Data processing, schema and instances, data independence.
Data Modelling using Entity Relationship Model: Basic introduction about the terminologies like Entity, Entity types, Entity set, Notation for ER diagram, Attributes and keys, Types of attributes (composite, derived and multivalued attributes) and keys (Super Key, candidate key, primary key), Relationships, Relation types, Weak entities, Enhanced E-R, Specialization and Generalization.

UNIT II **(13 Hrs)**
Introduction to SQL: Overview, Characteristics of SQL. Advantage of SQL, SQL data types and literals.
Types of SQL commands: DDL, DML, DCL. Basic SQL Queries.
Logical operators: BETWEEN, IN, AND, OR and NOT.
Null Values: Disallowing Null Values, Comparisons Using Null Values.
Integrity constraints: Primary Key, Not NULL, Unique, Check, Referential key.
Introduction to Nested Queries, Correlated Nested Queries, Set-Comparison Operators, Aggregate Operators: The GROUP BY and HAVING Clauses.
Joins: Inner joins, Outer Joins, Left outer, Right outer, full outer joins.
Overview of other SQL Objects: Views, Sequences, Indexes, Triggers and stored procedure.

UNIT III **(10 Hrs)**
Relational Data Models: Relational model terminology domains, Attributes, Tuples, Relations, Characteristics of relations, Relational constraints Domain constraints, Key constraints and Constraints on null, Relational DB schema. Codd's Rules.
Relational Algebra: Basic operations selection and projection.
Set Theoretic Operations: Union, Intersection, Set difference and division (Order, Relational calculus: Domain, Tuple, Well Formed Formula, Specification, Quantifiers).
Join operations: Inner, Outer, Left outer, Right outer, and Full outer join.
ER to relational mapping: Steps to map ER diagram to relational schema.
Data Normalization: Functional dependencies, Armstrong's inference rule, & Normalization (Up to BCNF)

UNIT IV **(07 Hrs)**
Transaction Processing: Definition of Transaction, Desirable ACID properties.
Database recovery and Database Security: System failure, Backup & recovery Techniques, Authentication, Authorization.
Overview of Query by Language, No SQL databases.

Text Books:

1. R. Elmarsi and SB Navathe, "Fundamentals of Database Systems", Pearson, 5th Ed.
2. Singh S.K., "Database System Concepts, design and application", Pearson Education [TB3] TB3.
3. Ramakrishnan and Gherke, "Database Management Systems", TMH.
4. Bipin Desai, "An Introduction to Database Systems", Galgotia Publications, 1991.

Suggested Readings:

1. Abraham Silberschatz, Henry Korth, S. Sudarshan, "Database Systems Concepts", 6th Edition, McGraw Hill, 2010.
2. Jim Melton, Alan Simon, "Understanding the new SQL: A complete Guide", Morgan Kaufmann Publishers, 1993.
3. A. K. Majumdar, P. Bhattacharya, "Database Management Systems', TMH, 2017.

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

FUNDAMENTALS OF DATA SCIENCE

Code: 26CS311
Max Marks: 70

Course Objectives: The objective of the course is to understand the data science process and life cycle, learn data analysis, visualization, and basic statistics and use tools like Python and libraries for data handling.

UNIT I **(10 Hrs)**

- Introduction to Data Science, Evolution of Data Science, Data Science Roles, Stages in a Data Science Project, Applications of Data Science in various fields, Data Security Issues.
- Data Collection Strategies, Data Pre-processing overview- Data Cleaning- Data Integration and transformation- Data Reduction- Data Discretization.

UNIT II **(10 Hrs)**

- Statistics for Data Science: Describing a Single Set of Data, Central Tendencies and Dispersion.
- Descriptive Statistics- Mean, standard Deviation, Skewness and Kurtosis, Box plots, Pivot Table, Linear Regression.

UNIT III **(16 Hrs)**

- Why Python? - Essential Python libraries.
- Introduction to NumPy: NumPy Basics: Arrays and Vectorized Computation- The NumPyndarray- Creating ndarrays- Data Types for ndarrays- Arithmetic with NumPy Arrays- Basic Indexing and Slicing.
- Data handling using Pandas in Python: Series (creation from ndarray, dictionary; mathematical operations; Head and Tail functions), DataFrames (creation from dictionary of series, operations on rows and columns).
- Statistical functions using pandas like min, max, count, sum, quartile, standard deviation, variance & DataFrame operations like aggregation, group by, sorting, deleting, Renaming Index, and Pivoting.

UNIT IV **(04 Hrs)**

- Case Studies: Checking different patterns in data, forecasting demand, and investigating clinical data.

Text Books:

1. McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly, 2nd Edition,2018.
2. Agile tools for real world data: Python for Data Analysis by Wes McKinney, O'Reilly.
3. Applying Data Science Business Case Studies Using SAS By Gerhard Svolba · 2017.

Suggested Readings:

1. Python: The Complete Reference by Martin Brown.
2. Programming Python, 4th Edition by Mark Lutz Released December 2010 Publisher(s): O'Reilly Media, Inc.

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MODELLING & SIMULATION

Code: 26CS321
Max Marks: 70

Course Objective: The objective of this course is to provide students with an understanding of modelling and simulation techniques and their applications in various domains. The course aims to develop students' skills in designing and implementing simulations to analyze and solve complex problems.

UNIT I: Introduction to Modelling and Simulation **(04 Hrs)**
Overview of modeling and simulation concepts, Types of simulation models, Continuous and discrete event simulation.

UNIT II: Model Development and Validation **(04 Hrs)**
System dynamics modeling, Agent-based modeling, Validation and verification of simulation models.

UNIT III: Simulation Software and Tools **(04 Hrs)**
Popular simulation software: AnyLogic, Arena, etc., Simulation experiment design and analysis, Sensitivity analysis and optimization.

UNIT IV: Case Studies in Simulation **(04 Hrs)**
Application of simulation in various domains, Simulation of manufacturing systems, Simulation of queuing systems.

UNIT V: Monte Carlo Simulation **(04 Hrs)**
Basics of Monte Carlo simulation, Generating random numbers, Monte Carlo simulation for risk analysis.

Suggested Readings:

1. "Simulation Modeling and Analysis" by Averill M. Law and David Kelton.
2. "Discrete-Event System Simulation" by Jerry Banks, John S. Carson II, Barry L. Nelson, and David M. Nicol.

GRAPH THEORY

Code: 26CS322
Max Marks: 70

Course Objective: The objective of this course is to introduce students to the concepts and algorithms of graph theory and their applications in various domains. The course aims to develop students' skills in analysing and solving problems related to graphs and networks.

UNIT I: Introduction to Graph Theory **(04 Hrs)**
Basic concepts: Graphs, Vertices, Edges, Types of graphs: Directed, Undirected, Weighted, etc., Graph representation: Adjacency matrix, Adjacency list.

UNIT II: Graph Traversal and Shortest Paths **(04 Hrs)**
Breadth-First Search (BFS) and Depth-First Search (DFS), Dijkstra's algorithm for single-source shortest path, Bellman-Ford algorithm for single-source shortest path.

UNIT III: Spanning Trees and Connectivity **(04 Hrs)**
Minimum Spanning Tree (MST) algorithms: Prim's, Kruskal's, connected components and Strongly Connected Components (SCC).

UNIT IV: Network Flows and Matching **(04 Hrs)**
Maximum Flow and Minimum Cut problem, Bipartite matching and applications, Applications of graph theory in various fields.

UNIT V: Graph Algorithms **(04 Hrs)**
Topological sorting, Eulerian and Hamiltonian cycles, Traveling Salesman Problem (TSP), Introduction to NP-completeness.

Suggested Readings:
1. "Introduction to Graph Theory" by Douglas B. West.
2. "Graph Theory and Its Applications" by Jonathan L. Grossand Jay Yellen.

INDIAN KNOWLEDGE SYSTEM

Code: 26GN301
Max Marks: 70

Course Objective: This course aims to provide participants with a comprehensive understanding of India's rich and diverse knowledge traditions, encompassing philosophy, literature, sciences, arts, and sustainable practices. Through the exploration of traditional wisdom and its contemporary relevance, this course seeks to foster appreciation, preservation, and responsible utilization of the Indian Knowledge System.

UNIT I: Introduction to Indian Knowledge System (IKS) **(02 Hrs)**
Definition, Concept and Scope of IKS, Definition, Concept and Scope of IKS, IKS based approaches on Knowledge Paradigms, IKS in ancient India and in modern India

UNIT II: IKS and Indian Scholars **(07 Hrs)**
Indian Literature Philosophy and Literature (Maharishi Vyas, Manu, Kanad, Pingala, Parasar, Banabhatta, Nagarjuna and Panini), Mathematics and Astronomy (Aryabhatta, Mahaviracharya, Bodhayan, Bhashkaracharya, Varahamihira and Brahmgupta), Medicine and Yoga (Charak, Susruta, Maharishi Patanjali and Dhanwantri), Sahitya (Vedas, Upvedas, Upavedas (Ayurveda, Dhanurveda, Gandharvaveda), Puran and Upnishad) and shad darshan (Vedanta, Nyaya.Vaisheshik, Sankhya, Mimamsa, Yoga, Adhyatma and Meditation), Shastra (Nyaya, vyakarana, Krishi, Shilp, Vastu, Natya and Sangeet)

UNIT III: Indian Traditional/tribal/ethnic communities, their livelihood and local wisdom **(02 Hrs)**
Geophysical aspects; Resources and Vulnerability; Resource availability, utilisation patterns, and limitations; Socio-Cultural linkages with the Traditional Knowledge System; Tangible and intangible cultural heritage.

UNIT IV: Unique Traditional Practices and Applied Traditional Knowledge **(07 Hrs)**
Myths, Rituals, Spirituals, Taboos and Belief System, Folk Stories, Songs, Proverbs, Dance, Play, Acts and Traditional Narratives, Agriculture, animal husbandry, Forest, Sacred Groves, Water Mills, Sacred Water Bodies, Land, water and Soil Conservation and management Practices, Indigenous Bio-resource Conservation, Utilization Practices and Food Preservation Methods, Handicrafts, Wood Processing and Carving, -Fiber Extraction and Costumes, Vaidya (traditional health care system), Tantra-Mantra, Amchi Medicine System, Knowledge of dyeing, chemistry of dyes, pigments and chemicals

UNIT V: Protection, preservation, conservation and Management of Indian Knowledge System (02 Hrs)
Documentation and Preservation of IKS, Approaches for conservation and Management of nature and bioresources, Approaches and strategies to protection and conservation of IKS

Suggested Readings:
1. "Introduction To Indian Knowledge System: Concepts and Applications" by B. Mahadevan, Nagendra Pavana, Vinayak Rajat Bhat
2. "Traditional Knowledge System in India" by Amit Jha

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

HUMAN VALUES AND ETHICS

Code: 26GN302
Max Marks: 70

Course Objectives: The course aims to develop ethical reasoning and awareness of human values, promoting responsible behaviour in personal, professional, and societal contexts.

UNIT I: Introduction to human values **(05 Hrs)**

- Understanding the need, Basic guidelines, Process of Value Education.
- Understanding the thought-provoking issues- Continuous happiness and Prosperity.
- Right understanding- relationship and physical facilities, Choice making- choosing, Cherishing and Acting.
- Understanding values- Personal Values, Social values, Moral values and Spiritual values, Self-Exploration and Awareness leading to Self-Satisfaction; Tools for Self-Exploration.

UNIT II: Harmony and role of values in family, society and human relations **(05 Hrs)**

- Understanding harmony in the Family- the basic unit of human interaction; Understanding values in human-human relationships; Understanding harmony in society-human relations.
- Interconnectedness and mutual fulfilment; Coexistence in nature.
- Holistic perception of harmony at all levels of existence, universal harmonious order in society.
- Visualising a universal harmonium order in society- undivided society (Akhand Samaj), universal order (Sarvabhaum Vyawastha)- from family to world family.

UNIT III: Coexistence and role of Indian Ethos **(05 Hrs)**

- Interconnectedness and mutual fulfilment among the four orders of nature: recyclability and self-regulation in nature.
- Ethos of Vedanta; Application of Indian Ethos in organisations in management; Relevance of Ethics and Values in organisations in current times.

UNIT IV: Professional ethics **(05 Hrs)**

- Understanding about Professional Integrity, respect and equality, Privacy, Building Trusting relationships, Co-operation, and Respecting the competence of other professions.
- Understanding about taking initiative, Promoting the culture of openness, and Demonstrating loyalty towards goals and objectives.
- Ethics at the workplace: - cybercrime, plagiarism, sexual misconduct, fraudulent use of institutional resources, etc.
- Ability to utilise professional competence for augmenting the universal human order.

Text Books:

1. A Textbook on Professional Ethics and Human Values by R S Naagarazan.
2. A Foundation Course in Human Values and Professional Ethics by R.R. Gaur, R. Sangal, G.P. Bagaria.
3. Indian Ethos and Modern Management by B L Bajpai, New Royal Book Co., Lucknow, 2004, Reprinted 2008.

Suggested Readings:

4. A N Tripathy, 2003, Human Values, New Age International Publishers
5. Human Values and Professional Ethics by Vaishali R Khosla, Kavita Bhagat
6. I.C. Sharma. Ethical Philosophy of India, Nagin & Co., Julundhar

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

DATA STRUCTURE USING C LAB

Code: 24CS391
Max. Marks: 70

Core Practicals (Implement minimum 8 out of 10 practicals)

1. WAP to implement following operation on one dimensional array (i) Insertion (ii)Deletion (iii) Traversal (iv) Reverse (v) Merge.
2. WAP to Sort an array using menu driven:
   (i) BUBBLE SORT (ii) MERGE SORT (iii) INSERTION SORT (iv) SELECTION SORT.
3. WAP to implement a Singly Linked List.
4. WAP to implement a Circular Linked Lists.
5. WAP to implement Doubly Linked Lists.
6. Write a menu driven program to implement (i) Static Stack (ii) Dynamic Stack.
7. WAP to implement a: (i) Static (ii) Dynamic Circular Queue.
8. WAP to implement a: (i) Static (ii) Dynamic De-Queue..
9. Implement recursive algorithms for the following operations on Binary SearchTree.
   (i) Insertion
   (ii) Searching
10. Implement recursive algorithms for BST traversal- Inorder, Preorder, Postorder.

Application Based Practicals (Implement minimum 5 out of 8 practicals)

11. WAP to search & display the location of an element specified by the user, in an array using: (i) Linear Search (ii) Binary Search technique.
12. WAP to accept a matrix from user, find out matrix is sparse or not and convert into triplex matrix.
13. WAP to implement Polynomial addition operation using linked list.
14. Write a C program to create two linked lists from a given list in following way:
    INPUT List:- 1 2 3 4 5 6 7 8 9 10 OUTPUT:-
    First List:- 1 3 5 7 9
    Second List:- 2 4 6 8 10
15. WAP to implement Student Database using Linked List with the following structure:
    - Name
    - Rollno
    - Marks of 5 subjects
    - Average
    - Result, If the average < 50, then print 'Fail', otherwise 'Pass'
16. Write a program to convert Infix to equivalent (i) Prefix expression (ii) Postfix expression
17. Write a program to evaluate (i) Prefix Expression (ii) Postfix Expression using stack.
18. Let us assume a Patient's coupon generator for the Doctors' clinic. The patients are given the coupons on first-come-first-serve basis. After the visit of a patient, patient-ID is kept stack-wise. At the end of the day, the count is generated from the stack. Construct a menu-based program for patients' coupons generator using an appropriate data structure.
19. WAP to implement an expression tree. (For example: (a + b / (c * d) – e)).
20. Sometimes a program requires two stacks containing the same type of items. Suppose two stacks are stored in separate arrays, then one stack might overflow while there is considerable unused space in the other. A neat way to avoid this problem is to put all spaces in one stack and let this stack grow from one end of the array, and the other stack starts from the other end and grows in the opposite direction, i.e., toward the first stack. In this way, if one stack turns out to be large and the other small, then they will still both fit, and there will be no overflow until all space is used. Declare a new structure that includes these two stacks and perform various stack operations.

Note:

1. **In total 15 practicals to be implemented. 2 additional practicals may be given by the course instructor.**
2. **This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.**

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

DATABASE MANAGEMENT SYSTEM LAB

Code: 24CS392
Max. Marks: 70

Core Practicals (Implement All the mentioned practicals)
The following are two suggestive databases. The students may use either or both databases for their core practicals. However, the instructor may provide any other databases for executing these practices.

1.COLLEGE DATABASE:
STUDENT (USN, SName, Address, Phone, Gender) SEMSEC (SSID, Sem, Sec)
CLASS (USN, SSID)
SUBJECT(Subcode,Title,Sem,Credits)
IA MARKS (USN, Subcode, SSID, Test1, Test2, Test3, Final IA)

2.COMPANY DATABASE:
EMPLOYEE (SSN, Name, Address, Sex, Salary, SuperSSN, DNo)
DEPARTMENT (DNo, DName, MgrSSN, MgrStartDate)
DLOCATION (DNo, DLoc)
PROJECT (PNo, PName, PLocation, DNo)
WORKS_ON (SSN, PNo, Hours)

1. Draw an E-R diagram from given entities and their attributes.
2. Convert the E-R diagram in to a Relational model with proper constraints.
3. Write queries to execute following DDL commands:
   CREATE: Create the structure of a table with at least five columns
   ALTER: Change the size of a particular column.
   Add a new column to the existing table.
   Remove a column from the table.
   DROP: Destroy the table along with its data.
4. Write queries to execute following DML commands:
   INSERT: Insert five records in each table.
   UPDATE: Modify data in single and multiple columns in a table.
   DELETE: Delete selective and all records from a table
5. Write queries to execute following DML command:
   SELECT: Retrieve the entire contents of the table.
   Retrieve the selective contents (based on provided conditions) from a table.
   Retrieve contents from a table based on various operators i.e. string operators, logical operators, conditional operators and Boolean operators.
   Sort the data in ascending and descending order in a table on the basis of one column or more than one column.
6. Create table using following integrity constraints:
   - PrimaryKey
   - Unique Key
   - Not Null
   - Check Default
   - Foreign Key
7. Write queries to execute following Aggregate functions:
   Sum, Avg, Count, Minimum and Maximum value of a numeric column of a table using aggregate function.
8. Retrieve data from a table using alias names.
9. Retrieve data of a table using nested queries.
10. Retrieve data from more than one table using inner join, left outer, right outer and full outer Joins.
11. Create view from one table and more than one table.
12. Create index on a column of a table.

Application Based Practicals

13. Consider the Insurance company's Database given below. The primary keys are underlined and the data types are specified.
    PERSON (driver_id#: string, name: string, address: string)
    CAR (reg no : string, model: string, year: int)

ACCIDENT (report_number:int, acc_date: date, location: string)
OWNS (driver_id#: string, reg no: string)
PARTICIPATED (driver_id#: string, reg no: string, report_number: int, damage_amount: number (10, 2))

(i) Create the above tables by properly specified the primary key and the foreign key
(ii) Enter at least five tuples for each relation
(iii) Demonstrate how you can
  a) Update the damage amount for the car with a specific reg no, the accident with report number 12 to 25000.
  b) Add a new accident to the database.
(iv) Find the total number of people who owned cars that were involved in accident in 2002.
(v) Find the number of accident in which cars belonging to a specific models were involved.

14. Consider the following schema of a library management system. Write the SQL queries for the questions given below:
Student (Stud_no: integer, Stud_name: string)
Membership (Mem_no: integer, Stud_no: integer)
Book_(book_no: integer, book_name: string, author: string)
lss_rec_(iss_no: integer, iss_date: date, Mem_no: integer, book_no: integer)
(i) Create the tables with the appropriate integrity constraints.
(ii) Insert around 10 records in each of the tables.
(iii) Display all records for all tables.
(iv) List all the student names with their membership numbers.
(v) List all the issues for the current date with student and Book names.
(vi) List the details of students who borrowed book whose author is Elmarsi & Navathe.
(vii) Give a count of how many books have been bought by each student.
(viii) Give a list of books taken by student with stud_no as 1005.
(ix) Delete the List of books details which are issued as of today.
(x) Create a view which lists out the iss_no, iss_date, stud_name, bookname.

15. Use the relations below to write SQL queries to solve the business problems specified.
CLIENT (clientno#, name, client_referred_by#)
ORDER (orderno#, clientno#, order_date, empid#)
ORDER_LINE (orderno#, orderlinenumber#, item_number#, no_of_items, item_ cost, shipping_date)
ITEM (item_number#, item_type, cost)
EMPLOYEE (empid#, emp_type#, deptno, salary, first name, last name)
Notes:
a. Column followed by # is the primary key of the table.
b. Each client may be referred by another client. If so, the client number of the referring client is stored in referred_by.
c. The total cost for a particular orderline=no_of_items*item_cost.c.

16. Write queries for the following:
(i) Create all the above tables.
(ii) Insert at least five records.
(iii) Display all the rows and columns in the CLIENT table. Sort by client name in reverse alphabetical order.
(iv) Display the item number and total cost for each order line (total cost = no of items X item cost). Name the calculated column TOTAL COST.
(v) Display all the client numbers in the ORDER table. Remove duplicates.
(vi) Display the order number and client number from the ORDER table. Out put the result in the format. Client <clientno> ordered <orderno>
(vii) Display full details from the ORDER_LINE table where the item number is (first condition) between 1 and 200 (no > or < operators) OR the item number is greater than 1000 AND (second condition) the item cost is not in the list 1000, 2000, 3000 OR the order number is not equal to 1000.
(viii) Display the client name and order date for all orders.
(ix) Repeat query (6) but also display all clients who have never ordered anything.
(x) Display the client name and order date for all orders using the join keywords.
(xi) Display the client name and order date for all orders using the JOIN method.

(xii) Display the client number, order date and shipping date for all orders where the shipping date is between three and six months after the order date.
(xiii) Display the client number and name and the client number and name of the person who referred that client.
(xiv) Display the client name in upper case only and in lower case only.
(xv) Display the second to fifth characters in each client name.

Note:

1. **In total 15 practicals to be implemented. 2 additional practicals may be given by the course instructor.**
2. **This is a suggestive list of programs. However, the instructor may add programs as per the requirements of the course.**

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Integrated MCA

4th Semester

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

DETAILED SYLLABUS

COMPUTER NETWORKS

Code: 26CS401
Max Marks: 70

Course Objectives: The objective of the course is to understand network models, protocols, and architecture, learn data transmission, routing, and switching concepts and study network security and communication standards.

UNIT I **(10 Hrs)**
Basic Concepts: Components of data communication, Distributed processing, Line configuration, Topology, Transmission mode and Categories of networks.
OSI and TCP/IP Models: Layers and their functions, Comparison of models.
Transmission Media: Guided and unguided, Attenuation, Distortion, Noise, Throughput, Propagation speed and time, Wavelength, Shannon Capacity.

UNIT II **(10 Hrs)**
Telephony: Multiplexing, WDM, TDM, FDM, Circuit switching, Packet switching and Message switching.
Data Link Layer: Types of errors, Framing (character and bit stuffing), Error detection & Correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- NARQ, Selective repeat ARQ.

UNIT III **(10 Hrs)**
Network Layer: Internet working & Devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway, Modems; **Addressing:** IPv4 and IPv6 addressing, IPv4 subnetting; Routing: Unicast Routing Protocols: RIP, OSPF, BGP; **Routing:** Routing Methods- Static and Dynamic Routing, Routing basic commands, Distance vector protocol, Link state protocol.

UNIT IV **(10 Hrs)**
Transport and upper layers in OSI Model: Transport layer functions and Protocols, Connection management, Functions of session layers, Presentation layer and Application layer.

Text Books:

1. A. S. Tenanbaum, "Computer Networks"; Pearson Education Asia, 4th Ed., 2003.
2. Behrouz A. Forouzan, "Data Communication and Networking", 2nd edition, Tata Mc Graw Hill.

Suggested Readings:

1. D. E. Comer, "Internetworking with TCP/IP", Pearson Education Asia, 2001.
2. William Stallings, "Data and computer communications", Pearson education Asia, 7th Ed., 2002.
3. Leinwand, A., Pinsky, B. (2001). Cisco router configuration. United Kingdom: Cisco Press.

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OPERATING SYSTEMS

Code: 26CS402
Max Marks: 70

Course Objectives: The objective of the course is to understand the design and functioning of operating systems, including process management, memory management, file systems, and scheduling.

UNIT I **(8 Hrs)**
Introduction to OS: Functionality of OS - OS design issues - Structuring methods (monolithic, layered, modular, micro-kernel models) - Abstractions, processes.
OS Principles: System calls, System/Application Call Interface – Protection: User/Kernel modes – Interrupts.

UNIT II **(10 Hrs)**
Scheduling: Processes Scheduling - CPU Scheduling: Pre-emptive, non-pre-emptive – Multiprocessor scheduling – Deadlocks - Resource allocation and management - Deadlock handling mechanisms: prevention, avoidance, detection, recovery.
Concurrency: Inter-process communication, Synchronization - Implementing synchronization primitives (Peterson's solution, Bakery algorithm, synchronization hardware) - Semaphores – Classical synchronization problems, Monitors: Solution to Dining Philosophers problem.

UNIT III **(8 Hrs)**
Memory Management: Main memory management, Memory allocation strategies, Virtual memory: Hardware support for virtual memory (caching, TLB) – Paging - Segmentation - Demand Paging - Page Faults – Page Replacement –Thrashing.

UNIT IV **(8 Hrs)**
Storage Management, Protection and Security : Disk structure and attachment – Disk scheduling algorithms (seek time, rotational latency based)-System threats and security – Policy vs mechanism - Access vs authentication.

UNIT V **(6 Hrs)**
System protection: Access matrix – Capability based systems - OS: performance, scaling, future directions in mobile OS, Recent Trends.

Text Books:

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne-Operating System Concepts, Wiley(2018).
2. Stallings (2006), Operating Systems, Internals and Design Principles, 5th edition, Pearson Education, India.

Suggested Readings:

1. Ramez Elmasri, A.Gil Carrick, David Levine, Operating Systems, A Spiral Approach-McGraw Hill Higher Education (2010).
2. Remzi H. Arpaci-Dusseau, Andrea C. Arpaci-Dusseau, Operating Systems, Three Easy Pieces, Arpaci-Dusseau Books, Inc (2015).
3. Andrew S. Tanenbaum, Modern Operating Systems, Pearson, 4th Edition (2016).
4. William Stallings, Operating Systems: Internals and Design Principles, Pearson, 9th Edition (2018).

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PYTHON PROGRAMMING

Code: 26CS411
Max Marks: 70

Course Objectives: This course is designed to introduce programming concepts using Python to students. The course aims to develop structured as well as object-oriented programming skills using Python. The course also aims to achieve competence amongst its students to develop correct and efficient Python programs to solve problems spanning multiple disciplines.

UNIT I **(8 Hrs)**
Introduction: History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

UNIT II **(8 Hrs)**
Types, Operators and Expressions: Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while, break, continue, pass.

UNIT III **(8 Hrs)**
Data Structures: Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions, strings and basic operations of strings.

UNIT IV **(8 Hrs)**
Functions: Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.

UNIT V **(8 Hrs)**
Object Oriented Programming OOP in Python: Classes, 'self-variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding,
Error and Exceptions: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions.

Text Books:
1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
2. Learning Python, Mark Lutz, Orielly.

Suggested Readings:
1. Think Python, Allen Downey, Green Tea Press.
2. Core Python Programming, W.Chun, Pearson.
3. Introduction to Python, Kenneth A. Lambert, Cengage.

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SOFTWARE ENGINEERING

Code: 26CS421
Max Marks: 70

Course Objectives: The objective of the course is to enable students to learn the software development life cycle and methodologies, apply principles of requirement analysis, design, testing, and maintenance, and understand project management and quality assurance.

UNIT I **(05 Hrs)**
Introduction of software engineering: Software Crisis, Software life cycle models, Waterfall, Prototype, Spiral – Models, Agile model.
Software Requirements analysis & specifications: Requirement engineering, requirement elicitation techniques like FAST, QFD, Requirement analysis using (DFD use-case, sequence and class diagram (with case studies), ER Diagrams, Requirements documentation: SRS, Characteristics & organization of SRS.

UNIT II **(05 Hrs)**
Software Project Planning: Software Metrics-Definition and Need, Types of Metrics-Product, Process and Project Metrics, Size Estimation like lines of Code & Function Count, Halstead Software Science measure, Cost Estimation: Need, Models COCOMO: Basic model, Intermediate model.
Risk Management: Software Risks, Types of risk, risk management activities: risk assessment, risk control.

UNIT III **(05 Hrs)**
Software Design: Cohesion & Coupling, Classification of Cohesiveness & Coupling.
Quality management: Quality concept, software quality assurance, Total Quality Management (TQM), software review, software inspection.
Software Implementation: Structured coding techniques, coding style, Standards and guidelines, documentation guidelines. Reverse Engineering, Software Re-engineering, Configuration Management.

UNIT IV **(05 Hrs)**
Software Testing: Testing Process, Levels of Testing: Unit testing, Integration testing and system testing. Types of Testing: Manual testing, Automation Testing. Methods of Testing- , Black box, White box and Grey Box Testing. Validation, Verification, Alpha-Beta testing, Acceptance testing, Functional Testing and its types, Structural Testing Difference between: Testing and Debugging.
Software Maintenance: Management of Maintenance, The Maintenance Process and Types of maintenance: Preventive, Perceptive, Adaptive and Corrective Maintenance. Maintenance tools and techniques.

Text Books:

1. K. K. Aggarwal & Yogesh Singh, "Software Engineering", 2nd Ed., New Age International, 2005.
2. I. Sommerville, "Software Engineering", 9th Edition, Pearson Edu

Suggested Readings:

1. Jibitesh Mishra and Ashok Mohanty, "Software Engineering", Pearson
2. R. S. Pressman, "Software Engineering – A practitioner's approach", 5th Ed., McGraw Hill Int. Ed., 2001.
3. James Peter, W. Pedrycz, "Software Engineering: An Engineering Approach", John Wiley & Sons.

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SOFTWARE TESTING

Code: 26CS422
Max. Marks: 70

Course Objective: The objective of this course is to provide students with an understanding of software testing principles, techniques, and methodologies. The course aims to develop students' skills in designing test cases, executing tests, and reporting defects.

UNIT I: Introduction to Software Testing **(04 Hrs)**
Fundamentals of software testing, Testing life cycle and testing methodologies, Types of testing: functional, non-functional, etc.

UNIT II: Test Planning and Test Case Design **(04 Hrs)**
Test planning and test strategy development, Test case design techniques: black-box, white-box, etc., Test data preparation and test environment setup.

UNIT III: Test Execution and Defect Management **(04 Hrs)**
Test execution and defect reporting, Test automation and test scripts, Defect management and tracking.

UNIT IV: Performance and Security Testing **(04 Hrs)**
Performance testing: load, stress, and scalability testing, Security testing: vulnerabilities and penetration testing, Usability testing and user experience evaluation.

UNIT V: Test Automation Tools and Emerging Trends **(04 Hrs)**
Introduction to test automation tools (e.g., Selenium, JUnit), Continuous integration and continuous testing, Emerging trends in software testing.

Suggested Readings:

1. "Foundations of Software Testing" by Dorothy Graham, Erik Van Veenendaal, Isabel Evans, and Rex Black.
2. "The Art of Software Testing" by Glenford J. Myers.

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INDIAN CONSTITUTION

Code: 26GN401
Max Marks: 70

Course Objectives: The objective of the *Indian Constitution* course is to provide the students with a foundational understanding of the principles, structure, and functioning of the Indian Constitution. The course emphasises the rights and duties of citizens, governance frameworks, and the role of the Constitution in shaping the democratic and legal structure of India.

UNIT I **(05 Hrs)**
Introduction to Constitution: Meaning and importance of the Constitution, salient features of the Indian Constitution. Preamble of the Constitution. Fundamental rights- meaning and limitations. Directive principles of state policy and Fundamental duties -their enforcement and their relevance.

UNIT II **(05 Hrs)**
Union Government: Union Executive- President, Vice-President, Prime Minister, Council of Ministers. Union Legislature- Parliament and Parliamentary proceedings. Union Judiciary-Supreme Court of India – composition, powers and functions.

UNIT III **(05 Hrs)**
State and Local Governments: State Executive- Governor, Chief Minister, Council of Ministers. State Legislature, State Legislative Assembly and State Legislative Council. State Judiciary-High Court. Local Government-Panchayat Raj System with special reference to 73rd and Urban Local Self-Government with special reference to 74th Amendment.

UNIT IV **(05 Hrs)**
Election provisions, Emergency provisions, Amendment of the constitution: Election Commission of India-composition, powers and functions and electoral process. Types of emergency grounds, procedure, duration and effects. Amendment of the Constitution- meaning, procedure and limitations.

Text Books:
1. M. V. Pylee, "Introduction to the Constitution of India",4th Edition, Vikas Publication,2005.
2. Durga Das Basu (DD Basu), "Introduction to the Constitution of India", (Student Edition), 19th edition, Prentice-Hall EEE, 2008.

Suggested Readings:
1. Merunandan, "Multiple Choice Questions on Constitution of India", 2nd Edition, Meraga Publication, 2007.

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DRUG ABUSE, ROAD SAFETY & TRAFFIC RULES

Code: 24GN402
Max Marks: 70

Course Objectives: This course aims to create awareness about the harmful effects of drug abuse, the importance of road safety, and the need to follow traffic rules. It seeks to help learners understand the physical, mental, social, and legal consequences of substance abuse, while also developing responsible attitudes and decision-making skills to avoid peer pressure and risky behaviour. The course further intends to build knowledge of traffic signals, road signs, and safe road use practices, so that learners can behave responsibly as pedestrians, cyclists, passengers, and drivers.

UNIT I: **(10 Hrs)**

Problem of Drug Abuse

a) Concept and overview
b) Types of drugs often abused and their effects (Stimulants, Depressants, Narcotics, Hallucinogens, and Miscellaneous).

Causes of consequences of drug abuse

a) Theories of drug abuse: Physiological theory. Psychological theory. Sociological theory.
b) Consequences of drug abuse: For individuals, families, society and the economy.

Extent and nature of the problem

a) Magnitude of the menace of drug abuse.
b) Vulnerable age groups.
c) Characteristic and features of proneness.
d) Signs and symptoms of drug abuse (Physical indicators, Academic indicators, Behavioural and psychological indicators).

Prevention and management of drug abuse

a) Legislation, public policies and programs for the prevention and cure of drug abuse.
b) Prevention and Management of drug abuse. Medical management.
c) Working of drug De-addiction Centres. Role of Family, School and Media.

UNIT II: **(10 Hrs)**

a) Concept and Significance of Road Safety.
b) Role of Traffic Police in Road Safety.
c) Traffic Engineering – Concept & Significance.
d) Traffic Rules & Traffic Signs.
e) How to obtain a driving license.
f) Traffic Offences, Penalties and Procedures.
g) Common Driving mistakes.
h) Significance of First-aid in Road Safety.
i) Role of Civil Society in Road Safety.
j) Traffic Police-Public Relationship.

Suggested Readings:

1. Clayton, J.M., and Scott, M.A (2014). Drugs and Drug Policy: the control of consciousness alteration. New Delhi: Sage Publications India Pvt. Ltd.
2. Kapoor, T. (1985). Drug epidemic among Indian Youth, New Delhi: Mittal Pub
3. Modi, I and Modi, S. (1997). Drugs: Addiction and prevention, Jaipur: Rawat Publication.
4. 2003 National Household Survey of Alcohol and Drug Abuse. New Delhi, Clinical Epidemiological Unit, AIIMS, 2004
5. World Drug Report (updated every year), United Nations office of Drug and Crime.
6. Extent, pattern and Trend of Drug use in India, Ministry of Social Justice and Empowerment, Government of India, 2004.
7. The Narcotic Drugs and Psychotropic Substances Act, 1985. (New Delhi: Universal, 2012).
8. Government of India (2015). Scheme of assistance for prevention and alcoholism and substance (Drugs) abuse and for social defence services-Guidelines. Ministry of social Justice and Empowerment. New Delhi.
9. NCERT (2010). Training Resource Materials (Adolescence Education Programme).
10. The Motor Vehicle Act, 1988 (2010), Universal Law Publishing Co. Pvt. Ltd., New Delhi.

11. Road Safety Signage and Signs (2011), Ministry of Road Transport and Highways, Government of India.

COMPUTER NETWORKS LAB

Code: 26CS491
Max Marks: 70

List of Experiments:

1. Implement the data link layer framing methods such as character, character stuffing and bit stuffing.
2. Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
3. Implement Dijkstra's algorithm to compute the Shortest path thru a graph.
4. Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm.
5. Take an example subnet of hosts. Obtain broadcast tree for it.
6. Take a 64 bit playing text and encrypt the same using DES algorithm.
7. Write a program to break the above DES coding.
8. Using RSA algorithm encrypt a text data and Decrypt the same.

OPERATING SYSTEMS LAB

Code: 26CS492
Max. Marks: 70

Core Practical:

1. Connect to the Linux Server and understand the basic Directory Structure of Linux.
2. To understand help commands like: -man, info, help, what is, apropos
3. To understand basic directory navigation commands like cat, cd, mv, cp, rm, mkdir, rmdir, file, pwd command.
4. To understand basic commands like: - date, cal, echo, bc, ls, who, whoami, hostname, uname, tty, aliase.
5. To understand vi basics, three modes of vi Editor, how to write, save, execute a shell script in vi editor.
6. To understand process related commands like: -ps, top, pstree, nice, renice in Linux.
7. To understand how to examine and change File permissions.
8. Set a file to be read-only with the chmod command. Interpret the file permissions displayed by the ls -l command.
9. Delete one or more directories with the rmdir command. See what happens if the directory is not empty. Experiment (carefully!) with the rm -r command to delete a directory and its content
10. Change your directory to the directory exercises. Create a file in that directory, named the file as example1 using the cat command containing the following text: water, water everywhere and all the boards did shrink; water, water everywhere, no drop to drink.
11. Write basic shell script to display the table of a number.
12. Write basic shell script to input a character from user and then check whether it is uppercase, lowercase or digit.
13. Write basic shell script to calculate factorial of a number.
14. Write basic shell script to input the month number and generate corresponding calendar.
15. Write basic shell script to list all directories.
16. Write basic shell script to display greatest of three numbers.
17. Write basic shell script to check whether the number entered by user is prime or not.

Note:

1. **In total 15 practical to be implemented. 2 additional practicals may be given by the course instructor.**
2. **This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.**

Integrated MCA

5th Semester

ARYAVART INTERNATIONAL UNIVERSITY
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DETAILED SYLLABUS

AUTOMATA AND COMPILER DESIGN

Code: 26CS501
Max Marks: 70

Course Objectives: The main objective of this course is to introduce the major concept areas of automata and compiler design and to develop an awareness of the function and complexity of modern compilers. This course is a study of the theory and practice required for the design and implementation of interpreters and compilers for programming languages.

UNIT I **(08 Hrs)**
Formal Language and Regular Expressions: Languages, Definition, Languages regular expressions, Finite Automata – DFA, NFA. Conversion of a regular expression to NFA, NFA to DFA. Context Free grammars and parsing, derivation, parse trees, Application of Finite Automata.

UNIT II **(08 Hrs)**
Introduction to Compiler, Phases of Compilation, ambiguity LL(K) grammars and LL (1) parsing, Bottom-up parsing, handle pruning, LR Grammar Parsing, LALR parsing, parsing ambiguous grammars, YACC programming specification. Semantics: Syntax-directed translation, S-attributed and L-attributed grammars.

UNIT III **(08 Hrs)**
Intermediate code – abstract syntax tree, translation of simple statements and control flow statements. Context Sensitive features – Chomsky hierarchy of languages and recognizers, type checking, type conversions, equivalence of type expressions, overloading of functions and operations.

UNIT IV **(08 Hrs)**
Run time storage: Storage organization, storage allocation strategies, scope access to nonlocal names, Code optimization: Principal Sources of optimization, optimization of basic blocks, peephole optimization.

UNIT V **(08 Hrs)**
Code generation: Machine-dependent code generation, object code forms, generic code generation algorithm, register allocation, and assignment. Using DAG representation of the Block.

Text Books:
1. Introduction to Theory of Computation. Sipser, 2nd Edition, Thomson.
2. Compilers: Principles, Techniques and Tools Aho, Ullman, Ravisethi, Pearson Education.

Suggested Readings:
1. Modern Compiler Construction in C, Andrew W. Appel Cambridge University Press.
2. Compiler Construction, LOUDEN, Thomson.
3. Elements of Compiler Design, A. Meduna, Auerbach Publications, Taylor and Francis Group.
4. Principles of Compiler Design, V. Raghavan, TMH.
5. Engineering a Compiler, K. D. Cooper, L. Torczon, ELSEVIER.

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COMPUTER GRAPHICS

Code: 26CS502
Max Marks: 70

Course Objectives: The objective of the course is to introduce basic concepts of computer graphics, including 2D/3D transformations, rendering, modeling, and graphical algorithms using programming tools.

UNIT I **(7 Hrs)**
Basic of Computer Graphics: Basic of Computer Graphics, Applications of computer graphics, Display devices, Random and Raster scan systems, Graphics input devices, Graphics software and standards.

UNIT II **(7 Hrs)**
Graphics Primitives: Points, lines, circles and ellipses as primitives, scan conversion algorithms for primitives, fill area primitives including scan-line polygon filling, inside-outside test, boundary and flood-fill, character generation, line attributes, area-fill attributes, character attributers.

UNIT III **(7 Hrs)**
2D transformation and viewing: Transformations (translation, rotation, scaling), matrix representation, homogeneous coordinates, composite transformations, reflection and shearing, viewing pipeline and coordinates system, window-to-viewport transformation, clipping including point clipping, line clipping (Cohen Sutherland, liang-bersky, NLN), polygon clipping.

UNIT IV **(6 Hrs)**
3D concepts and object representation: 3D display methods, polygon surfaces, tables, equations, meshes, curved lies and surfaces, quadric surfaces, spline representation, cubic spline interpolation methods, Bazier curves and surfaces, B-spline curves and surfaces.

UNIT V **(6 Hrs)**
3D transformation and viewing: 3D scaling, rotation and translation, composite transformation, viewing pipeline and coordinates, parallel and perspective transformation, view volume and general (parallel and perspective) projection transformations.

UNIT VI **(7 Hrs)**
Advance Topics: visible surface detection concepts, back-face detection, depth buffer method, illumination, light sources, illumination methods (ambient, diffuse reflection, specular reflection), and Colour models: properties of light, XYZ, RGB, YIQ and CMY colour models.

Text Books:

1. Donald Hearn & M. Pauline Baker, "Computer Graphics with OpenGL", Third Edition, 2004, Pearson Education, Inc. New Delhi.
2. Ze-NianLi and Mark S. Drew, "Fundamentals of Multimedia", First Edition, 2004, PHI Learning Pvt. Ltd., New Delhi.

Suggested Readings:

1. Computer Graphics, D. Hearn And P. Baker - Pearson Education - C Version.
2. Computer Graphics, with OpenGL Hearn and Baker, - Pearson.
3. Computer Graphics, Sinha & Udai, - TMH.
4. Computer Graphics, Foley and van Dam - Person Education.

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MULTIMEDIA APPLICATION

Code: 26CS511
Max Marks: 70

Course Objective: The objective of this course is to provide students with an understanding of multimedia technology and its applications in various domains. The course aims to develop students' skills in designing and developing multimedia content, integrating multimedia elements, and applying multimedia technologies.

UNIT I: Introduction to Multimedia Technology (8 Hrs)
Overview of multimedia technology and its components, Multimedia elements: text, images, audio, video, Multimedia file formats and compression techniques

UNIT II: Multimedia Authoring Tools and Techniques (8 Hrs)
Multimedia authoring software and tools, Design principles for multimedia content, Multimedia scripting and programming languages

UNIT III: Image and Video Processing in Multimedia (8 Hrs)
Image and video acquisition and editing, Image and video compression techniques, Image and video enhancement and effects

UNIT IV: Audio and Animation in Multimedia (8 Hrs)
Digital audio concepts and formats, Audio editing and processing techniques, Animation principles and techniques

UNIT V: Multimedia Integration and Application Development (8 Hrs)
Integration of multimedia elements in interactive applications, Multimedia in web design and development, Optimization and delivery of multimedia content

Suggested Readings:
1. "Multimedia: Making It Work" by Tay Vaughan.
2. "Multimedia Systems: Algorithms, Standards, and Industry Practices" by Parag Havaldar and Gerard Medioni.

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ASP.NET

Code: 26CS531
Max Marks: 70

Course Objectives: The objective of the course is to develop dynamic web applications using ASP.Net, understand server-side scripting and database connectivity and implement web forms, controls, and session handling.

UNIT I **(10 Hrs)**
.NET Framework: Understand the .NET Platform, Components of .NET Framework: CLI, CTS, CLS, CLR and CLI. Understand the Assembly in .NET Framework.

UNIT II **(10 Hrs)**
Working with ASP.NET Forms: Building ASP.NET Page, Building Forms with Web Server Controls, Performing Form Validation and Validation Control, Advanced Control Programming.

UNIT III **(10 Hrs)**
Working with ASP.NET Applications: Creating ASP.NET Application, Tracking User Sessions, Caching ASP.NET Application, Error Handling, Authentication and Authorization.

UNIT IV **(10 Hrs)**
Working with ADO.NET: Introduction to ADO.NET, Working with Data-Bound Controls, Working with Datasets.

Text Books:

1. Jason N. Gaylord, Christian Wenz, Pranav Rastogy, Todd Miranda, Scott Hanselman, "Professional ASP.NET 4.5 in C# and VB", Wrox Publication, 1st Edition, 2013
2. Stephen Walther, Kevin Hoffman, Nate Dudek, "ASP.NET 4.0 Unleashed", Pearson Education, 1st Edition 2010
3. Achyut S Godbole and Atul Kahate, "Web Technologies", Tata McGraw Hill
4. Malt. J. Crouch, "ASP.NET and VB.NET Web Programming", Pearson, 2002.

Suggested Readings:

1. T.M. Ramachandran, "Internet & Web Development", Dhruv
2. Kathleen Kalata, "Web Application using ASP.NET 2.0", 2nd Edition, 2009
3. K.K Sharma, "Web Technologies", A.B. Publication Delhi, First Edition, 2008
4. Jess Chadwick, Todd Snyder, Hrusikesh Panda, "Programming ASP.NET MVC 4", O'Reilly Media, 1st Edition, 2012

ASP.NET LAB

Code: 26CS593
Max Marks: 70

List of Practicals

1. Create a simple Web Page showing the use of basic Web Controls of ASP.NET.
2. Create a Web Page showing the integration of multiple forms in ASP.NET.
3. Create a basic student registration form in ASP.NET.
4. Create a Web Form to display all the validation controls of ASP.NET.
5. Create a Cookie and set its expiry date. Demonstrate its application on Web form.
6. Manage the state of a web form at global level and configure the state sat application level.
7. Apply the form-based authentication technique on web form in ASP.NET.
8. Demonstrate a calendar control and aim age map control on a Web Form.
9. Create a web form to store the students' data in the database.
10. Create a Web application for a Pizza Delivery using ASP.NET components.

Note:

1. **In total 10 practicals to be implemented. 2 additional practicals may be given by the course instructor.**
2. **This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.**

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JAVA PROGRAMMING

Code: 26CS532
Max Marks: 70

Course Objectives: The objective of the course is to learn object-oriented programming using Java, covering core concepts such as classes, inheritance, interfaces, exception handling, and GUI development.

UNIT I **(10 Hrs)**
Java Basics: Java as an Object-oriented Programming Language, History of Java, Features of Java, Difference between Java and C++, Java Architecture (JDK, JVM, JRE), Java Tokens: Data types, Literals, Variables, Scope and lifetime of variables, Operators. Control Structures, Arrays.
Introducing Classes: Creating a Class: properties, methods and constructors. Object Access modifiers, Method Overloading, Garbage collection, this keyword, Static (variable, method, block), final keyword, Wrapper Classes, String class and methods.

UNIT II **(10 Hrs)**
Inheritance: Types, Super keyword, method overriding, covariant return type, abstract class.
Interfaces and Packages: Creation and implementation an interface, the difference between abstract class and interface, Packages, and importing a package.
Exception Handling: Exception Class, built-in checked and unchecked exceptions, user-defined exceptions, use of try, catch, throw, throws, finally.

UNIT III **(10 Hrs)**
Using I/O: Elementary concepts of Input/Output, using the byte streams, reading and writing using byte streams, automatically closing a file, using the character-based streams, File I/O using character streams (using a File Writer and using a File Reader).
Multi-threaded programming: Multithreading fundamentals, Thread class, and Runnable interface, the life cycle of a thread, creation of single and multiple threads, implementation of Thread methods, Synchronization (using Synchronized methods, synchronized statement).

UNIT IV **(10 Hrs)**
Swings Fundamentals: Components (JLabel and ImageIcon, using swing Buttons (JButton, JToggleButton, JCheckBox, JRadioButton), JTextField, JScrollPane, JList, JComboBox) and Containers, Layout managers, event delegation Model, event handling (event sources, event listeners, event classes and interfaces, adapter classes).
JDBC: JDBC Architecture, JDBC Drivers, Connection, Statement, Prepared Statement, Result set, Connecting to the Database using JDBC.

Text Books:

1. Herbert Schildt, "Java 2 -The Complete Reference" – Tata McGraw-Hill Education Private Limited, 2010.
2. Trilochan Tarai, "Java Core Concepts and Applications", I.K. International Publishing House Pvt. Ltd., 2015.

Suggested Readings:

1. E. Balaguruswamy, "Programming with Java: A Primer", McGraw-Hill Education Private Limited, 5th edition.
2. Herbert Schildt, Dale Skrien, "Java Fundamentals: A Comprehensive Introduction" – Tata McGraw-Hill Education Private Limited, 2013.
3. Cay S. Horstmann, "Core Java Volume 1 – Fundamentals", 10th edition, Pearson, 2017.
4. Ken Arnold, Davis Holmes, James Gosling, Prakash Goteti, "The Java Programming Language", 3rd edition, Pearson, 2008.

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JAVA PROGRAMMING LAB

Code: 26CS594
Max Marks: 70

Core Practical (Implement minimum 10 out of 15 practical)

1. Write a program declaring a class Rectangle with data member's length and breadth and member functions Input, Output and Calc Area.
2. Write a program to demonstrate use of method overloading to calculate area of square, rectangle and triangle.
3. Write a program to demonstrate the use of static variable, static method and static block.
4. Write a program to demonstrate concept of ``this``.
5. Write a program to demonstrate multi-level and hierarchical inheritance.
6. Write a program to use super() to invoke base class constructor.
7. Write a program to demonstrate run-time polymorphism.
8. Write a program to demonstrate the concept of aggregation.
9. Write a program to demonstrate the concept of abstract class with constructor and ``final`` method.
10. Write a program to demonstrate the concept of interface when two interfaces have unique methods and same data members.
11. Write a program to demonstrate checked exception during file handling.
12. Write a program to demonstrate unchecked exception.
13. Write a program to demonstrate creation of multiple child threads.
14. Write a program to use Byte stream class to read from a text file and display the content on the output screen.
15. Write a program to demonstrate any event handling.

Application Based Practical (Implement minimum 5 out of 10 practical)

1. Create a class employee which have name, age and address of employee, include functions getdata() and showdata(), getdata() takes the input from the user, showdata() display the data in following format:
   Name:
   Age:
   Address:
2. Write a Java program to perform basic Calculator operations. Make a menu driven program to select operation to perform (+ - * /). Take 2 integers and perform operation as chosen by user.
3. Write a program to make use of Buffered Stream to read lines from the keyboard until 'STOP' is typed.
4. Write a program declaring a Java class called Savings Account with members ``account Number`` and ``Balance``. Provide member functions as ``deposit Amount ()`` and ``withdraw Amount ()``. If user tries to withdraw an amount greater than their balance then throw a user-defined exception.
5. Write a program creating 2 threads using Runnable interface. Print your name in ``run ()`` method of first class and "Hello Java" in ``run ()`` method of second thread.
6. Write program that uses swings to display combination of RGB using 3 scrollbars.
7. Write a swing application that uses at least 5 swing controls.
8. Write a program to implement border layout using Swing.
9. Write a java program to insert and update details data in the database.
10. Write a java program to retrieve data from database and display it on GUI.

Note:

1. **In total 15 practical to be implemented. 2 additional practical may be given by the course instructor.**
2. **This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.**

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AUTOMATA & COMPILER DESIGN LAB

Code: 26CS591
Max Marks: 70

List of Experiments
Compiler Design Experiments

1. Write a LEX Program to scan reserved word & Identifiers of C Language
2. Implement Predictive Parsing algorithm
3. Write a C program to generate three address code.
4. Implement SLR(1) Parsing algorithm
5. Design LALR bottom up parser for the given language

<program> ::= <block>
<block> ::= { <variabledefinition> <slist> }
| { <slist> }
<variabledefinition> ::= int <vardeflist> ;
<vardeflist> ::= <vardec> | <vardec> , <vardeflist>
<vardec> ::= <identifier> | <identifier> [<constant>]
<slist> ::= <statement> | <statement> ; <slist>
<statement> ::= <assignment> | <ifstatement> | <whilestatement>
| <block> | <printstatement> | <empty>
<assignment> ::= <identifier> = <expression>
| <identifier> [<expression>] = <expression>
<ifstatement> ::= if <bexpression> then <slist> else <slist> endif
| if <bexpression> then <slist> endif
<whilestatement> ::= while <bexpression> do <slist> enddo
<printstatement> ::= print (<expression>)
<expression> ::= <expression> <addingop> <term> | <term> | <addingop> <term> <bexpression> ::=
<expression> <relop> <expression>

<relop> ::= < | <= | == | >= | > | !=
<addingop> ::= + | -
<term> ::= <term>
<multop> <factor> |
<factor> <multop> ::= * | / <factor> ::= <constant> | <identifier> | <identifier> [<expression>]
| (<expression>)
<constant> ::= <digit> | <digit> <constant>
<identifier> ::= <identifier> <letterordigit> | <letter>
<letterordigit> ::= <letter> | <digit>
<letter> ::= a|b|c|d|e|f|g|h|i|j|k|l|m|n|o|p|q|r|s|t|u|v|w|x|y|z
<digit> ::= 0|1|2|3|4|5|6|7|8|9
<empty> has the obvious meaning

Comments (zero or more characters enclosed between the standard C/Java-style comment brackets /*...*/) can be inserted. The language has rudimentary support for 1-dimensional arrays. The declaration int a[3] declares an array of three elements, referenced as a[0], a[1] and a[2]. Note also that you should worry about the scoping of names.

A simple program written in this language is:

```
{ int a[3],t1,t2;   t1=2;   a[0]=1; a[1]=2; a[t1]=3;   t2=
(a[2]+t1*6)/(a[2]-t1);   if t2>5 then     print(t2);   else
{     int t3;     t3=99;     t2=-25;     print(-t1+t2*t3);   /*
this is a comment                    on 2 lines */
}
  endif
}
```

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COMPUTER GRAPHICS LAB

Code: 26CS592
Max Marks: 70

List of Experiments:

1. Write a program to draw basic geometric shapes (lines, circles, rectangles) using a graphics library.
2. Implement a program that allows the user to interactively draw and manipulate shapes on a canvas.
3. WAP that demonstrates 2D transformations (translation, rotation, scaling) on a set of objects.
4. Extend the program to include 3D transformations and demonstrate their effects.
5. Implement line-drawing algorithms.
6. Implement circle-drawing algorithms.
7. Develop a program for polygon filling using scanline or other suitable algorithms.
8. Create a program that renders objects with different shading models.
9. Explore the impact of lighting models on the visual appearance of 3D objects in a scene.
10. Implement texture mapping on a 3D model, and observe the changes in the rendered output.

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Integrated MCA

6th Semester

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DETAILED SYLLABUS

INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Code: 26CS601
Max Marks: 70

Course Objective: Introduce core AI concepts, including problem-solving, knowledge representation, machine learning, and intelligent agent design.

UNIT I **(10 Hrs)**
Overview of AI: Introduction to AI, Importance of AI, AI and its related field, AI techniques, and Criteria for success. Problems, problem space and search: Defining the problem as a state space search, Production Systems and its characteristics, Issues in the design of the search programs.
Heuristic search techniques: Generate and test, hill climbing, best first search technique, problem reduction, constraint satisfaction.

UNIT II **(10 Hrs)**
Knowledge Representation: Definition and importance of knowledge, Knowledge representation, various approaches used in knowledge representation, and issues in knowledge representation.
Logical Reasoning: Logical agents, propositional logic, inferences, Syntax and semantics of First Order Logic, Inference in First Order Logic Knowledge Base, forward chaining, backward chaining, unification, resolution, Expert system: Case study of Expert system in PROLOG.

UNIT III **(10 Hrs)**
Handling Uncertainty: Non-Monotonic Reasoning, Probabilistic reasoning, Bayes 'Theorem, Certainty factors and Rule-based Systems, Bayesian Networks, Dempster-Shafer Theory, Introduction to Fuzzy logic. Fuzzy set definition & types. Membership functions. Designing a fuzzy set for a given application.
Natural Language Processing: Introduction, Syntactic Processing, Semantic Processing, Pragmatic Processing.

UNIT IV **(10 Hrs)**
Learning: Introduction to Learning, Rote Learning, learning by taking advice, learning in problem solving, learning from examples: Induction, Explanation-based Learning, Discovery, Analogy, Neural Networks, and Genetic Learning.

Text Books:

1. Rich and Knight, "Artificial Intelligence", Tata McGraw-Hill, 1992.
2. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Second Edition (Indian Reprint: Pearson Education).

Suggested Readings:

1. Ivan Bratko, "Prologue Programming for AI", Addison-Wesley.
2. George F. Luger, "Artificial Intelligence" Pearson Education.
3. Ben Coppin, "Artificial Intelligence Illuminated" Jones and Bartlett Publishers.

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DESIGN AND ANALYSIS OF ALGORITHMS

Code: 26CS602
Max Marks: 70

Course Objectives: The objective of the course is to design efficient algorithms, analyze their time and space complexity, and understand algorithmic strategies such as divide and conquer, greedy, dynamic programming, and backtracking.

UNIT I: Introduction **(08 Hrs)**
Algorithm - Pseudo Code for Expressing Algorithms - Performance Analysis- Space Complexity - Time Complexity- Asymptotic Notation - Big Oh Notation - Omega Notation - Theta Notation and Little Oh Notation. - Recurrences - Substitution method, Recursion-tree method, Master method.

UNIT II: Disjoint Sets, Divide and Conquer **(08 Hrs)**
Disjoint Sets: Disjoint Set Operations - Union and Find Algorithms.
Divide and Conquer: General Method - Applications-Binary Search – Quick Sort - Merge Sort-Strassen's Matrix Multiplication.

UNIT III: Dynamic Programming **(08 Hrs)**
General Method –Applications-Matrix Chain Multiplication - Optimal Binary Search Trees - 0/1 Knapsack Problem - All Pairs Shortest Path Problem - Travelling Sales Person Problem – Reliability Design Problem.

UNIT IV: Greedy Method and Backtracking **(08 Hrs)**
Greedy Method: General Method –Applications- Job Sequencing with Deadlines - Knapsack Problem - Minimum Cost Spanning Trees - Single Source Shortest Path Problem - Backtracking: General Method – Applications-N-Queens Problem - Sum of Subsets Problem - Graph Colouring - Hamiltonian Cycles.

UNIT V: Branch and Bound, Np-Hard and Np-Complete Problems **(08 Hrs)**
Branch and Bound: General Method - Applications - Travelling Sales Person Problem - 0/1 Knapsack Problem- LC Branch and Bound Solution - FIFO Branch and Bound Solution.
NP Hard and NP-Complete Problems: Basic Concepts - Non-deterministic algorithms - NP – Hard and NP Complete Classes - Cook's Theorem.

Text Books:

1. Ellis Horowitz, Satraj Sahni, Sanguthevar Rajasekharan, "Fundamentals of Computer Algorithms", Universities Press, 2nd Edition, 2015.
2. 2. Alfred V. Aho, John E. Hopcroft, Jeffrey D, "The Design And Analysis Of Computer Algorithms", Pearson India, 1st Edition, 2013.

Suggested Readings:

1. Knuth Donald E, "Art of Computer Programming: Fundamental Algorithms Volume 1 - Fundamental Algorithms", Third Edition, Pearson Publishers, 2011.
2. Levitin A, "Introduction to the Design and Analysis of Algorithms", Pearson Education, 3rd Edition, 2012.
3. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to Algorithms , Third edition, MIT Press, 2009.
4. Jon Kleinberg, Éva Tardos , Algorithm Design, Pearson education, 2014.

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E-COMMERCE

Code: 26MG501
Max Marks: 70

Course Objectives: The objectives of the course are to understand the fundamentals of electronic commerce and digital markets, learn about online payment systems, security, and e-business models, and explore the legal, ethical, and technological aspects of e-commerce.

UNIT I **(10 Hrs)**
Introduction: Definition of Electronic Commerce, Evolution of e-commerce, E-Commerce& E Business, Unique features of e-commerce, applications of E-Commerce, advantages and disadvantages of E-commerce, Types of e-commerce: B2B, B2C, C2C, M-commerce, Social Commerce
E-commerce infrastructure: Technological building blocks: Internet, web and mobile applications

UNIT II **(10 Hrs)**
Building an e-commerce presence: Planning, System Analysis, Design, Choosing Software, Hardware, Other E-commerce site tools: Tools For website design, Tools for SEO, Interactivity and active contents (Server-side scripting)
Important Components of E-commerce website: Product Cataloguing, Product Listing Page, Product description Page, Cart building and Checkout, third party integrations: Payment systems, Data Layer Integrations for analytics, Customer support integration, Order tracking, Shipping, return and cancellation
New Technologies for E-commerce: Chatbots, Recommendation systems (Personalisation), Smart Search, Product Comparison, Augmented reality, Big data, Cloud computing

UNIT III **(10 Hrs)**
Electronic Payment Systems-
Overview of Electronics payments, electronic Fund Transfer, Digital Token based Electronics payment System, Smart Cards, Credit Cards, Debit Cards, Emerging financial Instruments Smartphone wallet, Social / Mobile Peer to Peer Payment systems, Digital Cash and Virtual Currencies, Online Banking, Payment Gateway, Electronic Billing Presentment and Payment.

UNIT IV **(10 Hrs)**
Security Threats and Issues: Cybercrimes, Credit card frauds/theft, Identity fraud, spoofing, sniffing, DOS and DDOS attacks, social network security Issues, Mobile Platform Security issues, Cloud security issues
Technology Solutions: Encryption: Secret Key Encryption, Public Key Encryption, Digital Certificates and public key infrastructure
Securing channels: Secured Socket Layer (SSL), Transport Layer Security (TLS), Virtual Private Network (VPN), Protecting Networks: Firewalls, Proxy Servers, Intrusion detection and protection systems, Anti-Virus software

Text Books:

1. Kenneth C. Laudon, "E-Commerce: Business, Technology and Society", 15th Edition, Pearson education
2. KK Bajaj & Debjani Nag," E-Commerce: The Cutting Edge of Business "McGraw Hill, II edition, 2015
3. Efraim Turban, Jae Lee, David King, H. Michael Chung, "Electronic Commerce – A Managerial Perspective", Addison-Wesley.

Suggested Readings:

1. The Complete Reference: Internet, Margaret Levine Young, Tata McGraw Hill.
2. E-Commerce: Concepts, Models, Strategies, CSV Murthy, Himalayas Publishing House.
3. Frontiers of Electronic Commerce, Ravi Kalakota & Andrew B. Wilson, Addison-Wesley (An Imprint of Pearson Education).
4. Network Security Essentials: Applications & Standards, William Stallings, Pearson Education.

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IMAGE PROCESSING

Code: 26CS631
Max Marks: 70

Course Objective: This course introduces students to the fundamentals of image processing, and various image transforms, image restoration techniques, image compression and segmentation used in image processing

UNIT I: Introduction to Digital Image Processing **(10 Hrs)**
The origins of Digital Image Processing, Examples of Digital Image Processing application, Fundamental steps in Digital Image processing, Components of Image Processing system Fundamentals: Elements of Visual Perception, Light and Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some basic Relationships between Pixels, Linear and Nonlinear Operations

UNIT II: Image Enhancement in the spatial domain **(08 Hrs)**
Background, some basic gray level transformation, Introduction of Histogram processing, Enhancement using Arithmetic/Logic operations, Basics of spatial filtering, smoothing spatial filters, Sharpening spatial filters, Image Enhancement in the Frequency Domain: Introduction.

UNIT III: Image Restoration **(12 Hrs)**
Model of the Image Degradation/Restoration process, Noise Models, Restoration in the presence of noise only spatial filtering, Inverse filtering, Minimum Mean Square Error (Wiener) filtering, Geometric mean filter, Geometric Transformations, Image Compression: Fundamentals, Lossy Compression, Lossless Compression, Image Compression models, Error-free Compression: Variable length coding, LZW coding, Bit plane coding, Run length coding, Introduction to JPEG.

UNIT IV: Morphology **(04 Hrs)**
Dilation, Erosion, Opening and Closing, Hit-and Miss transforms, Morphological Algorithms: Boundary Extraction, Region filling, Extraction of connected components, Convex Hull

UNIT V: Image Segmentation **(06 Hrs)**
Definition, characteristics of segmentation Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region based segmentation. Introduction to Representation and Description, Introduction to Object Recognition.

Suggested Readings:

1. Digital Image Processing: Rafael C. Gonzalez and Richard E.Woods. Addison Wesley.
2. Fundamentals of Digital Image Processing. Anil K. Jain, PHI.

IMAGE PROCESSING LAB

Code: 26CS693
Max Marks: 70

List of Practicals:

1. Display of Grey-scale Images.
2. Histogram Equalisation.
3. Design of Non-linear Filtering.
4. Determination of Edge Detection Using Operators.
5. 2-D DFT and DCT.
6. Filtering in the frequency domain.
7. Display of colour images.
8. Conversion between colour spaces.
9. DWT of images.
10. Segmentation using watershed transform.

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PARALLEL PROGRAMMING

Code: 26CS632
Max Marks: 70

Course Objective: This course aims to provide students with a comprehensive understanding of parallel computing. Starting with the need for high-speed computing and historical context, it explores diverse strategies to enhance computer speed through temporal and data parallelism. Students will grasp the structure and classifications of parallel computers, including vector supercomputers, shared memory systems, and distributed architectures. The course delves into operating systems for parallel environments, covering resource management, synchronisation, and performance evaluation. Additionally, it introduces the concept of GPU computing and CUDA, discussing applications and development tools.

UNIT I: Introduction to Parallel Computing and Speed Enhancement
Need for High-Speed Computing, how we increase the Speed of Computers, History of Parallel Computers, Solving problems in parallel: Utilising Temporal Parallelism, Utilising Data Parallelism, Comparison of Temporal and Data Parallel Processing, Data Parallel Processing with Specialised Processors.

UNIT II: Structure and Classification of Parallel Computers
Structure of parallel computers: A Generalised Structure of a Parallel Computer, Classification of Parallel Computers, Vector Computers, A Typical Vector Super Computer, Array Processors, Shared Memory Parallel Computers, Distributed Shared Memory Parallel Computers, Message Passing Parallel Computers.

UNIT III: Operating Systems and Performance Evaluation for Parallel Computers
Operating systems for parallel computers: Resource Management, Process Management, Process Synchronisation, Inter-process Communication, Memory Management, Input/output (Disk Arrays), Basics of Performance Evaluation, Performance Measurement Tools.

UNIT IV: Computer Unified Device Architecture (CUDA)
Computer Unified Device Architecture: The age of parallel processing, The rise of GPU computing, CUDA, Applications of CUDA, Development Environment-CUDA Enabled Graphics Processors, NVIDIA Device driver, CUDA Development Tool kit, Standard C compiler.

UNIT V: Introduction to CUDA C and Parallel Programming
Introduction to CUDA C: First program, Querying Devices, Using Device Properties, Parallel Programming in CUDA C: CUDA Parallel Programming- Summing Vectors program

Suggested Readings:
1. Parallel Computers Architecture and Programming, V. Rajaraman, C. Siva Ram Murthy, PHI.
2. CUDA By Example, Jason Sanders, Edward Kandrot, Addison-Wesley.

PARALLEL PROGRAMMING LAB

Code: 26CS694
Max Marks: 70

List of Practicals:

1. Write an OpenMP program to sort an array on n elements using both sequential and parallel merge sort (using Section). Record the difference in execution time.
2. Write an OpenMP program that divides the Iterations into chunks containing 2 iterations, respectively (OMP_SCHEDULE=static,2). Its input should be the number of iterations, and its output should be which iterations of a parallelised for loop are executed by which thread.
   For example, if there are two threads and four iterations, the output might be the following:
   a. Thread 0: Iterations 0 — 1
   b. Thread 1: Iterations 2 — 3
3. Write an OpenMP program to calculate n Fibonacci numbers using tasks.

4. Write an OpenMP program to find the prime numbers from 1 to n employing the parallel for directive. Record both serial and parallel execution times.
5. Write an MPI Program to demonstrate MPI_Send and MPI_Recv.
6. Write an MPI program to demonstrate deadlock using point-to-point communication and avoidance of deadlock by altering the call sequence
7. Write a MPI Program to demonstration of Broadcast operation.
8. Write an MPI Program demonstration of MPI_Scatter and MPI_Gather
9. Write a MPI Program to demonstration of MPI_Reduce and MPI_Allreduce (MPI_MAX, MPI_MIN, MPI_SUM, MPI_PROD)

ARTIFICIAL INTELLIGENCE LAB

Code: 26CS691
Max Marks: 70

List of Practicals:

1. Explore pre-trained word vectors. Explore word relationships using vector arithmetic. Perform arithmetic operations and analyse results.
2. Use dimensionality reduction (e.g., PCA or t-SNE) to visualise word embeddings for Q 1. Select 10 words from a specific domain (e.g., sports, technology) and visualise their embeddings. Analyse clusters and relationships. Generate contextually rich outputs using embeddings. Write a program to generate 5 semantically similar words for a given input.
3. Train a custom Word2Vec model on a small dataset. Train embeddings on a domain-specific corpus (e.g., legal, medical) and analyse how embeddings capture domain-specific semantics.
4. Use word embeddings to improve prompts for the Generative AI model. Retrieve similar words using word embeddings. Use similar words to enrich a GenAI prompt. Use the AI model to generate responses for the original and enriched prompts. Compare the outputs in terms of detail and relevance.
5. Use word embeddings to create meaningful sentences for creative tasks. Retrieve similar words for a seed word. Create a sentence or story using these words as a starting point. Write a program that: Takes a seed word. Generates similar words. Construct a short paragraph using these words.
6. Use a pre-trained Hugging Face model to analyse sentiment in text. Assume a real-world application, load the sentiment analysis pipeline. Analyse the sentiment by giving sentences to input.
7. Summarise long texts using a pre-trained summarisation model using the Hugging Face model. Load the summarisation pipeline. Take a passage as input and obtain the summarised text.
8. Install Lang chain, cohere (for key), Lang chain-community. Get the API key (By logging into Cohere and obtaining the Cohere key). Load a text document from your Google Drive. Create a prompt template to display the output in a particular manner.
9. Take the Institution name as input. Use Pedantic to define the schema for the desired output and create a custom output parser. Invoke the Chain and Fetch Results. Extract the below Institution related details from Wikipedia: The founder of the Institution. When it was founded. The current branches in the institution. How many employees are working in it? A brief 4-line summary of the institution.
10. Build a chatbot for the Indian Penal Code. We'll start by downloading the official Indian Penal Code document, and then we'll create a chatbot that can interact with it. Users will be able to ask questions about the Indian Penal Code and have a conversation with it.

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DESIGN AND ANALYSIS OF ALGORITHMS LAB

Code: 26CS692
Max Marks: 70

List of Practicals

1. Write a program to sort the elements of an array using Insertion Sort (The program should report the number of comparisons).
2. Write a program to sort the elements of an array using Merge Sort (The program should report the number of comparisons).
3. Write a program to sort the elements of an array using Heap Sort (The program should report the number of comparisons).
4. Write a program to multiply two matrices using the Strassen's algorithm for matrix multiplication
5. Write a program to sort the elements of an array using Radix Sort.
6. Write a program to sort the elements of an array using Bucket Sort.
7. Display the data stored in a given graph using the Breadth-First Search algorithm.
8. Display the data stored in a given graph using the Depth-First Search algorithm.
9. Write a program to determine a minimum spanning tree of a graph using the Prim's algorithm.
10. Write a program to implement Dijkstra's algorithm to find the shortest paths from a given source node to all other nodes in a graph.
11. Write a program to solve the weighted interval scheduling problem.
12. Write a program to solve the 0-1 knapsack problem.

For the algorithms at S.No 1, 2 and 3 , test run the algorithm on 100 different input sizes varying from 30 to 1000. For each size find the number of comparisons averaged on 10 different input instances; plot a graph for the average number of comparisons against each input size. Compare it with a graph of n log n.

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Integrated MCA

7th Semester

ARYAVART INTERNATIONAL UNIVERSITY
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DETAILED SYLLABUS

CRYPTOGRAPHY

Code: 26CS701
Max Marks: 70

Course Objectives: The objective of the course is to study the fundamentals of cryptographic techniques and protocols for ensuring confidentiality, integrity, and security in digital communication.

UNIT I: Mathematical Foundations Number Theory (10 Hrs)
Fermat's theorem - Cauchy 's theorem - Chinese remainder theorem - Primality testing algorithm - Euclid's algorithm for integers - quadratic residues - Legendre symbol - Jacobi symbol.

UNIT II: Classical Cryptosystems (10 Hrs)
Cryptography and cryptanalysis - Classical Cryptography - different type of attack: CMA - CPA - CCA - Shannon perfect secrecy - OTP - Pseudo random bit generators - stream ciphers and RC4.

UNIT III: Symmetric Key Ciphers Block ciphers (04 Hrs)
Modes of operation - DES and its variants - finite fields (2n) - AES - linear and differential cryptanalysis.

UNIT IV: Asymmetric Key Ciphers (10 Hrs)
One-way function - trapdoor one-way function - Public key cryptography - RSA cryptosystem - Diffie-Hellman key exchange algorithm - ElGamal Cryptosystem

UNIT V: Message Authentication (6 Hrs)
Cryptographic hash functions - secure hash algorithm - Message authentication - digital signature - RSA digital signature.

Text Book:

1. Stinson. D., "Cryptography: Theory and Practice", Third Edition, Chapman & Hall/CRC, 2012.

Suggested Readings:

1. W. Mao, "Modern Cryptography: Theory & Practice", Pearson Education, 2010.
2. W. Stallings, "Cryptography and Network Security Principles and practice", Fifth Edition, Pearson Education Asia, 2013.
3. Behrouz A. Forouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security", Second Edition, Tata McGraw Hill, 2013.
4. Thomas Koshy, "Elementary Number Theory with Applications", Elsevier India, 2005.

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CLOUD COMPUTING

Code: 26CS702
Max Marks: 70

Course Objectives: The primary objectives of cloud computing include increasing efficiency, scalability, and flexibility of IT resources, while reducing costs and complexity. By leveraging cloud services, organizations can access computing resources on-demand, easily scale up or down based on their needs, and benefit from pay-as-you-go pricing models. This enables businesses to focus on their core competencies, innovate more rapidly, and respond quickly to changing market demands without significant upfront investments in hardware and infrastructure.

UNIT I **(10 Hrs)**
Cloud Computing Overview –Services of Internet, Origins of Cloud computing – Cloud components – Essential characteristics – On-demand self-service, The vision of cloud computing – Characteristics, benefits, and Challenges ahead

UNIT II **(10 Hrs)**
Cloud Computing Architecture-Introduction – Internet as a Platform, The cloud reference model - Types of clouds - Economics of the cloud, Computing platforms and technologies, Cloud computing economics, Cloud infrastructure - Economics of private clouds - Software productivity in the cloud - Economies of scale: public vs. private clouds.

UNIT III **(10 Hrs)**
Principles of Parallel and Distributed Computing: Parallel vs. distributed computing - Elements of parallel computing - Hardware architectures for parallel processing, Approaches to parallel programming - Laws of caution.

UNIT IV **(10 Hrs)**
Virtualization: Introduction - Characteristics of virtualized environments - Taxonomy of virtualization techniques - Virtualization and cloud computing - Pros and cons of virtualization - Technology example: VMware: full virtualization, Types of hardware virtualization: Full virtualization - partial virtualization - paravirtualization

Text Books:

1. Rajkumar Buyya, Christian Vecchiola and S. Thamarai Selvi, "Mastering Cloud Computing" - Foundations and Applications Programming, MK publications, 2013.
2. Gautam Shroff, "Enterprise Cloud Computing: Technology, Architecture, Applications" by Cambridge University Press, 2010.

Suggested Readings:

1. Michael J. Kavis, "Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS)", John Wiley & Sons Inc., Jan 2014.

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ARYAVART INTERNATIONAL UNIVERSITY
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R-PROGRAMMING

Code: 26CS711
Max Marks: 70

Course Objective: The R Programming course aims to provide participants with a comprehensive understanding of the R programming language and its applications in data analysis and statistical computing. Participants will start by gaining proficiency in the basics of R syntax, data structures, and control flow. As the course progresses, they will delve into data manipulation, visualisation, and statistical analysis using R's extensive ecosystem of packages.

UNIT I: Getting Started with R **(08 Hrs)**
Introduction to R Programming, Setting Up R Studio, Basics of R Syntax, Storing Data with Variables, Displaying Data: Input and Output

UNIT II: Working with Data **(08 Hrs)**
Different Data Types in R, Organising Data: Vectors and Matrices, Cleaning and Transforming Data, Basic Data Analysis, Creating Simple Charts

UNIT III: Coding Control and Functions **(08 Hrs)**
Making Choices with if and else, looping with for and while, Building Own Functions, Using Functions Effectively, Handling Mistakes: Debugging

UNIT IV: Creating Visuals **(08 Hrs)**
Introduction to Data Visualisation, Simple Plots with R, Customising Graphics, Creating More Advanced Plots, Interactive Visualisations

UNIT V: Understanding Data Patterns **(08 Hrs)**
Exploring Data Stats, Basics of Hypothesis Testing, Understanding Regression, Introduction to Machine Learning, Practical Applications: Classification and Clustering

Suggested Readings:
1. R Programming for Data Science by Roger D. Peng
2. The Art of R Programming by Prashanth Singh, Vivek Mourya, Cengage Learning India.

COMMUNITY ENGAGEMENT

Code: 26MG721
Max Marks: 70

Course Objectives: The course aims to cultivate respect for rural culture, ways of life and indigenous wisdom among students, to assess the status of different agricultural and rural development programmes, to analyse the factors contributing to rural distress and poverty and to explore viable solutions and to integrate theoretical knowledge with practical field experience, thereby improving learning outcomes.

UNIT I: Appreciation of Rural Society **(05 Hrs)**
Rural lifestyle, rural society, caste and gender relations, rural value with respect to community, nature and resources, elaboration of 'soul of India lies in villages' (Gandhi), rural infrastructure.

UNIT II: Understanding Rural Economy & Livelihood **(05 Hrs)**
Agriculture, farming, land ownership, water management, animal husbandry, non-farm livelihoods, artisans, rural entrepreneurs, and rural markets.

UNIT III: Rural Institutions **(05 Hrs)**
Traditional rural organisations, self-help groups, Panchayati raj institutions (Gram Sabha, Gram Panchayat Standing Committee), local civil society, local administration.

UNIT IV: Rural development Programmes **(05 Hrs)**
History of rural development in India, current national programmes: Sarva Shiksha Abhiyan, Beti Bachao-Beti Padhao, Ayushman Bharat, Swachh Bharat, PM Awaas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA, etc.

Suggested Readings:

1. Singh Katar (2015): Rural Development: Principles, Policies and Management. Sage Publication, New Delhi.
2. A Handbook on Village Panchayat Administration, Rajiv Gandhi chair for Panchayati Raj Studies (2002).
3. G. Mahida, Rinkesh Kumar (2024): Rural Development in India: Policies and Programmes. Red Shine Publication.
4. M. P. Borain (2016): Best Practices in Rural Development. Shanlax Publishers.
5. Journal of Rural Development, Published by NIRD & PR, Hyderabad.
6. Kurukshetra (Ministry of Rural Development, Government of India).
7. Yojana (Ministry of Rural Development, Government of India).

INTERNET OF THINGS

Code: 26CS731
Max Marks: 70

Course Objectives: This course focuses on the latest microcontrollers with application development, product design and prototyping. The Internet of Things (IOT) is the next wave, world is going to witness. Internet of Things is a term given to the attempt of connecting objects to the internet and also to each other - allowing people and objects themselves to analyse data from various sources in real-time and take necessary actions in an intelligent fashion.

UNIT I **(10 Hrs)**
Introduction: Definition, Functional requirements, Characteristics, Foundations, architectures, challenges and issues, Physical design of IoT, Logical design of IoT, Web 3.0 of IoT, IoT World Forum (IoTWF) and Alternative IoT models, IoT Communication Models, IoT in Global Context, Real world scenarios, Different Areas, Examples Trends in the Adaption of the IoT (Cloud Computing, Big Data Analytics, Concepts of Web of Things, Concept of Cloud of Things with emphasis on Mobile Cloud Computing, Smart Objects).

UNIT II **(10 Hrs)**
Components in IoT: Control Units, Sensors, Communication modules, Power Sources, Communication Technologies, RFID, Bluetooth, Zigbee, Wi-fi, RF links, Mobile Internet, Wired Communication;
IoT Protocol and Technology: RFID, NFC, Wireless Networks, WSN, RTLS, GPS, Agents, Multi–Agent Systems, IoT Protocols: M2M, BacNet, ModBus, Bluetooth, WiFi, ZigBee;
Web of Things (WoT): WoT vs. IoT, Architecture;
Cloud of Things (CoT): Grid/SOA and Cloud Computing, Standards, Cloud Providers and Systems, Architecture.

UNIT III **(10 Hrs)**
Data Analytics for IoT: Introduction, Machine Learning, Big Data Analytics Tools and Technology, Apache Hadoop, Using Hadoop MapReduce for Batch Data Analysis, Apache Oozie, Apache Spark, Apache Storm, Apache Kafka, Edge Streaming Analytics and Network Analytics, Xively Cloud for IoT, Using Apache Storm for Real-time Data Analysis, Structural Health Monitoring Case Study.
Tools for IoT: Chef, Chef Case Studies, Puppet, Puppet Case Study – Multi-tier Deployment, NETCONF-YANG Case Studies, IoT Code Generator.

UNIT IV **(10 Hrs)**
Domain-specific applications of IoT: Home automation, Industry applications, Surveillance applications, Smart Homes, Ambient Assisted Living, Intelligent Transport, Other IoT applications: Use-Case Examples.
Developing IoT solutions: Introduction to Python, Introduction to different IoT tools, Introduction to Arduino and Raspberry Pi, Implementation of IoT with Arduino and Raspberry Pi, Cloud Computing, Fog Computing, Connected Vehicles, Data Aggregation for the IoT in Smart Cities, Privacy and Security Issues in IoT.

Text Books:

1. A. Bahga, V. Madisetti, “Internet of Things: A Hands-on Approach”, 1st Edition, Universities Press, 2015/ Latest Edition.

2. R. Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw-Hill Education Private Limited, 2017/ Latest Edition.

Suggested Readings:

1. D. Uckelmann, M. Harrison, "Architecting the Internet of Things", 1st Ed., Springer, 2011/ Latest Edition.
2. O. Hersent, D. Boswarthick, O. Elloumi, "The Internet of Things – Key applications and Protocols", 2nd Edition, Wiley, 2012/ Latest Edition

INTERNET OF THINGS LAB

Code: 26CS793
Max Marks: 70

List of Practical:

1. Select any one development board (E.g., Arduino or Raspberry Pi) and control LED using the board.
2. Using the same board as in (1), read data from a sensor. Experiment with both analogue and digital sensors.
3. Control any two actuators connected to the development board using Bluetooth.
4. Read data from sensor and send it to a requesting client. (using socket communication) Note: The client and server should be connected to same local area network.
5. Create any cloud platform account, explore IoT services and register a thing on the platform.
6. Push sensor data to cloud.
7. Control an actuator through cloud.
8. Accesses the data pushed from sensor to cloud and apply any data analytics or visualization services.
9. Create a mobile app to control an actuator.
10. Design an IoT based air pollution control system which monitors the air pollution by measuring carbon monoxide, ammonia, etc and gives alarm or sends message when the pollution level is more than permitted range.
11. Design an IoT based system which measures the physical and chemical properties of the water and displays the measured values.
12. Identify a problem in your local area or college which can be solved by integrating the things you learned and create a prototype to solve it (Mini Project).
13. Design a business model canvas for a digital display.

INTRODUCTION TO MACHINE LEARNING

Code: 26CS732
Max Marks: 70

Course Objectives: The objective of the course is to enable students to comprehend the concept of supervised and unsupervised learning techniques, to differentiate regression, classification, and clustering techniques, to implement their algorithms, to analyze the performance of various machine learning techniques, and to select appropriate features for training machine learning algorithms.

UNIT I: Introduction to Machine Learning (10 Hrs)
Introduction to Machine Learning (ML); Feature engineering; Learning Paradigm, Generalisation of hypothesis, VC Dimension, PAC learning, Applications of ML.
Data Handling and ANN: Feature selection Mechanisms, Imbalanced data, Outlier detection- Artificial neural networks, including backpropagation- Applications

UNIT II: ML Models and Evaluation (10 Hrs)
Regression: Multi-variable regression; Model evaluation; Least squares regression; Regularisation; LASSO; Applications of regression, Classification – KNN, Naïve Bayes, SVM, Decision Tree; Training and testing classifier models; Cross-validation; Model evaluation (precision, recall, F1-measure, accuracy, area under curve); Statistical decision theory, including discriminant functions and decision surfaces
Model Assessment and Inference: Model assessment and Selection – Ensemble Learning – Boosting, Bagging, Model Inference and Averaging, Bayesian Theory, EM Algorithm

UNIT III: Hidden Markov Models **(10 Hrs)**
Hidden Markov Models (HMM) with forward-backwards and Viterbi algorithms; Sequence classification using HMM; Conditional random fields; Applications of sequence classification, such as part-of-speech tagging
Association Rules: Mining Association Rules in Large Databases. Mining Frequent Patterns-- basic concepts - Efficient and scalable frequent item set mining -methods, Apriori algorithm, FP-Growth algorithm

UNIT IV: Clustering **(10 Hrs)**
K-Means, Hierarchical Clustering – Single, complete, Average linkage; Ward's algorithm; Minimum spanning tree clustering; BIRCH clustering
Recent Trends: Recent Trends and Case Study

Text Books:
1. Ethem Alpaydin, Introduction to Machine Learning, MIT Press, Pearson, Third Edition, 2014.
2. Friedman Jerome, Trevor Hastie, and Robert Tibshirani. The Elements of Statistical Learning. Springer-Verlag, 2nd Edition, 2013.
3. Jeeva Jose, Introduction to Machine Learning, Khanna Book Publishing.

Suggested Readings:
1. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
2. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", Cambridge University Press, 2012.
3. Rajiv Chopra, Machine Learning, Khanna Book Publishing.

MACHINE LEARNING LAB

Code: 26CS794
Max Marks: 70

List of Experiments:
1. Implement Decision Tree learning.
2. Implement Logistic Regression.
3. Implement classification using a Multilayer perceptron
4. Implement classification using SVM
5. Implement Adaboost
6. Implement Bagging using Random Forests
7. Implement K-means Clustering to Find Natural Patterns in Data
8. Implement Hierarchical clustering
9. Implement K-mode clustering
10. Implement Association Rule Mining using FP Growth
11. Classification based on association rules
12. Implement Gaussian Mixture Model Using the Expectation Maximisation
13. Valuing ML algorithm with balanced and unbalanced datasets
14. Comparison of Machine Learning algorithms
15. Implement the k-nearest neighbour algorithm

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CRYPTOGRAPHY LAB

Code: 26CS791
Max Marks: 70

List of Experiments:

1. Working with Sniffers for monitoring network communication using
   a) Ethereal
   b) Wire shark
   c) Snort
   d) tcp dump.
2. Implementation and Performance evaluation of various cryptographic algorithms in C/C++
   a) DES
   b) RSA.
3. Using IP TABLES on Linux and setting the filtering rules.
4. Using open SSL for web server - browser communication.
5. Configuring S/MIME for e-mail communication.
6. Understanding the buffer overflow and format string attacks.
7. Using NMAP for ports monitoring.
8. Secure Socket programming.

CLOUD COMPUTING LAB

Code: 26CS792
Max Marks: 70

List of Practicals

1. Install Virtualbox/VMware Workstation with different flavours of Linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs.
3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version).
8. Install Hadoop single node cluster and run simple applications like wordcount.

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Integrated MCA

8th Semester

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Detailed Syllabus

DEEP LEARNING

Code: 26CS801
Max Marks: 70

Course Objective: The objective of this course is to provide students with an in-depth understanding of deep learning principles, algorithms, and applications. The course aims to develop students' skills in designing and implementing deep neural networks for solving complex machine learning tasks.

UNIT I: Introduction to Deep Learning **(08 Hrs)**
Overview of deep learning concepts and its significance, Basics of neural networks and gradient-based optimisation, Activation functions and loss functions in deep learning

UNIT II: Deep Neural Network Architectures **(08 Hrs)**
Feedforward neural networks and backpropagation algorithm, Convolutional neural networks (CNNs) for image processing, Recurrent neural networks (RNNs) for sequential data analysis

UNIT III: Deep Learning Frameworks and Libraries **(08 Hrs)**
Introduction to popular deep learning frameworks (e.g., TensorFlow, PyTorch), Building and training deep neural networks using frameworks, Transfer learning and pre-trained models

UNIT IV: Advanced Deep Learning Techniques **(08 Hrs)**
Generative adversarial networks (GANs) for data generation, Autoencoders and variational autoencoders (VAEs), Reinforcement learning with deep neural networks

UNIT V: Applications of Deep Learning **(08 Hrs)**
Deep learning for image classification and object detection, Natural language processing and sentiment analysis with deep learning, Deep learning in recommendation systems and autonomous vehicles

Suggested Readings:

1. "Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville.
2. "Deep Learning with Python" by Francois Chollet.

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WIRELESS & MOBILE COMPUTING

Code: 26CS802
Max Marks: 70

Course Objective: The Wireless and Mobile Computing course aims to provide students with a comprehensive understanding of the principles, technologies, and applications in the field of wireless and mobile computing. Participants will learn about wireless communication fundamentals, network protocols, and mobile device architectures. The course covers topics like cellular networks, Wi-Fi, Bluetooth, and emerging wireless technologies. Participants will explore mobile application development and optimisation techniques, including responsive design and app performance considerations.

UNIT I: Existing Wireless Systems **(08 Hrs)**
Introduction, Global System for Mobile Communications (GSM), Personal Communications Services (PCS), International Mobile Telecommunications 2000 (IMT-2000). Wireless local area networks. Wireless local loops.

UNIT II: Wireless and Mobile Computing **(06 Hrs)**
Overview of the history, evolution, and compatibility of wireless standards; the special problems of wireless and mobile computing.

UNIT III: Mobile Communication Systems **(10 Hrs)**
Introduction, mobile Internet protocol; mobile aware adaptation; extending the client-server model to accommodate mobility; mobile data access; the software packages to support mobile and wireless computing; Mobile/Cellular System Infrastructure, Registration, Handoff Parameters and Underlying Support. Roaming Support Using System Backbone. The role of middleware

UNIT IV: Satellite Systems **(06 Hrs)**
Introduction, Types of Satellite Systems, Characteristics of Satellite Systems, Satellite System Infrastructures, Call Setup, Global Positioning System.

UNIT V: Recent Advances **(10 Hrs)**
Introduction, Ultra-Wideband Technology, Multimedia Services Requirements. Mobility Management for Integrated Systems; Multicast in Wireless Networks; MANET Route Maintenance/Repair; Design Issues in Sensor Networks; Bluetooth Networks; Threats and Security Issues.

Suggested Readings:

1. Introduction to Wireless and Mobile Systems, Dharma P. Agrawal.
2. Internetworking with TCP/IP Vol.1: Principles, Protocols, and Architecture, 4/e, Comer, Douglas E., Prentice Hall.

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COMPUTER VISION

Code: 26CS733
Max Marks: 70

Course Objectives: The course aims to introduce students to the fundamentals of image formation, the major ideas, methods, and techniques of computer vision and pattern recognition. It also aims to develop an appreciation for various issues in the design of computer vision and object recognition systems, and provide the student with programming experience from implementing computer vision and object recognition applications.

UNIT I **(10 Hrs)**
Image Formation: Geometric primitives and transformations: Orthogonal, Euclidean, affine, projective, etc., photometric image formation. Edges canny, LOG, DOG; line detectors (Hough transform), Corners Harris, Hessian Affine, orientation histogram, SIFT, SURF, HOG, GLOH.

UNIT II **(10 Hrs)**
Camera Geometry: Camera parameters and perspective projection, affine camera, least-squares parameter estimation, linear approach to camera calibration, homography, rectification, auto calibration. Linear colour spaces: CIE XYZ, RGB, CMY, non-linear colour spaces: HSV, spatial and temporal effects.

UNIT III **(10 Hrs)**
Motion Analysis: Translational alignment, parametric motion, spline-based motion, optical flow, KLT. Epipolar geometry, sparse correspondence, dense correspondence, and multi-view stereo.

UNIT IV **(10 Hrs)**
Object Recognition and Advanced Computer Vision Applications: Basics of object detection, face recognition, instance recognition, category recognition, context and scene understanding, activity recognition, computational photography, shape from X.

Suggested Readings:

1. Computer Vision: Algorithms and Applications – Richard Szeliski, Springer, 2010.
2. Computer Vision – Shapiro and Stockman, Prentice Hall, 2001.
3. Image Processing, Analysis, and Machine Vision – Sonka, Hlavac, and Boyle, Cengage Learning, 2009.
4. Fundamentals of Machine Vision – Harley R. Myler, PHI Learning, 2003.
5. Computer Vision: A Modern Approach – Forsyth, David A., Ponce, Jean, PHI Learning, 2009.
6. Digital Image Processing – Rafael C. Gonzalez and Richard E. Woods, Pearson Education, 3rd Edition
7. D. L. Baggio et al., ―Mastering OpenCV with Practical Computer Vision Projects, Packt Publishing, 2012.
8. E. R. Davies, Computer & Machine Vision, Fourth Edition, Academic Press, 2012.
9. Jan Erik Solem, ―Programming Computer Vision with Python: Tools and algorithms for analysing images, O'Reilly Media, 2012.
10. Mark Nixon and Alberto S. Aquado, Feature Extraction & Image Processing for Computer Vision, Third a. Edition, Academic Press, 2012.
11. R. Szeliski, ―Computer Vision: Algorithms and Applications, Springer 2011.
12. Simon J. D. Prince, ―Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012.

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DEEP LEARNING LAB

Code: 26CS891
Max Marks: 70

List of Experiments:

1. Build a deep neural network model start with linear regression using a single variable.
2. Build a deep neural network model start with linear regression using multiple variables.
3. Write a program to convert speech into text.
4. Write a program to convert text into speech.
5. Write a program to convert video into frames.
6. Write a program for Time-Series Forecasting with the LSTM Model.
7. Build a feed forward neural network for prediction of logic gates.
8. Write a program to implement deep learning Techniques for image segmentation.
9. Write a program for object detection using image labeling tools.
10. Write a program to predict a caption for a sample image using LSTM.
11. Write a program for character recognition using CNN.
12. Write a program to predict a caption for a sample image using CNN.
13. Write a program for character recognition using RNN and compare it with CNN.
14. Write a program to detect Dog image using YOLO Algorithm.
15. Write a program to develop Autoencoders using MNIST Handwritten Digits.
16. Write a program to develop a GAN for Generating MNIST Handwritten Digits.

WIRELESS & MOBILE COMPUTING LAB

Code: 26CS892
Max Marks: 70

List of Experiments:

1. Write a program to simulate Fixed Time Division Multiplexing. Take 12 stations. Every station has time slice of 417 microseconds. Delay should be 10ms. Every time the station gets turn, it shows message.
2. Write a program that identifies the bluetooth devices in the wireless range.
3. Write a program that prints the signal strength of WiFi connection of the given computer.
4. Prepare a wireless ad hoc network and show its working.
5. Write a program to find hamming distance. For example Hamming distance d(v1,v2)=3 if v1=011011,v2=110001.
6. Write a program to perform infrared communication.
7. Write a program to perform Bluetooth file transfer.
8. Develop an android app which displays “Hello, welcome to Android Lab” message.
9. Develop an android app which displays a form to get following information from user.
    - Username
    - Password
    - Email Address
    - Phone Number
    - Country
    - State
    - State
    - Gender
    - Interests
    - Birth Date
    - Birth Time
10. Form should be followed by a Button with label “Submit”. When user clicks the button, a message should be displayed to user describing the information entered.
11. Utilize suitable UI controls (i.e. widgets). [When user enters country in AutoCompleteTextView, list of states should be displayed in Spinner automatically.]

12. Using Android, Create a login Activity. It asks "username" and "password" from user. If username and password are valid, it displays Welcome message using new activity.
13. Develop calculator Android Application.

SEMINAR/CONFERENCE

Code: 26PR102
Max Marks: 70

OBJECTIVE:
Seminars/Conferences and Presentations provide a platform to the students, where they can learn from what others are doing, learn about new things, ideas and important tips related to new technologies. To foster the Innovations happening in upcoming technologies and harnessing the entrepreneurial opportunities, Institutes must provide ample opportunities to the students to learn and yield the advantages of new advancements in the field of technology. It is expected from a student to learn latest in the industry and write an article related to it and present their findings in front of a panel.
The following points need to be considered while planning and evaluating the presentation:

- The seminars must be conducted after every 15 days/ or a month. A minimum of 3-4 seminar sessions can be organized during the semester.
- A minimum of 7-8 slides must be there which would include the title slide. The first slide should be the Introduction slide and the last one reference slide wherein all the links/books references/paper reference to paper must be quoted. The rest of the slides should focus on the technology, application areas etc.
- The title of the seminar must be related to the field of Information technology and must talk about the latest innovation/technology like IOT, Machine learning, Deep learning, AI Cloud computing, Mobility, Hand held devices, Social Computing, NOSQL Database, CRM, Social CRM, Open Source Application Development Frameworks, Zero Trust Security Framework/ Architecture, Big Data/ Data Lake, Emerging and Innovative Technologies, Conversational AI, Sentiments Analysis, DevOps, Real time Analytics, Fraud Detection. Proper approval must be taken before starting the work.
- Student's feedback must be taken after taking the seminar as to what learning they have gathered after studying the topics. For this, a feedback form may be designed using Google form utility.

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MINOR PROJECT I

Code: 26PR103
Max Marks: 100

PROJECT REPORT
All the students are required to submit a report based on the project work done by them during the sixth semester.

SYNOPSIS (SUMMARY/ABSTRACT):
All students must submit a summary/abstract separately with the project report. Summary, preferably, should be of about 3-4 pages. The content should be as brief as is sufficient enough to explain the objective and implementation of the project that the candidate is going to take up. The write up must adhere to the guidelines and should include the following:

- Name / Title of the Project
- Statement about the Problem
- Why is the particular topic chosen?
- Objective and scope of the Project
- Methodology (including a summary of the project)
- Hardware & Software to be used
- Testing Technologies used
- What contribution would the project make?

TOPIC OF THE PROJECT
This should be explicitly mentioned at the beginning of the Synopsis. Since the topic itself gives a peep into the project to be taken up, candidate is advised to be prudent on naming the project. This being the overall impression on the future work, the topic should corroborate the work.

OBJECTIVE AND SCOPE:
This should give a clear picture of the project. Objective should be clearly specified. What the project ends up to and in what way this is going to help the end user has to be mentioned.

PROCESS DISCRIPTION:
The process of the whole software system proposed, to be developed, should be mentioned in brief. This may be supported by DFDs / Flowcharts to explain the flow of the information.

RESOURCES AND LIMITATIONS:
The requirement of the resources for designing and developing the proposed system must be given. The resources might be in form of the hardware/software or the data from the industry. The limitation of the proposed system in respect of a larger and comprehensive system must be given.

CONCLUSION:
The write-up must end with the concluding remarks- briefly describing innovation in the approach for implementing the Project, main achievements and also any other important feature that makes the system stand out from the rest. Bachelor of Computer Applications programme offered by USICT at affiliated institutions.

<u>The following suggested guidelines must be followed in preparing the Minor Project Report:</u>
Good quality white A4 size paper should be used for typing and duplication. Care should be taken to avoid smudging while duplicating the copies.

- Page Specification: (Written paper and source code)
- Left margin - 3.0cms
- Right margin- 2.0cms
- Top margin 2.54cms
- Bottom margin 2.54cms
- Page numbers - All text pages as well as Program source code listing should be numbered at the bottom centre of the pages.

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Normal Body Text: Font Size: 12, Times New Roman, Double Spacing, Justified. 6 point above and below para spacing
Paragraph Heading Font Size: 14, Times New Roman, Underlined, Left Aligned. 12 point above & below spacing.
Chapter Heading Font Size: 20, Times New Roman, Centre Aligned, 30 point above and below spacing. Coding Font size: 10, Courier New, Normal
Submission of Project Report to the University:
The student will submit his/her project report in the prescribed format. The Project Report should include:

1. One copy of the summary/abstract.
2. One hard Copy of the Project Report.
3. The Project Report may be about 75 pages (excluding coding).

FORMAT OF THE STUDENT PROJECT REPORT ON COMPLETION OF THE PROJECT

I. Cover Page as per format
II. Acknowledgement
III. Certificate of the project guide
IV. Synopsis of the Project
V. Main Report
   a. Objective & Scope of the Project
   b. Theoretical Background Definition of Problem
   c. System Analysis & Design vis-a-vis User Requirements
   d. System Planning (PERT Chart)
   e. Methodology adopted; System Implementation & Details of Hardware & Software used System Maintenance &Evaluation
   f. Detailed Life Cycle of the Project
      i. ERD, DFD
      ii. Input and Output Screen Design
      iii. Process involved
      iv. Methodology used testing
      v. Test Report, Printout of the Report & Code Sheet
VI. Coding and Screenshots of the project
VII. Conclusion and Future Scope
VIII. References

<u>Formats of various certificates and formatting styles are as:</u>

1. **Certificate from the Guide**

CERTIFICATE

This is to certify that this project entitled "……." submitted in partial fulfilment of the degree of Integrated MCA to the "……." through …… done by Mr./Ms. _____, Roll No. _____is an authentic work carried out by him/her at _____ under my guidance. The matter embodied in this project work has not been submitted earlier for award of any degree to the best of my knowledge and belief.

Signature of the student Signature of the Guide

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2. **Project Report Cover Page Format:**

Title of the Project/report
(Times New Roman, Italic, Font size = 24)

Submitted in partial fulfilment of the requirements for the award of the Degree of
Integrated MCA
(Bookman Old Style, 16 point, centre)

Submitted to:
(Guide Name)

Submitted by:
(Student's name)
Roll No
College Name

3. **Self-Certificate by the students**

SELF CERTIFICATE

This is to certify that the dissertation/project report entitled "……" is done by me is an authentic work carried out for the partial fulfilment of the requirements for the award of the degree of Integrated MCA under the guidance of _____. The matter embodied in this project work has not been submitted earlier for award of any degree or diploma to the best of my knowledge and belief.

Signature of the student
Name of the Student
Roll No.

4. **ACKNOWLEDGEMENTS**

In the "Acknowledgements" page, the writer recognises his indebtedness to the guidance and assistance of the thesis adviser and other members of the faculty. Courtesy demands that he also recognises specific contributions by other persons or institutions, such as libraries and research foundations. Acknowledgements should be expressed, tastefully, and tactfully.

ARYAVART INTERNATIONAL UNIVERSITY
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Integrated MCA

9th Semester

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

Detailed Syllabus

DATA WAREHOUSING & MINING

Code: 26CS734
Max Marks: 70

Course Objective: The objective of the course is to learn methods for storing, managing, and analyzing large volumes of data using data warehousing and mining techniques for informed decision-making.

UNIT I: Introduction to Data Warehousing and ETL tools (10 Hrs)
Overview, Difference between Database System and Data Warehouse, The Compelling Need for data warehousing, Data warehouse – The building Blocks: Defining Features, data warehouses and data marts, overview of the components, three-tier architecture, Metadata in the data warehouse.
Defining the business requirements: Dimensional analysis, information packages – a new concept, requirements gathering methods, requirements definition: scope and content.

UNIT II : Dimensional Modelling and OLAP (10 Hrs)
Principles of Dimensional Modelling: Objectives, From Requirements to data design, Multi-Dimensional Data Model, Schemas: the STAR schema, the Snowflake schema, the fact constellation schema.
OLAP in the Data Warehouse: Demand for Online Analytical Processing, limitations of other analysis methods, OLAP definitions and rules, OLAP characteristics, major features and functions, hyper cubes.
OLAP Operations: Drill-down and roll-up, slice-and-dice, pivot or rotation, OLAP models, overview of variations, the MOLAP model, the ROLAP model, the DOLAP model, ROLAP versus MOLAP, OLAP implementation considerations. Query and Reporting, Executive Information Systems (EIS), Data Warehouse, and Business Strategy.

UNIT III: Data mining and data pre-processing (10 Hrs)
Data mining: Introduction, What kind of data can be mined, What kind of patterns to be mined, Which technologies are used, What kinds of applications are targeted, Major issues in data mining.
Data pre-processing: Overview of Data pre-processing, data cleaning, data integration, data reduction, data transformation and data discretization, exploring data using the IRIS datasets. Introduction to Apriori algorithm for association mining rules.

UNIT IV: Data mining applications, and Data mining Tools (10 Hrs)
Applications of data mining: Data mining for retail and telecommunication industries, data mining and recommender systems.
Introduction to data mining tools (open source): Weka, Rapid Miner, IBM Watson for classification and clustering algorithms using IRIS Datasets.

Text Books:

1. Kamber and Han, "Data Mining Concepts and Techniques", Third edition, Hartcourt India P.Ltd.,2012.
2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to data mining", Pearson Education, 2006
3. Paul Raj Poonia, "Fundamentals of Data Warehousing", John Wiley & Sons, 2004

Suggested Readings:

1. Ashok N. Srivastava, Mehran Sahami, "Text Mining Classification, Clustering, and Applications", Published by Chapman and Hall/CRC1st Edition, June 23, 2009
2. Ian H., Eibe Frank, Mark A. Hall, Christopher Pal. "Data Mining: Practical Machine Learning Tools and Techniques." Published by Morgan Kaufmann; 4th edition, December 1, 2016
3. G. K. Gupta, "Introduction to Data Mining with Case Studies", PHI, 2006.
4. Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", Tata McGraw-Hill, 1 July 2017 RB5. Shmueli, "Data Mining for Business Intelligence: Concepts, Techniques and Applications in Microsoft Excel with XL Miner", Wiley Publications

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ANDROID APP DEVELOPMENT

Code: 26CS231
Max Marks: 70

Course Objectives: This course is concerned with the development of applications on mobile and wireless computing platforms. Android will be used as a basis for teaching programming techniques and design patterns related to the development of standalone applications and mobile portals to enterprise and commerce systems. Emphasis is placed on the processes, tools and frameworks required to develop applications for current and emerging mobile computing devices. Students will work at all stages of the software development life-cycle from inception through to implementation and testing. In doing so, students will be required to consider the impact of user characteristics, device capabilities, networking infrastructure and deployment environment, in order to develop software capable of meeting the requirements of stakeholders.

UNIT I **(12 Hrs)**

Introduction: Brief history of mobile applications, Different types of mobile applications, Brief history of Android, Introduction to Android Development Environment, Android Application

Design Essentials: Anatomy of an Android applications, Creating First Android Application, Creating Android project, Project organization, setting up real Android device, setting up Android emulator, developing simple user interface, Running your first application

Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.

UNIT II **(10 Hrs)**

User Interface in Android: Adaptive and responsive user interfaces, User Input Controls, Menus, Screen Navigation, Recycler View, Drawable, Themes and Styles, Fragments, Fragment Life Cycle, Introduction to Material Design.

Android Application Components: App Widgets, Processes and Threads, User Interface Components, Views and layouts, Input controls, Input Events, Settings, Dialogs, Menus, Notifications, Toasts, Testing the user interface

UNIT III **(8 Hrs)**

Background tasks: AsyncTask, AsyncTaskLoader, Connecting App to Internet, Broadcast receivers, Services, Notifications, Alarm managers.

Sensor, Location, and Maps: Sensor Basic, Motion and Position Sensors, Location services, Google Maps API, Google Places API

UNIT IV **(10 Hrs)**

Working with data in Android: Shared Preferences, App Settings, SQLite primer, Store data using SQLite database, Content Providers, Content Resolver, Loader

Publishing Your App: Preparing for publishing, signing, and preparing the graphics, and publishing to the Android Market

Using Common Android APIs: Using Android Data and Storage APIs, managing data using SQLite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

Text Books:

1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)
2. Wei-Meng Lee," Beginning Android 4 Application Development", Wiley India Pvt. Ltd.
3. J. F. DiMarzio, "Android: A Programmers Guide", McGraw Hill Education (India) Private Limited.

Suggested Readings:

1. Paul Deitel "Android for Programmers: An App-Driven Approach" 1st Edition, Pearson India.
2. Wei-Meng Lee, "Beginning Android Application Development", Wiley Publishing

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MANAGEMENT INFORMATION SYSTEM

Code: 26MG103
Max Marks: 70

Course Objectives: To equip Management Information Systems (MIS), focusing on their role in decision-making, system design, IT integration, security, ethical issues, and strategic use to improve organizational efficiency and competitive advantage.

UNIT I **(06 Hrs)**
Basic Concepts of Information System Role of data and information, Organization structures, Business Process, Systems Approach and introduction to Information Systems.

UNIT II **(08 Hrs)**
Types of IS Resources and components of Information System, integration and automation of business functions and developing business models. Role and advantages of Transaction Processing System, Management Information System, Expert Systems and Artificial Intelligence, Executive Support Systems and Strategic Information Systems.

UNIT III **(08 Hrs)**
Architecture & Design of IS Architecture, development and maintenance of Information Systems, Centralised and Decentralised Information Systems, Factors of success and failure, value and risk of IS.

UNIT IV **(06 Hrs)**
Decision Making Process: Programmed and Non- Programmed decisions, Decision Support Systems, Models and approaches to DSS

UNIT V **(08 Hrs)**
Introduction to Enterprise Management technologies, Business Process Reengineering, Total Quality Management and Enterprise Management System viz. ERP, SCM, CRM and E-commerce.

UNIT VI **(04 Hrs)**
Introduction to SAD System Analysis and Design. Models and Approaches of Systems Development.

Text Books:

1. Management Information Systems, Effy OZ, Thomson Learning/Vikas Publications.
2. Management Information Systems, James A. O'Brein, Tata McGraw-Hill.

Suggested Readings:

1. Management Information System, W.S Jawadekar, Tata McGraw-Hill Publication.
2. Management Information System, David Kroenke, Tata McGraw-Hill Publication.
3. MIS: Management Perspective, D.P. Goyal, Macmillan Business Books.
4. MIS and Corporate Communications, Raj K. Wadhwa, Jimmy Dawar, P. Bhaskara Rao, Kanishka Publishers.
5. MIS: Managing the digital firm, Kenneth C. Landon, Jane P. Landon, Pearson Education.

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NATURAL LANGUAGE PROCESSING

Code: 26CS533
Max Marks: 70

Course Objectives: This course will enable students to, learn the importance of natural language Modelling, understand the Applications of natural language processing, study spelling, error detection and correction methods and parsing techniques in NLP and illustrate the information retrieval models in natural language processing.

UNIT I **(08 Hrs)**
Introduction: What is Natural Language Processing? Origins of NLP, Language and Knowledge, The Challenges of NLP, Language and Grammar, Processing Indian Languages, NLP Applications.
Language Modelling: Statistical Language Model - N-gram model (unigram, bigram), Paninion Framework, Karaka theory.

UNIT II **(08 Hrs)**
Word Level Analysis: Regular Expressions, Finite-State Automata, Morphological Parsing, Spelling Error Detection and Correction, Words and Word Classes, Part-of-Speech Tagging.
Syntactic Analysis: Context-Free Grammar, Constituency, Top-down and Bottom-up Parsing, CYK Parsing.

UNIT III **(08 Hrs)**
Naive Bayes, Text Classification and Sentiment: Naive Bayes Classifiers, Training the Naive Bayes Classifier, Worked Example, Optimising for Sentiment Analysis, Naive Bayes for Other Text Classification Tasks, Naive Bayes as a Language Model.

UNIT IV **(08 Hrs)**
Information Retrieval: Design Features of Information Retrieval Systems, Information Retrieval Models - Classical, Non-classical, Alternative Models of Information Retrieval - Custer model, Fuzzy model, LSTM model, Major Issues in Information Retrieval. Lexical Resources: WordNet, FrameNet, Stemmers, Parts-of-Speech Tagger, Research Corpora.

UNIT V **(08 Hrs)**
Machine Translation: Language Divergences and Typology, Machine Translation using Encoder-Decoder, Details of the Encoder-Decoder Model, Translating in Low-Resource Situations, MT Evaluation, Bias and Ethical Issues.

Suggested Readings:

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press.
2. Daniel Jurafsky, James H. Martin, "Speech and Language Processing, An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Pearson Education, 2023.
3. Akshay Kulkarni, Adarsha Shivananda, "Natural Language Processing Recipes – Unlocking Text Data with Machine Learning and Deep Learning using Python", Apress, 2019.
4. T V Geetha, "Understanding Natural Language Processing – Machine Learning and Deep Learning Perspectives", Pearson, 2024.
5. Gerald J. Kowalski and Mark.T. Maybury, "Information Storage and Retrieval systems", Kluwer Academic Publishers.

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NATURAL LANGUAGE PROCESSING LAB

Code: 26CS595
Max. Marks: 70

List of Experiments:

1. Installation and exploring features of NLTK and spaCy tools. Download Word Cloud and few corpora.
2. (i) Write a program to implement word Tokenizer, Sentence and Paragraph Tokenizers.
   (ii) Check how many words are there in any corpus. Also check how many distinct words are there?
3. (i) Write a program to implement both user-defined and pre-defined functions to generate
   (a) Uni-grams
   (b) Bi-grams
   (c) Tri-grams
   (d) N-grams
   (ii) Write a program to calculate the highest probability of a word (w2) occurring after another word(w1).
4. (i)Write a program to identify the word collocations.
   (ii) Write a program to print all words beginning with a given sequence of letters.
   (iii) Write a program to print all words longer than four characters.
5. (i) Write a program to identify the mathematical expression in a given sentence.
   (ii) Write a program to identify different components of an email address.
6. (i) Write a program to identify all antonyms and synonyms of a word.
   (ii) Write a program to find hyponymy, homonymy, polysemy for a given word.
7. (i) Write a program to find all the stop words in any given text.
   (ii) Write a function that finds the 50 most frequently occurring words of a text that are not stopwords.
8. Write a program to implement various stemming techniques and prepare a chart with the performance of each method.
9. Write a program to implement various lemmatization techniques and prepare a chart with the performance of each method.
10. (i) Write a program to implement Conditional Frequency Distributions (CFD) for any corpus.
    (ii) Find all the four-letter words in any corpus. With the help of a frequency distribution (FreqDist), show these words in decreasing order of frequency.
    (iii) Define a conditional frequency distribution over the names corpus that allows you to see which initial letters are more frequent for males versus females.
11. (i) Write a program to implement Part-of-Speech (PoS) tagging for any corpus.
    (ii) Write a program to identify which word has the greatest number of distinct tags? What are they, and what do they represent?
    (iii) Write a program to list tags in order of decreasing frequency and what do the 20 most frequent tags represent?
    (iv) Write a program to identify which tags are nouns most commonly found after? What do these tags represent?
12. Write a program to implement TF-IDF for any corpus.
13. Write a program to implement chunking and chinking for any corpus.
14. (i) Write a program to find all the mis-spelled words in a paragraph.
    (ii) Write a program to prepare a table with frequency of mis-spelled tags for any given text.
15. Write a program to implement all the NLP Pre-Processing Techniques required to perform further NLP tasks.

Case Studies: (At Least any one Case Study has to be performed)

- Case Study-1. Write a program to implement Named Entity Recognition (NER) for any corpus.
- Case Study-2. Write a program to perform Auto-Correction of spellings for any text.
- Case Study-3. Check for all positive words in a news article/ any text.

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BIG DATA ANALYTICS

Code: 26CS513
Max Marks: 70

Course Objectives: This course gives an overview of Big Data, i.e. storage, retrieval and processing of big data. In addition, it also focuses on the "technologies", i.e., the tools/algorithms that are available for storage and processing of Big Data. It also helps a student to perform a variety of "analytics" on different data sets and to arrive at positive conclusions.

UNIT I **(08 Hrs)**
Introduction to Big Data: Big Data and its Importance – Four Vs of Big Data – Drivers for Big Data – Introduction to Big Data Analytics – Big Data Analytics applications.

UNIT II **(08 Hrs)**
Big Data Technologies: Hadoop's Parallel World – Data discovery – Open-source technology for Big Data Analytics – cloud and Big Data –Predictive Analytics – Mobile Business Intelligence and Big Data

UNIT III **(06 Hrs)**
Introduction Hadoop: Big Data – Apache Hadoop & Hadoop Eco System – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization.

UNIT IV **(10 Hrs)**
Hadoop Architecture: Hadoop: RDBMS Vs Hadoop, Hadoop Overview, Hadoop distributors, HDFS, HDFS Daemons, Anatomy of File Write and Read., Name Node, Secondary Name Node, and Data Node, HDFS Architecture, Hadoop Configuration, Map Reduce Framework, Role of HBase in Big Data processing, HIVE, PIG.

UNIT V **(08 Hrs)**
Data Analytics with R Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering, Social Media Analytics, Mobile Analytics, Big Data Analytics with BigR.

Text Books:

1. Big Data Analytics, Seema Acharya, Subhasini Chellappan, Wiley 2015.
2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiley CIO Series, 2013.
3. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O'Reilly Media, 2012.
4. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.

Suggested Readings:

1. Big Data and Business Analytics, Jay Liebowitz, Auerbach Publications, CRC Press (2013).
2. Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop, Tom Plunkett, Mark Hornick, McGraw-Hill/Osborne Media (2013), Oracle Press.
3. Professional Hadoop Solutions, Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, Wiley, ISBN: 9788126551071, 2015.
4. Understanding Big data, Chris Eaton, Dirk deroos et al. McGraw-Hill, 2012.
5. Intelligent Data Analysis, Michael Berthold, David J. Hand, Springer, 2007.
6. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Bill Franks, 1st Edition, Wiley and SAS Business Series, 2012.

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BIG DATA NALYTICS LAB

Code: 26CS596
Max Marks: 70

List of Practical:

1. Perform setting up and installing VMware for Hadoop and Linux.
2. Basic Linux Commands
3. Run basic HDFS shell commands
4. Implement the following file management tasks in Hadoop:
    - Adding files and directories
    - Retrieving files
    - Deleting files and directories.
5. Write the steps to export a JAR using Eclipse.
6. Run a basic Word Count MapReduce program to understand the MapReduce paradigm
7. Write a MapReduce program that mines weather data. (Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi-structured and record-oriented).
8. Run Pig and perform basic PIG commands.
9. Write Pig Latin scripts to sort, group, join, project, and filter your data.
10. Run HIVE and perform basic HIVE commands to create a table and enter data into the table.
11. Use Hive to create, alter, and drop databases, tables, views, functions, and indexes
12. Use CDH and HUE to analyse data and generate reports for sample datasets
13. Importing and exporting Data in HDFS using Sqoop from the MySQL database
14. Use a data visualisation tool to generate reports on sample datasets.

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DATA WAREHOUSING & MINING LAB

Code: 26CS796
Max Marks: 70

List of Practicals:

1. Listing applications for mining
2. File format for data mining
3. conversion of various data files
4. Training the given dataset for an application
5. Testing the given dataset for an application
6. Generating accurate models
7. Data pre-processing – data filters
8. Feature selection
9. Web mining
10. Text mining
11. Design of fact & dimension tables
12. Generating graphs for a star schema.

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ANDROID APP DEVELOPMENT LAB

Code: 26CS294
Max Marks: 70

List of Practicals:

1. Set up ANDROID STUDIO using ECLIPSE IDE.
2. Build and Run first ANDROID program in Emulator.
3. Create an APP for currency converter.
4. Create an APP to registration form.
5. Create a calculator using ANDROID APP.
6. Create an APP to insert data from registration form into database.
7. Create an APP to conduct online quiz.
8. Create Slide show of multiple images using ANDROID APP.
9. Develop an APP which plays video files.
10. Create an App to identify the current location using GOOGLE MAP API.

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Integrated MCA

10th Semester

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Detailed Syllabus

BLOCKCHAIN TECHNOLOGY

Code: 26CS404
Max Marks: 70

Course Objectives: The objective of this course is to develop familiarity with theoretical concepts, underlying technology, tools, implementation strategies, and current practices. The course will offer a strong technical understanding of Blockchain technologies, develop familiarity with current technologies, tools, and implementation strategies, and introduce application areas, current practices, and research activity.

UNIT I **(08 Hrs)**
Introduction to Blockchain Technology – Distributed systems – The history of blockchain – Introduction to blockchain – CAP theorem and blockchain – Benefits and limitations of blockchain – Decentralization using blockchain - Methods of decentralization – Routes to decentralization.

UNIT II **(08 Hrs)**
Cryptography in Blockchain: Introduction – cryptographic primitives – Asymmetric cryptography – public and private keys -line interface – Bitcoin improvement proposals (BIPs) – Consensus Algorithms.

UNIT III **(08 Hrs)**
BitCoin Introduction – Transactions – Structure - Transaction types – The structure of a block– The genesis block – The bitcoin network– Wallets and their types– Bitcoin payments– Bitcoin investment and buying and selling bitcoins – Bitcoin installation – Bitcoin programming and the command-line interface – Bitcoin improvement proposals (BIPs).

UNIT IV **(08 Hrs)**
Ethereum - Ethereum blockchain- Elements of the Ethereum blockchain– Precompiled contracts – Accounts and their types – Block header- Ether – Messages – Mining - Clients and wallets – Trading and investment – The yellow paper - The Ethereum network - Applications developed on Ethereum - Scalability and security issues.

UNIT V **(08 Hrs)**
Smart Contract and Hyperledger – History of Smart Contract – Ricardian contracts - The DAO. Hyperledger projects – Hyperledger as a protocol – Fabric - Hyperledger Fabric - Sawtoothlake – Corda Architecture.

Text Book:

1. Bashir, Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained, 2nd Edition, 2nd revised edition. Birmingham: Packt Publishing, 2018.

Suggested Readings:

1. A. M. Antonopoulos, Mastering Bitcoin, First edition. Sebastopol, CA: O'Reilly, 2015.
2. Z. Zheng, S. Xie, H. Dai, X. Chen, and H. Wang, "An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends", in 2017 IEEE International Congress on Big Data (Big Data Congress), 2017, pp.557–564.

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SOFT COMPUTING

Code: 26CS405
Max Marks: 70

Course Objectives: This course will cover fundamental concepts used in Soft computing. The concepts of Fuzzy logic (FL) will be covered first, followed by Artificial Neural Networks (ANNs) and optimization techniques using Genetic Algorithm (GA). Applications of Soft Computing techniques to solve various real-life problems will be covered to provide hands-on practice. In summary, this course will provide exposure to both theory and practical systems and software used in soft computing.

UNIT I: Introduction to Soft Computing **(08 Hrs)**

a. Concept of computing systems.
b. "Soft" computing versus "Hard" computing
c. Characteristics of Soft Computing
d. Some applications of Soft computing techniques.

UNIT II: Fuzzy Logic **(08 Hrs)**

a. Introduction to Fuzzy logic.
b. Fuzzy sets and membership functions.
c. Operations on Fuzzy sets.
d. Fuzzy relations, rules, propositions, implications and inferences.
e. Defuzzification techniques.
f. Fuzzy logic controller design.
g. Some applications of Fuzzy logic.

UNIT III: Genetic Algorithms **(08 Hrs)**

a. Concept of "Genetics" and "Evolution" and its application to probabilistic search techniques
b. Basic GA framework and different GA architectures.
c. GA operators: Encoding, Crossover, Selection, Mutation, etc.
d. Solving single-objective optimization problems using GAs.

UNIT IV: Multi-Objective Optimization Problem-Solving **(08 Hrs)**

a. Concept of multi-objective optimization problems (MOOPs) and issues of solving them.
b. Multi-Objective Evolutionary Algorithm (MOEA).
c. Non-Pareto approaches to solve MOOPs
d. Pareto-based approaches to solve MOOPs
e. Some applications with MOEAs.

UNIT V: Artificial Neural Networks **(08 Hrs)**

a. Biological neurons and their working.
b. Simulation of biological neurons for problem-solving.
c. Different ANN architectures.
d. Training techniques for ANNs.
e. Applications of ANNs to solve some real-life problems.

Text Books:

1. Fuzzy Logic: A Practical Approach, F. Martin, McNeill, and Ellen Thro, AP Professional, 2000.
2. Foundations of Neural Networks, Fuzzy Systems, and Knowledge Engineering, Nikola K. Kasabov, MIT Press, 1998.
3. An Introduction to Genetic Algorithms, Melanie Mitchell, MIT Press, 2000.
4. Genetic Algorithms In Search, Optimization And Machine Learning, David E. Goldberg, Pearson Education, 2002.
5. Practical Genetic Algorithms, Randy L. Haupt and Sue Ellen Haupt, John Wiley & Sons, 2002.
6. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis, and Applications, S. Rajasekaran, and G. A. Vijayalakshmi Pai, Prentice Hall of India, 2007.

Suggested Readings:

1. Soft Computing, D. K. Pratihar, Narosa, 2008.
2. Fuzzy Logic for Embedded Systems Applications, Ahmed M. Ibrahim, Elsevier Press, 2004.
3. Neuro-Fuzzy and Soft Computing, J.-S. R. Jang, C.-T. Sun, and E. Mizutani, PHI Learning, 2009.
4. Neural Networks and Learning Machines, (3rd Edn.), Simon Haykin, PHI Learning, 2011.
5. Fuzzy Logic with Engineering Applications (3rd Edn.), Timothy J. Ross, Willey, 2010.

MAJOR PROJECT

Code: 26PR104
Max Marks: 70

PROJECT REPORT

All the students are required to submit a report based on the project work done by them during the tenth semester.

SYNOPSIS (SUMMARY/ABSTRACT):

All students must submit a summary/abstract separately with the project report. Summary, preferably, should be about 3-4 pages. The content should be as brief as is sufficient to explain the objective and implementation of the project that the candidate is going to take up. The write-up must adhere to the guidelines and should include the following:

- Name/Title of the Project
- Statement about the Problem
- Why are the particular topic chosen?
- Objective and scope of the Project
- Methodology (including a summary of the project)
- Hardware & Software to be used
- Testing Technologies used
- What contribution would the project make?

TOPIC OF THE PROJECT- This should be explicitly mentioned at the beginning of the Synopsis. Since the topic itself gives a peek into the project to be taken up, the candidate is advised to be prudent in naming the project. This is the overall impression of the future work; the topic should corroborate the work.

OBJECTIVE AND SCOPE: This should give a clear picture of the project. The objective should be clearly specified. What the project ends up to and in what way this is going to help the end user has to be mentioned.

PROCESS DESCRIPTION: The process of the whole software system proposed to be developed should be mentioned in brief. This may be supported by DFDs / Flowcharts to explain the flow of the information.

RESOURCES AND LIMITATIONS: The requirements of resources for designing and developing the proposed system must be given. The resources might be in the form of hardware/software or data from the industry. The limitation of the proposed system with respect to a larger and comprehensive system must be given.

CONCLUSION: The write-up must end with the concluding remarks- briefly describing innovation in the approach for implementing the Project, main achievements and also any other important feature that makes the system stand out from the rest.

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The following suggested guidelines must be followed in preparing the Final Project Report: Good quality white A4 size paper should be used for typing and duplication. Care should be taken to avoid smudging while duplicating the copies.

Page Specification: (Written paper and source code)

- Left margin- 3.0 cms
- Right margin- 2.0 cms
- Top margin- 2.54 cms
- Bottom margin- 2.54 cms
- Page numbers- All text pages as well as Program source code listing should be numbered at the bottom centre of the pages.

Normal Body Text: Font Size: 12, Times New Roman, Double Spacing, justified 6 points above and below para spacing.

Paragraph Heading Font Size: 14, Times New Roman, Underlined, Left Aligned. 12 points above & below spacing.

Chapter Heading Font Size: 20, Times New Roman, Centre Aligned, 30 points above and below spacing.

Coding Font size :10, Courier New, Normal

Submission of Project Report to the University: The student will submit his/her project report in the prescribed format. The Project Report should include:

1. One copy of the summary/abstract.
2. One hard Copy of the Project Report.
3. The Project Report may be about 75 pages (excluding coding).

FORMAT OF THE STUDENT PROJECT REPORT ON COMPLETION OF THE PROJECT

I. Cover Page as per format
II. Acknowledgement
III. Certificate of the project guide
IV. Synopsis of the Project
V. Main Report
    i. Objective & Scope of the Project
    ii. Theoretical Background Definition of Problem
    iii. System Analysis & Design vis-à-vis User Requirements
    iv. System Planning (PERT Chart)
    v. Methodology adopted System Implementation & Details of Hardware & Software used System Maintenance & Evaluation
    vi. Detailed Life Cycle of the Project
        a. ERD, DFD
        b. Input and Output Screen Design
        c. Process involved
        d. Methodology used testing
        e. Test Report, Printout of the Report & Code Sheet
VI. Coding and Screenshots of the project
VII. Conclusion and Future Scope
VIII. References

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Formats of various certificates and formatting styles are as:

1. **Certificate from the Guide**

CERTIFICATE

This is to certify that this project entitled "……..……..." submitted in partial fulfillment of the degree of Integrated MCA to the "……" through ……done by Mr./Ms._____Enrollment No._____ is an is an authentic work carried out by him/her at _____my guidance. The matter embodied in this project work has not been submitted earlier for award of any degree to the best of my knowledge and belief.

Signature of the student Signature of the Guide

2. **Project Report Cover Page Format:**

Title of the Project/report

(Times New Roman, Italic, Font size= 24)

Submitted in partial fulfilment of the requirements for the award of the degree of Integrated MCA (Bookman Old Style, 16points, centre)

Submitted to: **Submitted by:**

(Guide Name) **(Student's name)**

Enrolment No.:

3. **Self-Certificate by the students**

SELFCERTIFICATE

This is to certify that the dissertation/project report entitled "_____" is done by me is an authentic work carried out for the partial fulfilment of the requirements for the award of the degree of Integrated MCA under the guidance of_____.
The matter embodied in this project work has not been submitted earlier for award of any degree or diploma to the best of my knowledge and belief.

Signature of the student

Name of the Student

Enrollment No.

4. **ACKNOWLEDGEMENTS**

In the "Acknowledgements" page, the writer recognizes his indebtedness for guidance and assistance of the thesis adviser and other members of the faculty. Courtesy demands that he also recognizes specific contributions by other persons or institutions such as libraries and research foundations. Acknowledgements should be expressed

simply, tastefully, and tactfully.

BLOCKCHAIN TECHNOLOGY LAB

Code: 26CS494
Max Marks: 70

List of Practicals

PROGRAMS USING SOLIDITY:

1. A) Generate public-private key pairs for Bitcoin and Ethereum addresses.
   B) Connect to the Public/Test net Ethereum Blockchain network using popular wallets (MetaMask, Brave browser) and understand various terminologies like gas, gas fee, gas price, and priority fee.
   C) Send a test email from one account to another.
   D) Send test ether to the smart contract.
2. Installation and Configuration of Node.js and Web3.js.
3. Using Web3.js to transfer Ether from one account to another.
4. Create a Private Ethereum Blockchain network.
5. Using Web3.js to Interact with Smart Contracts.
6. Using Web3.js with Chrome to Interact with Smart Contracts.
7. Create a Hyperledger Fabric Permissioned blockchain network.
8. Write, deploy and execute chain code in the Hyperledger Fabric network.

PROGRAMS USING RUST

9. Basics of Rust:
   A) Write a program to display the statements.
   B) Write a program to demonstrate the basic data types in Rust.
   C) Write a program to format strings and numbers.
   D) Write a program to compute arithmetic operations taking input from the user and display the result.
   E) Write a program to demonstrate bitwise and logical operators.
   F) Write a program to swap two numbers without using a temporary variable.
10. Write programs that demonstrate the Compound Data Types in Rust (Arrays, Tuples)
11. Write programs that can demonstrate the working of loops and Conditional Loops in Rust
12. Write a program that can demonstrate
    A) Assigning the value of one variable to another variable.
    B) Passing a value to a function.
    C) Returning value from a function.
13. Write a program to generate a Random number using Rust
14. Write a program that can compare the guessed number with a Secret generated number
15. Write a program that can demonstrate borrowing in Rust

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SOFT COMPUTING LAB

Code: 26CS495
Max Marks: 70

List of Practicals:

1. Performing Union, Intersection and Complement operations
2. Implementation of De Morgan's Law
3. Plotting various membership functions
4. Using fuzzy toolbox to model tips value
5. Implementation of Fuzzy Inference System
6. Simple fuzzy set operations
7. Using a Hopfield network with no self-connection
8. Generation of ANDNOT function using McCulloch-Pitts neural net
9. Finding the weight matrix and bias of the Hebb Net to classify two-dimensional input patterns
10. Perceptron net for AND function with bipolar inputs and targets
11. Finding the weight matrix of a Hetero-Associative neural net for mapping of vectors
12. Generation of the XOR function using the back propagation algorithm

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