

Syllabus For
4-Year UG Programme
in
BCA (AIML)
(Artificial Intelligence & Machine Learning)

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, Artificial Intelligence and Machine Learning have emerged as the most transformative forces shaping industries, economies, and everyday life. The rapid adoption of intelligent systems, automation, and data-driven decision-making has made specialised computing education an indispensable pillar of higher learning. The four-year Bachelor of Computer Applications (Artificial Intelligence & Machine Learning) — BCA (AIML) — Programme at Aryavart International University (AIU) is an undergraduate programme designed to build strong computing foundations alongside focused expertise in AI and ML, preparing students for careers at the forefront of the technology industry.

Aligned with the National Education Policy (NEP) 2020, the BCA (AIML) Programme at AIU is a three-year (six-semester) undergraduate programme that offers students a multiple entry and multiple exit framework along with the flexibility to build depth in domains such as Machine Learning, Deep Learning, Data Science, Computer Vision, and Natural Language Processing. The Programme integrates theoretical learning with industry-oriented practical training, IBM-certified skill modules, live projects, an internship, and a major project undertaken in collaboration with leading industry partners.

Programme Objectives

The objectives of the three-year BCA (AIML) Programme are:

- To provide students with a strong foundation in computing fundamentals, programming, and the mathematical and statistical basis of Artificial Intelligence and Machine Learning.
- To develop analytical, logical, and algorithmic problem-solving abilities required for designing and building intelligent systems.
- To build practical proficiency in machine learning, deep learning, data analytics, and AI-driven application development.
- To foster an entrepreneurial mindset and innovation through project-based learning, incubation support, and industry interaction.
- To equip students with skills in data structures, databases, cloud computing, and modern AI/ML frameworks and tools.
- To inculcate ethical values, responsible AI practices, and data-privacy awareness essential for professional software and AI development.
- To prepare students for postgraduate study, competitive examinations, and entry-level to mid-level technical 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 applied AI/ML assignments.

Programme Learning Outcomes

On the completion of the BCA (AIML) Programme, students will be able to:

- ✓ Demonstrate comprehensive understanding of core computing functions including programming, databases, networks, and software engineering.
- ✓ Apply machine learning and deep learning algorithms to solve real-world data-driven problems.
- ✓ Analyse large datasets and generate actionable insights using modern AI/ML tools and techniques.
- ✓ Design and implement AI-powered applications and software products, supported by AIU's incubation centre and industry network.
- ✓ Exhibit professional communication, presentation, and teamwork skills essential for technical roles.
- ✓ Demonstrate awareness of emerging AI/ML trends, cloud infrastructure, and responsible/ethical AI practices.
- ✓ Uphold ethical standards and data-protection responsibility in professional conduct.
- ✓ Qualify for postgraduate study, national competitive examinations, and entry into AI/ML-focused technical careers.

Need for Curriculum Development

The BCA (AIML) curriculum at Aryavart International University is framed in alignment with the UGC guidelines and NEP 2020 to produce industry-ready AI/ML professionals and future technology leaders. The following factors necessitate a contemporary and flexible curriculum:

Rapidly Evolving AI/ML Landscape

Rapid advances in machine learning frameworks, generative AI, and intelligent automation demand that students be trained in emerging domains such as deep learning, computer vision, natural language processing, and MLOps. The curriculum integrates these evolving domains to bridge the gap between academia and industry.

Credit Transfer and Academic Mobility

In line with the UGC's credit transfer provisions under NEP 2020, the BCA (AIML) 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 AI/ML modules, hackathons, and live projects. 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 BCA (AIML) Programme opens diverse and rewarding career pathways. Graduates of AIU's BCA (AIML) Programme are equipped to pursue technical careers including:

- Machine Learning Engineer
- AI Application Developer
- Data Analyst / Junior Data Scientist
- Computer Vision Engineer
- Natural Language Processing (NLP) Engineer
- Python / AI Software Developer
- Business Intelligence Analyst
- Cloud & MLOps Associate
- Entrepreneur / Start-up Founder (supported by AIU Incubation Centre)
- Research Assistant (further studies in AI/ML, Data Science, or Computer Science)

Pedagogy

The BCA (AIML) pedagogy at Aryavart International University is designed to create practice-oriented, industry-aligned AI/ML professionals and future technology leaders. The curriculum employs a blend of traditional and experiential learning methodologies.

Integration of Theory and Practice

Each course balances conceptual foundations with hands-on application. Students engage in coding labs, machine learning model-building exercises, hackathons, and industry case studies to translate theoretical knowledge into applied AI/ML competencies.

ICT-Enabled Teaching

Smart classrooms, computing and AI/ML labs, cloud-based development and model-training 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 semester-wise project reports and a final-year applied AI/ML research/development 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 and machine learning labs
- Case study analysis and AI/ML model-design exercises
- Internships, hackathons, and live industry projects
- 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 model-building project submissions
- Viva-voce and practical evaluations
- Attendance and class participation

Scheme of Evaluation

A. BCA (AIML) — 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, lab-based, and AI/ML model-building courses of the BCA (AIML) Programme:

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

C. 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

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

Applicable to students in the 6th Semester (Final Year) of the BCA (AIML) Programme. The major project is undertaken under faculty guidance and evaluated entirely through external assessment for a total of 200 marks.

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 may exit the programme at the end of each year and are awarded the corresponding certificate/degree:

Exit Option / Completion	Credits	Certificate / Award
Successful completion of Year I (2 Semesters)	40	Undergraduate Certificate in Computer Applications (AI & ML)
Successful completion of Year II (4 Semesters)	80	Undergraduate Diploma in Computer Applications (AI & ML)
Successful completion of Year III (6 Semesters)	120	Bachelor of Computer Applications — Artificial Intelligence & Machine Learning (BCA-AIML)
Successful completion of Year IV (8 Semesters)	160	Bachelor of Computer Applications — Artificial Intelligence & Machine Learning (BCA-AIML) (with Honors/Research)

Internal Assessment: Continuous Mode

The Internal Assessment for the BCA (AIML) 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 the semester as detailed below.

BCA (AIML) — Continuous Mode Assessment (15 Marks)

The Continuous Mode Assessment for the BCA (AIML) is conducted on an ongoing basis throughout the semester and comprises the following components, emphasising broad-based computing and AI/ML 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/ML 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 Bachelor 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	HTML (with Lab)	PC Hardware/ Office Automation	Business Communication	Not Applicable	Life Skills and Personality Development	Not Applicable	22
	C-Programming with Lab							
II	Object Oriented Programming with C++ with Lab	Introduction to Machine Learning & Data Science	Linux Programming Lab/ Cyber Security	Environmental Studies	Not Applicable	Not Applicable	Health & Wellness	22
	Computer Organisation & Architecture with Lab							
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	Probability & Statistics	Modelling & Simulation/ Graph Theory	Not Applicable	Not Applicable	Indian Knowledge System	Human Values & Ethics	22
	Database Management System with Lab							
IV	Computer Networks with Lab	Optimization Technique	Software Engineering/ Software Testing	Not Applicable	Not Applicable	Indian Constitution	Drug Abuse, Road Safety & Traffic Rules	22
	Machine Learning using Python with Lab							
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	Distributed Computing	Disaster Management	Not Applicable	DSE-I (Choose any one paper)	Not Applicable	Not Applicable	24
	Cloud Computing with Lab							
VI	Java Programming with Lab	E-Commerce	Not Applicable	Not Applicable	DSE-II (Choose any one paper)	Not Applicable	Not Applicable	22
	Solve Business Problems with AI with Lab							
Exit option with Degree in Bachelor of Computer Application (132 Credits)								
VII	Cryptography with Lab	R-Programming	Not Applicable	Not Applicable	DSE-III (Choose any one paper)	Not Applicable	Not Applicable	22
	Internet of Things with Lab							
VIII	Deep Learning with Lab	Not Applicable	Not Applicable	Seminar/ Conference	Major Project	Not Applicable	Not Applicable	22
	Mobile Application Development with Lab							
Exit option with Degree in Bachelor of Computer Application with Research (174 Credits)								

For students securing 75% and above (UG with Research)

For students securing 75 % and above (UG with Research)								
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 (12 Credits)	Extracurricular Courses (2 Credits)	Value Added Courses/ VAC (2 Credits)	Total Credits
VII	Cryptography with Lab	R-Programming	Not Applicable	Not Applicable	Research Project/ Dissertation*	Not Applicable	Not Applicable	22
VIII	Deep Learning with Lab	Not Applicable	Not Applicable	Seminar/ Conference	Major Project	Not Applicable	Not Applicable	22
	Mobile Application Development with Lab							
Exit option with Degree in Bachelor of Computer Application with Research (174 Credits)								

*Research Project or Dissertation carries 12 credits

#One Research/Review Paper to be published in peer-reviewed journal in both 7th and 8th Sem (for both Honors and Research Students)

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

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
26CS533	Natural Language Processing	4	0	0	4	70	30	0	100
26CS595	Natural Language Processing Lab	0	0	2	2	0	30	70	100

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

Course Code	Paper Name	L	T	P	Credit	Theory Marks	Internal Marks	Practical Marks	Total Marks
26CS633	Digital Marketing & SEO	4	0	0	4	70	30	0	100
26CS696	Digital Marketing Lab	0	0	2	2	0	30	70	100
26CS634	Software Project Management	4	0	0	4	70	30	0	100
26PR103	Minor Project I	0	0	2	2	0	30	70	100

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

Course Code	Paper Name	L	T	P	Credit	Theory Marks	Internal Marks	Practical Marks	Total Marks
26CS733	Computer Vision	4	0	0	4	70	30	0	100
26CS795	Computer Vision Lab	0	0	2	2	0	30	70	100
26CS734	Data Warehousing & Mining	4	0	0	4	70	30	0	100
26CS796	Data Warehousing & Mining Lab	0	0	2	2	0	30	70	100



BCA-AIML

1st Semester

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.

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.



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.

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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.

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.

BCA-AIML

2nd Semester

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.

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.

विद्याधनं सर्वधनप्रधानं

INTRODUCTION TO MACHINE LEARNING & DATA SCIENCE

Code: 26CS212

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 analyse the performance of various machine learning techniques, and to select appropriate features for training machine learning algorithms. It also aims to understand the data science process and life cycle, learn data analysis, visualisation, and basic statistics and use tools like Python and libraries for data handling

UNIT I

(10 Hrs)

Introduction to Machine Learning:

- 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

ML Models and Evaluation:

- 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 II

(10 Hrs)

Hidden Markov Models:

- 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

Clustering:

- K-Means, Hierarchical Clustering – Single, complete, Average linkage; Ward's algorithm; Minimum spanning tree clustering; BIRCH clustering
- Recent Trends: Recent Trends and Case Study

UNIT III

(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.
- 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 IV

(10 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).

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

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

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

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, alias.
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

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instructor.

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

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 programmes: 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. Sulphery; "Introduction to Environment Management"; PHI Learning, 2019.

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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

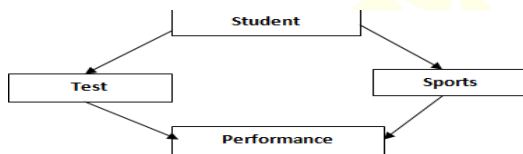
Max Marks: 70

Core Practical (Implement minimum 8 out of 10 practical)

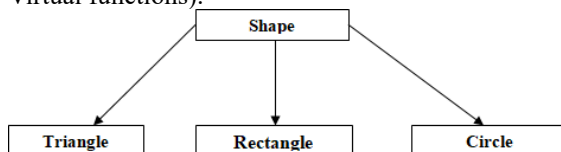
1. WAP to implement 'Inline function'.
2. WAP to implement call by reference and return by reference using class. [Hint. Assume necessary functions].
3. WAP to implement friend function by taking some real-life examples.
4. WAP to implement 'Function Overloading'.
5. WAP to implement Parameterized Constructor, 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 object 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

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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.

विद्याधनं सर्वधनप्रधानं

BCA-AIML

3rd Semester

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.

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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. Elmarsri 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.

PROBABILITY & STATISTICS

Code: 26CS312

Max Marks: 70

Course Objectives: The course "Probability and Statistics" is designed to provide students with a strong foundation in both probability theory and statistical methods. The course covers key topics such as probability distributions, random variables, statistical inference, hypothesis testing, correlation, regression analysis, and sampling methods. Students will learn how to apply probability concepts to model uncertainty and how to use statistical techniques to analyze and interpret data. Emphasis is placed on understanding concepts like mean, variance, standard deviation, and confidence intervals, as well as mastering the use of statistical tools for data-driven decision-making.

UNIT I (08 Hrs)

Algebra of Sets: sets and classes, limit of a sequence of sets, rings, sigma-rings, fields, sigma-fields, monotone classes. Probability: Classical, relative frequency and axiomatic definitions of probability, addition rule and conditional probability, multiplication rule, total probability, Bayes' Theorem and independence, problems.

UNIT II (12 Hrs)

Random Variables: Discrete, continuous and mixed random variables, probability mass, probability density and cumulative distribution functions, mathematical expectation, moments, probability and moment generating function, median and quantiles, Markov inequality, Chebyshev's inequality, problems.

Special Distributions: Discrete uniform, binomial, geometric, negative binomial, hypergeometric, Poisson, continuous uniform, exponential, gamma, Weibull, Pareto, beta, normal, lognormal, inverse Gaussian, Cauchy, double exponential distributions, reliability and hazard rate, reliability of series and parallel systems, problems.

The function of a random variable, problems.

UNIT III (08 Hrs)

Joint Distributions: Joint, marginal and conditional distributions, product moments, correlation and regression, independence of random variables, bivariate normal distribution, and problems.

Transformations: functions of random vectors, distributions of order statistics, distributions of sums of random variables, problems.

Sampling Distributions: The Central Limit Theorem, distributions of the sample mean and the sample variance for a normal population, Chi-Square, t and F distributions, problems.

UNIT IV (12 Hrs)

Descriptive Statistics: Graphical representation, measures of locations and variability.

Estimation: Unbiasedness, consistency, the method of moments and the method of maximum likelihood estimation, confidence intervals for parameters in one sample and two sample problems of normal populations, confidence intervals for proportions, problems.

Testing of Hypotheses: Null and alternative hypotheses, the critical and acceptance regions, two types of error, power of the test, the most powerful test and Neyman-Pearson Fundamental Lemma, tests for one sample and two sample problems for normal populations, tests for proportions, Chi-square goodness of fit test and its applications, problems.

Text Books:

1. "An Introduction to Probability and Statistics" by V.K. Rohatgi & A.K. Md.E.Saleh.
2. "Introduction to Probability and Statistics" by J.S. Milton & J. C. Arnold.
3. "Introduction to Probability Theory and Statistical Inference" by H. J. Larson.

Suggested Readings:

1. "Introduction to Probability and Statistics for Engineers and Scientists" by S.M. Ross.
2. "A First Course in Probability" by S.M. Ross.
3. "Probability and Statistics in Engineering" by W.W. Hines, D.C. Montgomery, D.M. Goldsman & C. M.

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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 analyse and solve complex problems.

UNIT I: Introduction to Modelling and Simulation (04 Hrs)

Overview of modelling and simulation concepts, Types of simulation models, Continuous and discrete event simulation.

UNIT II: Model Development and Validation (04 Hrs)

System dynamics modelling, Agent-based modelling, 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 optimisation.

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 Modelling 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.

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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. Gross and 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, Bodhayana, 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

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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 harmonious 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:

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

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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 Search Tree.
(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.

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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)

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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)
Iss_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.

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- (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.



BCA-AIML

4th Semester

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. Tanenbaum, "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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MACHINE LEARNING USING PYTHON

Code: 26CS403

Max Marks: 70

Course Objective: This course aims to understand the meaning, purpose, scope, stages, applications, and effects of ML and explore important packages of Python, such as numpy, scipy, OpenCV and scikit-learn.

UNIT I: Application and Environmental Setup

(08 Hrs)

- Applications of Machine Learning In different fields (Medical science, Agriculture, Automobile, mining and many more)
- Supervised vs Unsupervised Learning based on problem Definition.
- Understanding the problem and its possible solutions using IRIS and various datasets.
- Python libraries suitable for Machine Learning(numpy, scipy, scikit-learn, opencv)
- Environmental setup and Installation of important libraries.

UNIT II: Regression

(08 Hrs)

- Linear Regression
- Non-linear Regression
- Model Evaluation in Regression
- Evaluation Metrics in Regression Models
- Multiple Linear Regression
- Feature Reduction using PCA
- Implementation of regression model on various datasets.

UNIT III: Classification and Introduction to Neural Networks

(16 Hrs)

- Defining Classification Problem with IRIS datasets.
- Mathematical formulation of K-Nearest Neighbour Algorithm for binary classification.
- Implementation of K-Nearest Neighbour Algorithm using sci-kit learn.
- Classification using Decision tree.
- Construction of decision trees based on entropy.
- Implementation of Decision Trees for various datasets .
- Classification using Support Vector Machines.
- SVM for Binary classification
- Regulating different functional parameters of SVM using sci-kit learn.
- SVM for multi class classification.
- Implementation of SVM using various datasets .
- Implementation of Model Evaluation Metrics using sci-kit learn and various datasets.
- Basics of neural network and architecture: neurons, layers (input, hidden, output), weights, and biases.
- Common activation functions: Sigmoid, ReLU, Tanh. forward propagation, loss calculation, and backpropagation.
- Simple implementation examples using libraries like scikit-learn or TensorFlow.

UNIT IV: Unsupervised Learning

(08 Hrs)

- Defining clustering and its application in ML .
- Mathematical formulation of K-Means Clustering.
- Defining K value and its importance in K-Means Clustering.
- Finding appropriate K value using elbow technique for a particular problem.
- Implementation of K-Means clustering for various datasets

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Suggested Readings:

1. Géron, A. (2022). Hands-on machine learning with Scikit-Learn, Keras, and TensorFlow (3rd ed.).
2. Müller, A. C., & Guido, S. (2016). Introduction to machine learning with Python.
3. Raschka, S., & Mirjalili, V. (2019). Python machine learning (3rd ed.).
4. Bishop, C. M. (2006). Pattern recognition and machine learning.
5. Chollet, F. (2021). Deep learning with Python (2nd ed.).

OPTIMIZATION TECHNIQUE

Code: 26CS412

Max Marks: 70

Course Objectives: The course aims to enable students to use MATLAB to implement important optimization methods, learn efficient computational procedures to solve optimization problems, and cast engineering minima/maxima problems into an optimization framework.

UNIT I

(10 Hrs)

Introduction: Historical Development, Engineering applications of optimization, Statement of an optimization problem, Classification of optimization problems

Classical Optimization Techniques: Single variable optimization, Constrained and unconstrained multivariable optimization, Relevant applications

UNIT II

(10 Hrs)

Linear Programming: Standard form of a linear programming problem, Simplex method, Duality in linear programming, Quadratic programming, Stochastic linear programming, Relevant applications

Nonlinear Programming: Unimodal function, Interpolation methods, Direct and indirect methods, Relevant applications

UNIT III

(10 Hrs)

Geometric Programming: Unconstrained and constrained geometric programming problems, Geometric programming with mixed inequality constraints

Integer Programming: Integer linear programming, Integer nonlinear programming, Relevant applications

UNIT IV

(10 Hrs)

Game Theory: Introduction, Characteristics of Game Theory, Two-person, Zero-sum games, Pure strategy. Dominance theory

Genetic Algorithms: Introduction, Representation methods, Selection methods, Operators, Replacement methods, Relevant applications.

Suggested Readings:

1. Rao, S. S., & Rao, S. S., Engineering optimisation: theory and practice. John Wiley & Sons.
2. Hadley, G., Linear programming, Narosa Publishing House.
3. Taha, H. A., Operations research: An introduction. Pearson Education India.
4. Deb, K, Optimisation for engineering design: Algorithms and examples. PHI Learning Pvt. Ltd.
5. Kumar, D. N., Multi criterion analysis in engineering and management. PHI Learning Pvt. Ltd.

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.

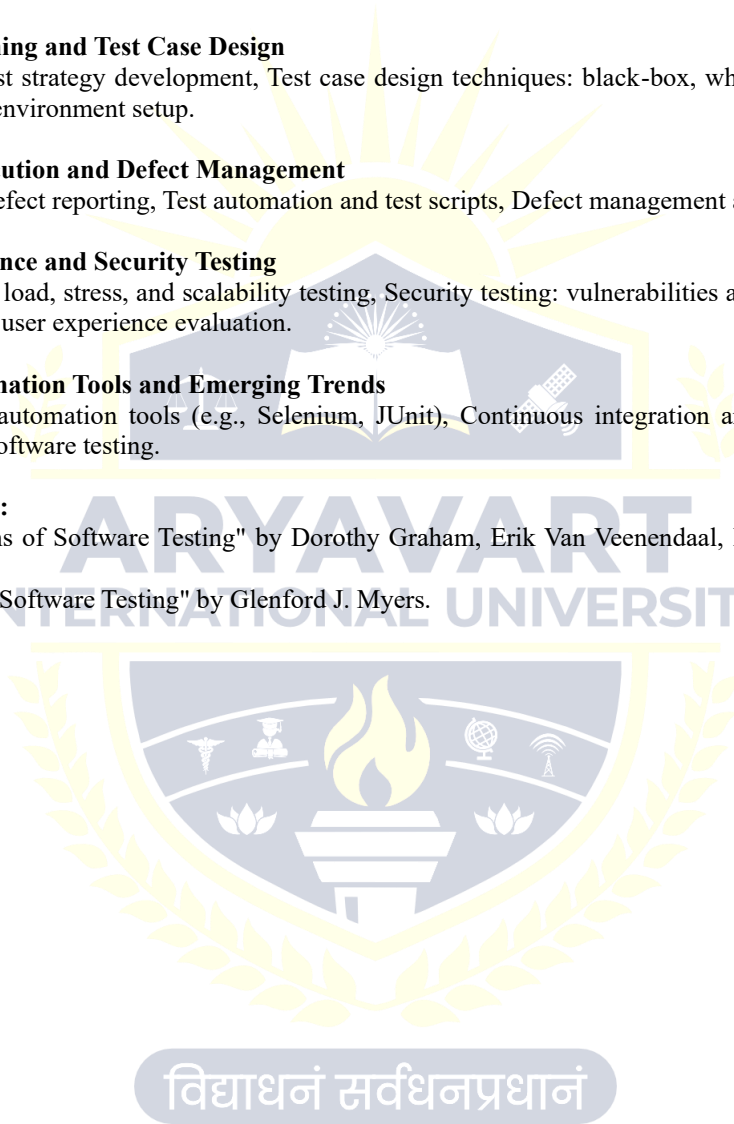
UNIT V: Test Automation Tools and Emerging Trends

(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.



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 India, 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.

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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.

MACHINE LEARNING USING PYTHON LAB

Code: 26CS492

Max. Marks: 70

Core Practicals:

1. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is the probability that a student is absent given that today is Friday? Apply Bayes' rule in Python to get the result. (Ans: 15%)
2. Extract the data from the database using Python
3. Implement k-nearest neighbours classification using Python
4. Implement linear regression using Python
5. Implement K-Means Clustering using Python
6. Implement Naive Bayes Theorem to Classify the English Text using Python
7. Implement an algorithm to demonstrate the significance of the Genetic Algorithm in Python
8. Implement an algorithm to demonstrate the Back Propagation Algorithm in Python
9. Implementing the FIND-S algorithm using Python
10. Implementing Candidate Elimination algorithm using Python.

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BCA-AIML

5th Semester

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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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 - Economics 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 Reading:

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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DISTRIBUTED COMPUTING

Code: 26CS512

Max Marks: 70

Course Objectives: The course will enable the students to understand the foundations of distributed systems, learn issues related to clock Synchronization and the need for global state in distributed systems, learn distributed mutual exclusion and deadlock detection algorithms, understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems, and learn the characteristics of peer-to-peer and distributed shared memory systems

UNIT I: A MODEL OF DISTRIBUTED COMPUTATIONS

(12 Hrs)

Definition, Relation to computer system components, Motivation, Relation to parallel systems, Message-passing systems versus shared memory systems, Primitives for distributed communication, Synchronous versus asynchronous executions, Design issues and challenges.

A model of distributed computations: A distributed program, A model of distributed executions, Models of communication networks, Global state, Cuts, Past and future cones of an event, Models of process communications.

Logical Time: A framework for a system of logical clocks, Scalar time, Vector time, Physical clock synchronisation: NTP.

UNIT II: MESSAGE ORDERING & SNAPSHOTS

(10 Hrs)

Global state and snapshot recording algorithms: Introduction, System model and definitions, Snapshot algorithms for FIFO channels, Snapshot algorithms for non-FIFO channels,

Message Ordering & Snapshots: Message ordering and group communication: Message ordering paradigms, Asynchronous execution with synchronous communication, Synchronous program order on an asynchronous system, Group communication, Causal order (CO), Total order.

UNIT III: DISTRIBUTED MUTEX & DEADLOCK

(08 Hrs)

Distributed Mutex & Deadlock: Distributed mutual algorithm, Introduction, Preliminaries, Lamport's Algorithm, Ricart-Agarwala Algorithm, Maekawa's Algorithm, Suzuki-Kasami's broadcast algorithm.

Deadlock detection in distributed systems: Introduction, System model, Preliminaries, Models of deadlocks, Knapp's classification, Algorithms for the single resource model, the AND model and OR model.

UNIT IV: RECOVERY & CONSENSUS

(06 Hrs)

Recovery & Consensus: Checkpointing and rollback recovery: Introduction, Background and definitions, Issues in failure recovery, Checkpoint-based recovery, Log-based rollback recovery, coordinated checkpointing algorithm, Algorithm for asynchronous checkpoint in grand recovery.

Consensus and agreement algorithms: Problem definition, Overview of results, Agreement in a failure, free system, Agreement in synchronous systems with failures.

UNIT V: PEER-TO-PEER COMPUTING AND OVERLAY GRAPHS

(04 Hrs)

Peer-to-peer computing and overlay graphs: Introduction, Data indexing and overlays, Chord, Content addressable networks, Tapestry.

Distributed shared memory: Abstraction and advantages, Memory consistency models, Shared memory Mutual Exclusion.

Suggested Readings:

1. Distributed computing: Principles, algorithms, and systems, Ajay Kshemkalyani and MukeshSinghal, Cambridge University Press, 2011.
2. Distributed Systems Concepts and Design, George Coulouris, Jean Dollimore and Tim Kindberg, Fifth Edition, Pearson Education, 2012.
3. Distributed Operating Systems: Concepts and Design, Pradeep K Sinha, Prentice Hall of India, 2007.
4. Advanced concepts in operating systems. MukeshSinghal and Niranjana G. Shivaratri, McGraw-Hill, 1994.
5. Java in Distributed Systems, Concurrency, Distribution and Persistence, Marko Boger, 2001.

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6. Distributed Systems: Principles and Paradigms, Tanenbaum A.S., Van Steen M., Pearson Education, 2007.
7. Kshemkalyani Ajay D, Mukesh Singhal, Distributed Computing: Principles, Algorithms and Systems, Cambridge Press, 2011
8. Mukesh Singhal, Niranjana G Shivaratri, Advanced Concepts in Operating systems, McGraw Hill Publishers, 1994.

DISASTER MANAGEMENT

Code: 26GN103

Max Marks: 70

Course Objective: The course aims to provide a basic conceptual understanding of disasters, to understand approaches to disaster management and to build skills to respond to disasters.

UNIT I: Definition and types of disaster (05 Hrs)

Hazards and Disasters, Risk and Vulnerability in Disasters, Natural and Man-made disasters, earthquakes, floods, drought, landslides, land subsidence, cyclones, volcanoes, tsunami, avalanches, global climate extremes. Man-made disasters: Terrorism, gas and radiation leaks, toxic waste disposal, oil spills, forest fires.

UNIT II: Study of Important Disasters (05 Hrs)

Earthquakes and their types, magnitude and intensity, seismic zones of India, major fault systems of India plate, flood types and their management, drought types and its management, landside and its managements case studies of disasters in Sikkim (e.g) Earthquakes, Landside). Social Economics and Environmental impact of disasters.

UNIT III: Mitigation and Management techniques of Disaster (05 Hrs)

Basic principles of disaster management, Disaster Management cycle, Disaster management policy, National and State Bodies for Disaster Management, Early Warning Systems, building design and construction in highly seismic zones, retrofitting of buildings.

UNIT IV: Training, awareness program and project on disaster management (05 Hrs)

Training and drills for disaster preparedness, Awareness generation program, usage of GIS and Remote sensing techniques in disaster management, Mini project on disaster risk assessment and preparedness for disasters with reference to disasters in Sikkim and its surrounding areas.

Suggested Readings:

1. Disaster Management Guidelines, GOI-UND Disaster Risk Program (2009-2012)
2. Damon, P. Copola, (2006) Introduction to International Disaster Management, Butterworth Heinemann.
3. Gupta A.K., Niar S.S and Chatterjee S. (2013) Disaster management and Risk Reduction, Role of Environmental Knowledge, Narosa Publishing House, Delhi.
4. Murthy D.B.N. (2012) Disaster Management, Deep and Deep Publication PVT. Ltd. New Delhi.
5. Modh S. (2010) Managing Natural Disasters, Macmillan Publishers India LTD.

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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, Ist Edition, 2013
2. Stephen Walther, Kevin Hoffman, Nate Dudek, "ASP.NET 4.0 Unleashed", Pearson Education, Ist 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, Ist Edition, 2012

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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.

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.

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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.

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.

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- (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 chunking 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.

Code: 26CS591

Max Marks: 70

AUTOMATA & COMPILER DESIGN LAB

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>
```

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<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
}
```

CLOUD COMPUTING LAB

Code: 26CS792

Max Marks: 70

List of Experiments:

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.

विद्याधनं सर्वधनप्रधानं

BCA-AIML

6th Semester

DETAILED SYLLABUS

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.

SOLVE BUSINESS PROBLEMS WITH AI

Code: 26CS603

Max Marks: 70

Course objectives: The course aims to understand the role of artificial intelligence and machine learning in business and decision-making, gain knowledge on AI-based governance, business analytics, and change management and explore challenges in AI adoption: cyber-security and analytics.

UNIT I (08 Hrs)

- Artificial intelligence and machine learning: Opportunities for digital business
- Data to decisions: Evolving interrelationships.

UNIT II (08 Hrs)

- Digital leadership: Strategies for AI adoption,
- Dynamicity in learning: Smart selection of learning techniques.

UNIT III (08 Hrs)

- Intelligent business processes with embedded analytics,
- Adopting data-driven culture: Leadership and change management for business optimisation.

UNIT IV (08 Hrs)

- Quality and risks: Assurance and control in BO,
- Cybersecurity in BO: Significance and challenges for digital business.

UNIT V (08 Hrs)

- Natural intelligence and social aspects of AI-based decisions,
- Case study: Investing in the future technology of self-driving vehicles.

Suggested Readings:

1. Bhuvan Unhelkar and Tad Gonsalves, "Artificial Intelligence for Business Optimization - Research and Applications", CRC Press, Taylor & Francis, 2021.
2. Paul Roetzer, "Marketing Artificial Intelligence – AI, Marketing, and the Future of Business", BenBella Books, Inc., 2022.
3. Sandeep Kumar Panda, Vaibhav Mishra, R. Balamurali and Ahmed A. Elngar, "Artificial Intelligence and Machine Learning in Business Management - Concepts, Challenges, and Case Studies", CRC Press, Taylor & Francis, 2022.

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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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DIGITAL MARKETING & SEO

Code: 26CS633

Max Marks: 70

Course Objectives: This course aims to familiarise students with the concept of digital marketing and its current and future evolutions. It further aims to equip students with the ability to understand and subsequently create strategic, targeted campaigns using digital media tools.

UNIT I (10 Hrs)

Fundamentals of Digital marketing & Its Significance, Traditional marketing Vs Digital Marketing, Evolution of Digital Marketing, Digital Marketing Landscape, Key Drivers, Digital Consumer & Communities, Gen Y & Netizen's expectation & influence w.r.t Digital Marketing.

The Digital users in India, Digital marketing Strategy- Consumer Decision journey, POEM Framework, Segmenting & Customising messages, Digital advertising Market in India, Skills in Digital Marketing, Digital marketing Plan.

UNIT II (10 Hrs)

Terminology used in Digital Marketing, PPC and online marketing through social media, Social Media Marketing, SEO techniques, Keyword advertising, Google webmaster and analytics overview, Affiliate Marketing, Email Marketing, Mobile Marketing

Display advertising, Buying Models, different types of ad tools, Display advertising terminology, types of display ads, different ad formats, Ad placement techniques, Important ad terminology, Programmatic Digital Advertising.

UNIT III (10 Hrs)

Introduction to SEO, How Search engines work, SEO Phases, History of SEO, How SEO Works, What is Googlebot (Google Crawler), Types of SEO techniques, Keywords, Keyword Planner tools

On-page Optimisation, Technical Elements, HTML tags, Schema.org, RSS Feeds, Microsites, Yoast SEO Plug-in

UNIT IV (10 Hrs)

Off-page Optimisation- About off-page optimisation, Authority & hubs, Backlinks, Blog Posts, Press Release, Forums, Unnatural links.

Social media Reach- Video Creation & Submission, Maintenance- SEO tactics, Google search Engine, Other Suggested tools

Suggested Readings:

1. Digital Marketing –Kamat and Kamat-Himalaya
2. Marketing Strategies for Engaging the Digital Generation, D. Ryan,
3. Digital Marketing, V. Ahuja, Oxford University Press
4. Digital Marketing, S.Gupta, McGraw-Hill
5. Quick Win Digital Marketing, H. Annmarie, A. Joanna, Paperback edition

DIGITAL MARKETING & SEO LAB

Code: 26CS696

Max Marks: 70

List of Experiments:

1. Digital Marketing Implementation in Business Scenario
2. Create the Digital Marketing Webpage
3. Conducting the Search Engine Optimization and Search Engine Marketing
4. Using Google Analytics to analyze website performance
5. Creating Promotional banner through Canva
6. Facebook Promotion using banners
7. Creating YouTube Channel for Marketing
8. Twitter Marketing
9. Instagram Marketing
10. Email Marketing Additional
11. Digital Marketing Final Analysis and Report

SOFTWARE PROJECT MANAGEMENT

Code: 26CS634

Max Marks: 70

Course Objectives: The course provides an in-depth examination of project management principles and modern software project management practices. The five process groups and nine knowledge areas are examined in the context of the systems development lifecycle. Methods for managing and optimizing the software development process are discussed along with techniques for performing each phase of the systems development lifecycle. Portfolio management and the use and application of software project management tools are also discussed.

UNIT I: SYSTEM ANALYSIS & DESIGN (08 Hrs)

Overview of system analysis & Design: Introduction to different methodologies & structured system analysis – Details of SDLC approach – mini cases – E.R. diagrams – DFD concepts – Data dictionary concepts. Structure charts – modular programming – I/O & file design consideration – Entity Life histories (ELH).

UNIT II: SYSTEM IMPLEMENTATION (08 Hrs)

System implementation & maintenance: Implementation Strategies – SW / HW selection & procurement – Control & security – issues of designing & implementing on-line systems – data communication requirements – system conservation approaches & selection issues.

UNIT III: PROJECT DEVELOPMENT & DATABASE DESIGN (08 Hrs)

Introduction to Database technologies & CASE tools with specific packages – overview of relational model – Database creation – SQL command – Normalization – designing forms & reports – using CASE tools for system analysis & design-case studies – Cost / benefit analysis – project & resource planning – design & development testing & documentation.

UNIT IV: SOFTWARE PROJECT MANAGEMENT (08 Hrs)

Software project management: challenges & opportunities – changing technologies & approaches – choice development of methodologies & technical platforms, project management techniques – monitoring & measurement of progress.

UNIT V: SOFTWARE PROJECT MANAGEMENT (08 Hrs)

Software project management – elements, cost estimation, manpower planning, Software & Product Metrics – Quality assurance & control – standards & documentation – testing – implementation – training – technology management – quality standards – certificate – handling multiple projects, issues of share development.

Text Books:

1. Software Engineering Principles and practice by Waman S. Jawadekar Tata McGraw Hill Co. – Chennai.
2. For Unit I Database Management systems Alexis Leon & Mathews Leon, Vikas Publishing House PVT Ltd.
3. Software Project Management by S.A. Kelkar, PHI learning India PVT Ltd
4. Software project management (2 volumes set) by Prof. SN. Singh and SL. Gupta – Global India publications PVT Ltd., New Delhi.

विद्याधनं सर्वधनप्रधानं

MINOR PROJECT

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 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 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.

The following suggested guidelines must be followed in preparing the Minor 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 - 3.0cms
- 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

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 fulfilment of the degree of BCA-AIML 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
BCA-AIML
(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 BCA-AIML 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 recognizes his indebtedness for guidance and assistance of the thesis adviser and other members of the faculty. Courtesy demands that he also recognize specific contributions by other persons or institutions such as libraries and research foundations. Acknowledgements should be expressed simply, tastefully, and tactfully.

विद्याधनं सर्वधनप्रधानं

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.

SOLVE BUSINESS PROBLEMS WITH AI LAB

Code: 26CS695

Max Marks: 70

List of Practicals:

1. Marketer to Machine: Develop an ML model for Smart email Compose. Smart email compose finishes sentences for you by predicting what word or words the user will type next.
2. Marketer to Machine: Develop a level-2 Marketer-to-Machine (M2M) Scale of intelligent automation to personalise business email based on user preferences and interests (Extension to Exp. No.1).
3. AI and Marketing: Develop data-driven content for a given business organisation (website). Optimize Website content for search engines. Send emails to customers with personalised content/activity.
4. AI and Marketing: Develop a system to recommend highly targeted content to users of the website (Extension to Exp. No 3).
5. AI and Advertisement: Develop AI-powered programmatic advertising by using cookies and collecting user data.
6. AI and Analytics: Create an analytics dashboard. Integrate Google Analytics with the dashboard. Use an AI tool (Open) to draw from the existing data to make predictions.
7. Public relations, communications, and AI: Design presentations with smart templates using open-source AI-driven presentation tools (Open).
8. Use AI-powered design tools (Open) to create branding for collateral.
9. Content Marketing and AI: Demonstrate content development using an AI-powered language platform.
10. Customer Service and AI: Demonstrate intelligent product searches and discoveries possible across text, voice, and visual searches on e-commerce websites using AI tools.

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BCA-AIML

7th Semester

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 (2^n) - 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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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. Madiseti, "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

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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.

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.

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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.

COMPUTER VISION LAB

Code: 26CS795

Max Marks: 70

List of Experiments:

1. Image Loading, Exploring and Displaying an Image.
2. Access and Manipulation of Image Pixels.
3. Image Transformations.
 - i) Resizing
 - ii) Rotation
4. Addition operation of Two Images.
5. Image filtering operations
 - i) Mean Filtering
 - ii) Gaussian Filtering
6. Image Binarisation Using Simple Thresholding Method.
7. Edge Detection operation using Sobel and Scharr Gradients.
8. Find Grayscale and RGB Histograms of an Image.
9. Segment an Image using K-means Clustering algorithm.
10. Write a program to classify an Image using KNN Classification algorithm.

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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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DATA WAREHOUSING & MINING LAB

Code: 26CS796

Max Marks: 70

List of Practical:

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.

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.

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INTERNET OF THINGS LAB

Code: 26CS793

Max Marks: 70

List of Practicals:

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.

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BCA-AIML

8th Semester

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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MOBILE APPLICATION DEVELOPMENT

Code: 26CS803

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, RecyclerView, 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

(08 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

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.

MOBILE APPLICATION DEVELOPMENT LAB

Code: 26CS893

Max Marks: 70

List of Experiments:

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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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.

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 eighth 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?

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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.

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

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- 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

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 BCA-AIML to the “.....” through done by Mr./Ms. Enrollment No. 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 fulfillment of the requirements for the
award of the degree of BCA-AIML (Bookman Old Style,
16points, centre)

Submitted to:

(Guide Name)

Submitted by:

(Student's name)

Enrolment No.:

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 fulfillment of the requirements for the award of the degree of BCA-AIML under the guidance of

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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.



BCA-AIML

7th Semester

(Research)

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 (2^n) - 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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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.

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.

RESEARCH PROJECT/DISSERTATION

Code: 26PR106

Max Marks: 70

PROJECT REPORT

All the students are required to submit a report based on the project work done by them during the seventh 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 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 being 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 requirement of the 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 limitations of the proposed system with respect to a larger and more 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.

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.

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Normal Body Text: Font Size: 12, Times New Roman, Double Spacing, justified 6 points above and below paragraph 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 for testing
 - e. Test Report, Printout of the Report & Code Sheet
- VI. Coding and Screenshots of the project
- VII. Conclusion and Future Scope
- VIII. References

Formats of various certificates and formatting styles are as:

1. Certificate from the Guide

CERTIFICATE

This is to certify that this project entitled “.....” was submitted in partial fulfilment of the degree of Bachelor of Computer Applications-AIML to the “.....” through done by Mr./Ms. Enrollment No. 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 the 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
Bachelor of Computer Applications- AIML (Bookman Old Style, 16points, centre)**

Submitted to:
(Guide Name)

Submitted by:
(Student's name)
Enrolment No.:

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 Bachelor of Computer Applications - AIML 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

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BCA-AIML

8th Semester

(Research)

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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MOBILE APPLICATION DEVELOPMENT

Code: 26CS803

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, RecyclerView, 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

(08 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

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.

MOBILE APPLICATION DEVELOPMENT LAB

Code: 26CS893

Max Marks: 70

List of Experiments:

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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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.

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 eighth semester.

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- V. Main Report
 - i. Objective & Scope of the Project

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- 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
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 - 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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1. Certificate from the Guide

CERTIFICATE

This is to certify that this project entitled “.....” submitted in partial fulfillment of the degree of BCA-AIML to the “.....” through done by Mr./Ms. Enrollment No. 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 BCA-AIML (Bookman Old Style,
16points, centre)

Submitted to:
(Guide Name)

Submitted by:
(Student's name)

Enrolment No.:

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 BCA-AIML under the guidance of

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Tilthai, Dharmanagar, North Tripura

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Name of the Student

Enrollment No.

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