

Kalinga University Atal Nagar (C.G.)



SCHEME OF EXAMINATION & SYLLABUS



**KALINGA
UNIVERSITY**
of

Bachelor of Computer Applications (BCA)

(Artificial Intelligence & Machine Learning)

UNDER

Faculty of Information Technology

w.e.f. Session 2023-24



KALINGA UNIVERSITY

**Kalinga University,
Naya Raipur, Chhattisgarh
Bachelor of Computer Applications
(W.e.f. 2023 – 2024)**

| Semester – I | | | | | |
|---------------------|---|---------------|-----------------|-----------------|--------------|
| Subject Code | Subject Name | Credit | Internal | External | Total |
| BCAAIML101 | Problem Solving Using Programming | 3 | 30 | 70 | 100 |
| BCAAIML102 | Computer Fundamentals | 3 | 30 | 70 | 100 |
| BCAAIML103 | Introduction to Artificial Intelligence | 2 | 30 | 70 | 100 |
| BCAAIML104 | Mathematics – I | 3 | 30 | 70 | 100 |
| BCAAIML105 | English – I | 3 | 30 | 70 | 100 |
| BCAAIML106 | Environmental Science | 2 | 30 | 70 | 100 |
| BCAAIML107 | Health and Wellness | 2 | 30 | 70 | 100 |
| BCAAIML108P | Coding and Computational Thinking – I Lab | 2 | 20 | 30 | 50 |
| BCAAIML109P | Problem Solving Using Programming Lab | 2 | 20 | 30 | 50 |
| Total | | 22 | 250 | 550 | 800 |

| Semester – II | | | | | |
|----------------------|---|---------------|-----------------|-----------------|--------------|
| Subject Code | Subject Name | Credit | Internal | External | Total |
| BCAAIML201 | Data Structures and Algorithms | 3 | 30 | 70 | 100 |
| BCAAIML202 | Database Management Systems | 2 | 30 | 70 | 100 |
| BCAAIML203 | Operating Systems | 2 | 30 | 70 | 100 |
| BCAAIML204 | Knowledge Representation and Reasoning | 2 | 30 | 70 | 100 |
| BCAAIML205 | Maths II | 3 | 30 | 70 | 100 |
| BCAAIML206 | English – II | 3 | 30 | 70 | 100 |
| BCAAIML207 | Understanding India | 2 | 30 | 70 | 100 |
| BCAAIML208P | Coding and Computational Thinking – II- Lab | 2 | 20 | 30 | 50 |
| BCAAIML209P | Data Structures and Algorithms-Lab | 1 | 20 | 30 | 50 |
| BCAAIML210P | Database Management System (DBMS) Lab | 1 | 20 | 30 | 50 |
| BCAAIML211P | Operating System – Lab | 1 | 20 | 30 | 50 |
| Total | | 22 | 290 | 610 | 900 |

* Student has to undergo for Internship Assessment completion of 2nd Semester which is to be evaluated in 3rd Semester

| Semester – III | | | | | |
|-----------------------|---|---------------|-----------------|-----------------|--------------|
| Subject Code | Subject Name | Credit | Internal | External | Total |
| BCAAIML301 | Object Oriented Programming with Java | 3 | 30 | 70 | 100 |
| BCAAIML302 | Python Programming | 3 | 30 | 70 | 100 |
| BCAAIML303 | Probability and Statistics | 4 | 30 | 70 | 100 |
| BCAAIML304 | Web Technologies | 3 | 30 | 70 | 100 |
| BCAAIML305 | Employability Skills Programme - I | 2 | 30 | 70 | 100 |
| BCAAIML306P | Coding and Computational Thinking – III-Lab | 2 | 20 | 30 | 50 |
| BCAAIML307P | Object Oriented Programming with Java Lab | 2 | 20 | 30 | 50 |
| BCAAIML308P | Python Programming Lab | 1 | 20 | 30 | 50 |
| BCAAIML309P | Web Technologies Lab | 1 | 20 | 30 | 50 |
| | | 21 | 230 | 470 | 700 |

| Semester – IV | | | | | |
|----------------------|--|---------------|-----------------|-----------------|--------------|
| Subject Code | Subject Name | Credit | Internal | External | Total |
| BCAAIML401 | Computer Networks | 3 | 30 | 70 | 100 |
| BCAAIML402 | Inferential Statistics | 3 | 30 | 70 | 100 |
| BCAAIML403 | Digital Image Processing | 3 | 30 | 70 | 100 |
| BCAAIML404 | Machine Learning | 4 | 30 | 70 | 100 |
| BCAAIML405P | Coding and Computational Thinking – IV Lab | 2 | 20 | 30 | 50 |
| BCAAIML406 | Foreign Language | 2 | 30 | 70 | 100 |
| BCAAIML407 | Employability Skills Programme – II | 2 | 30 | 70 | 100 |
| BCAAIML408P | Computer Networks Lab | 1 | 20 | 30 | 50 |
| BCAAIML409P | Digital Image Processing Lab | 1 | 20 | 30 | 50 |
| BCAAIML410P | Machine Learning Lab | 1 | 20 | 30 | 50 |
| Total | | 23 | 260 | 540 | 800 |

* Student has to undergo for Internship Assessment completion of 4th Semester which is to be evaluated in 5th Semester

| Semester – V | | | | | |
|---------------------|-------------------------------------|---------------|-----------------|-----------------|--------------|
| Subject Code | Subject Name | Credit | Internal | External | Total |
| BCAAIML501 | Time Series Analysis | 4 | 30 | 70 | 100 |
| BCAAIML502 | Advanced Machine Learning | 4 | 30 | 70 | 100 |
| BCAAIML503 | Artificial Neural Network | 3 | 30 | 70 | 100 |
| BCAAIML504 | Employability Enhancement Programme | 2 | 30 | 70 | 100 |
| BCAAIML505 | Speech Processing | 3 | 30 | 70 | 100 |
| BCAAIML506P | Time Series Analysis Lab | 1 | 20 | 30 | 50 |
| BCAAIML507P | Advanced Machine Learning Lab | 2 | 20 | 30 | 50 |
| BCAAIML508P | Artificial Neural Network Lab | 2 | 20 | 30 | 50 |
| BCAAIML509 | Speech Processing | 2 | 20 | 30 | 50 |
| | | 23 | 230 | 470 | 700 |

| Semester – VI | | | | | |
|----------------------|---------------------------------|---------------|-----------------|-----------------|--------------|
| Subject Code | Subject Name | Credit | Internal | External | Total |
| BCAAIML601 | Software Engineering | 4 | 30 | 70 | 100 |
| BCAAIML602 | Natural Language Processing | 3 | 30 | 70 | 100 |
| BCAAIML603P | Project | 12 | 150 | 200 | 350 |
| BCAAIML604P | Natural Language Processing Lab | 2 | 20 | 30 | 50 |
| Total | | 21 | 230 | 370 | 600 |

| Semester – VII | | | | | |
|-----------------------|---|---------------|-----------------|-----------------|--------------|
| Subject Code | Subject Name | Credit | Internal | External | Total |
| BCAAIML701 | Big Data Analytics | 4 | 30 | 70 | 100 |
| BCAAIML702 | Computer Vision | 4 | 30 | 70 | 100 |
| BCAAIML703 | Numerical Methods and Optimization Techniques | 3 | 30 | 70 | 100 |
| BCAAIML704 | Deep Learning | 3 | 30 | 70 | 100 |
| BCAAIML705A | Recommender Systems | 3 | 30 | 70 | 100 |
| BCAAIML705B | Expert systems | 3 | 30 | 70 | 100 |
| BCAAIML706P | Big Data Analytics Lab | 1 | 20 | 30 | 50 |
| BCAAIML707P | Computer Vision Lab | 2 | 20 | 30 | 50 |
| BCAAIML708P | Deep Learning Lab | 2 | 20 | 30 | 50 |
| Total | | 22 | 210 | 440 | 650 |

| Semester – VIII | | | | | |
|------------------------|------------------------------------|---------------|-----------------|-----------------|--------------|
| Subject Code | Subject Name | Credit | Internal | External | Total |
| BCAAIML801 | Reinforcement Learning | 3 | 30 | 70 | 100 |
| BCAAIML802A | Chatbot Development | 3 | 30 | 70 | 100 |
| BCAAIML802B | Intelligent Process Automation | 3 | 30 | 70 | 100 |
| BCAAIML803P | Project | 12 | 150 | 200 | 350 |
| BCAAIML804P | Reinforcement Learning Lab | 2 | 20 | 30 | 50 |
| BCAAIML805A(P) | Chatbot Development Lab | 2 | 20 | 30 | 50 |
| BCAAIML805B(P) | Intelligent Process Automation Lab | 2 | 20 | 30 | 50 |
| Total | | 22 | 250 | 400 | 650 |



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SEMESTER – I

Problem Solving Using Programming

Course Objectives:

- Understand the basic architecture of a computer and the basic structure of a C program.
- Illustrate different data types, decision control and looping statements.
- Explore functions and arrays.
- Introduce strings and pointers concepts.
- Implement file handling, structures, unions and enumerated data types.

Course Outcomes:

- Describe the basic architecture and functionalities of a Computer.
- Implement programming constructs of C language to solve the real-world problems.
- Understand different user-defined data structures like arrays, structures and pointers in implementing solutions to problems.
- Implement strings and pointers.
- Apply structured programming constructs such as functions and procedures to different problems.

UNIT-I Introduction to Programming and C

9 Hours

Introduction to computers- input and output devices, Introduction to computer-based problem solving, Program design and implementation issues- Flowcharts & Algorithms, Top down design & stepwise refinement, Programming environment –Assemblers, Compilers, Interpreters. Introduction to C, Structure of a C program, pre-processor directives , Compiling and executing C programs.

UNIT- II Data Types, Decision Control and Looping Statements

9 Hours

Data Types: Input/output statements in C Constants, Variables, scope of variables, Operators & Expressions, Type conversion, type casting, Decision control- if, if-then-else, nested if, nested else, Looping statements- while, Do-While, for; switch. Break continue and goto statements. Type modifiers and storage class specifiers for data types.

UNIT- III Functions and Arrays

9 Hours

Functions: Introduction to functions, function definition, function declaration, function call, return statement, passing parameters to functions: Call by Value , Call by reference, , recursive functions.

Arrays: Declaration of arrays, accessing the elements of an array, storing values in arrays, Operations on arrays, Passing arrays to functions, two dimensional arrays, operations on two-dimensional arrays, multidimensional arrays, applications of arrays.

UNIT- IV Strings and Pointers

9 Hours

Strings: Introduction, string taxonomy, operations on strings, Miscellaneous string and character functions, arrays of strings.

Pointers- The & and * operator, pointer expression, initializing pointers ,malloc vs calloc, array of pointers, pointers to pointers, pointers to functions, function returning pointers.

UNIT- V Files, Structures, Unions and Enumerated data types.

9 Hours

File Handling – Files: Introduction to files, using files in C, reading and writing data files, Detecting end of file .The file pointer, file accessing functions, fopen, fclose, putc, getc, fprintf. Structure, Union, and Enumerated Data Type: Introduction, structures and functions, Unions, unions inside structures, Enumerated data type.

Text Books:

1. The 'C Complete Reference by Herbert Schildt - 4th edition ,McGraw Hill Education , July 2017.
2. "C Programming: The Complete Guide for Beginners to Master C Programming Step by Step" by Byron Francis, published by Independently published in 2021.
3. "C Programming: The Complete Guide for Beginners to Master C Programming Step by Step" by Byron Francis, published by Independently published in 2021.

References:

1. Programming in ANSI C by Balaguruswamy, 3rd Edition, 2005, Tata McGraw Hill.
2. Let us C by Yashwant Kanetkar, 6th Edition, PBP Publication
3. The C programming Language by Richie and Kenninghan, 2004, BPB Publication

Computer Fundamentals

Course Objectives:

Computer fundamentals form an essential component for a better understanding of higher concepts. It's vital to know the computer's working process, how the computer stores the data and interprets the information and converts it into machine-understandable form for processing, and later renders the output back in a human-readable format.

Course Outcomes:

- Learn the number systems and fundamentals of logic gates.
- Simplify Boolean expressions and use data processing circuits.
- Understand working of Arithmetic Logic Unit.
- Apply different addressing modes.
- Interpret Input/Output Organization, interrupts and memory system.

UNIT – I

Number Systems and Logic Gates and Combining Logic Gates:

9 Hours

Number Systems: decimal system; Binary; Octal and Hexadecimal number systems, Place Value, number conversion, Binary Coded Decimal

Logic Gates : The AND Gate; The OR Gate; The Inverter and Buffer; The NAND Gate; The NOR Gate; The Exclusive OR Gate; The Exclusive NOR Gates; The NAND and NOR Gate as an Universal Gate; Gates with more than Two Inputs.

Combining Logic Gates : Constructing Circuits from: Boolean Expression, Drawing a Circuit from a Maxterm and Minterm Boolean Expression; Truth Tables and Boolean Expressions;, Boolean postulates, Demorgan's theorem.

UNIT - II

Simplification of Boolean Expression:

9 Hours

Simplifying Boolean Expression using boolean postulates; Karnaugh Maps with Two, Three, Four, Five Variables, Don't care condition; Tabulation method.

Data Processing Circuits: Multiplexers, Demultiplexers, Decoders of 16 Decoder, BCD to Decimal Decoders, Seven Segment Decoders, Encoders, Parity Generators and Checkers, Magnitude Comparator.

UNIT - III

Arithmetic Circuits and Arithmetic Unit:

9 Hours

Binary Addition; Half Adders; Full Adders; Three Bit Adders; Binary Subtraction; Parallel Subtractors; 2's Complement Notation; Addition & Subtraction of Signed Numbers; 2's Complement Adders/Subtractor.; Design of Fast Adders.

Binary Multiplication; Multiplication of Positive Numbers; Binary Multipliers; Signed-Operand Multiplication; Fast Multiplication; Integer Division; Floating-Point Numbers & Operations.

UNIT - IV

Machine Instruction and Programs:

9 Hours

Basic operational concepts, Memory Location and Addresses, Memory Operations; Instructions & Instruction Sequencing; Addressing Modes, Stacks and Queues, Subroutines, Subroutine nesting and processor stack, parameter passing

UNIT - V

Input / Output Organization :

9 Hours

Input / Output Organization: Accessing I/O Devices, Interrupts, Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Controlling Device Requests, Buses, Direct Memory Access.

Memory Systems : Memory System: Some Basics Concepts; Semiconductor RAM Memories; Read-Only Memories; Cache Memories - Mapping Functions

Text Books:

1. Roger L Tokheim : Digital Electronics Principles and Applications, Sixth Edition, McGraw Hill, 2004
2. M Morris Mano, "Digital Logic and Computer Design", 10th Edition, Pearson, 2008
3. Carl Hamacher, Z Varnesic and S Zaky : Computer Organization, Fifth Edition, McGraw Hill, 2002

Reference:

1. Stephen Brown, Zvonko Vranesic, "Fundamentals of Digital Logic Design with VHDL", 2nd Edition, Tata McGraw Hill, 2005.
2. Donald P Leach, Albert Paul Malvino & Goutam Saha, "Digital Principles".
3. Computer Organization and Architecture Books Collection Free Download – Learnengineering.in

Introduction to Artificial Intelligence

Course Objectives:

- Know about the basic building block of Artificial Intelligence.
- Explain the concept of machine thinking.
- Describe the evolution of AI and modern concepts and programming platforms for AI.

Course Outcomes:

- Discuss about the basic principle of AI.
- Analyse the concept of machine thinking.
- Understanding the modern concept in AI..

UNIT – I

10 hours

Introduction to Artificial Intelligence (AI):

What is Artificial Intelligence (AI)? Brief history of AI. Intelligence and artificial intelligence. Elements of Intelligence – Reasoning, Learning, Problem Solving, Perception, Linguistic Intelligence. Coming together of cognition, philosophy, math, linguistics, control theory and computer science. Introduction to agent-Agent performance –Example of Agents- Agent Faculties

UNIT - 2:

10 hours

Philosophy of AI

Can machine think?: ‘Turning and testing-The Chinese room. Computation and representation-Applications eras of AI-Computationalism-Ethics of AI-Impacts of AI, Limitations and possibilities of AI, Concerns about AI, AI and the future.

UNIT - 3:

10 hours

Intelligent System

What is intelligence? Structure of intelligent system-Biological brain -Basic neural model-Intelligent Agents- Rationality- Agent Environment- Agent architectures-the concept of rationality-The structure of agent-The impact of AI in human labor-AI and the social equality.

Text Books:

1. “Artificial Intelligence A Modern Approach”, by Stuart J. Russell and Peter Norvig, Second Edition, Pearson Education, Inc., Upper Saddle River; New Jersey 07458.
2. “Artificial Intelligence: The Basics”, by Kevin Warwick, Professor of Cybernetics Kevin, first published 2012 by Routledge.
3. “Artificial intelligence A systems approach”, by M. Tim Jones, INFINITY SCIENCE PRESS LLC, 2008.

Reference Books:

1. “Artificial Intelligence: Foundations of Computational Agents”, by D. Poole, Cambridge University Press, 2010.
2. “Artificial Intelligence and Intelligent Systems”, by Padhy N.P, 4th impression, Oxford University Press, 2007.
3. “Super Intelligence Paths, Dangers and Strategies”, by Nick Bostrom, Oxford University Press.

Mathematics-I

Course Objectives:

To identify the concepts of Mathematical maturity and ability to deal with abstraction and to introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.

Course Outcomes:

- Understand the basic concepts of Linear Equations and linear dependence.
- Solve the functions using Taylor's Series and Maclaurin's Series expansion
- Apply the concept of differential equations and how such equations are used in modelling.
- Apply the concepts of partial differentiation like maxima and minima for two and several variables, Jacobians and their applications.

Unit-1

Matrices

9 Hours

Characteristic equation of a matrix, Eigen values and Eigen vectors, Properties of Eigen values, Diagonalization of matrix, Cayley-Hamilton Theorem (without proof) verification, Finding Inverse and Power of a matrix using it.

Unit-2

Set theory and Relations

9 Hours

Introduction theorems on sets, sets and elements, Venn diagrams, set operations, algebra of sets, duality, classes of sets, power sets, real vector spaces and subspaces null spaces, dimension of vector spaces, column spaces, geometrical vectors in a plane, vectors in a Cartesian plane, scalar multiplications, Euclidean inner product of two vectors, application of dot and scalar multiplications, vectors in three dimensional spaces, cross product in three dimension, relations and its properties, order relations, Hasse diagrams.

Unit 3

Functions and Algorithms

9 hours

Introduction to functions and algorithms, functions and types of functions, interjections and surjections, bijections and inverse functions, One-to-One, Onto, invertible functions, mathematical, exponential and logarithmic functions, sequences and indexed classes of sets, recursively defined functions, cardinality, data base: functional dependence and normal forms, algorithms and functions, complexity of algorithms.

Unit 4

Descriptive Statistics

9 hours

Data and Data Sources, Types of Data, Measures of Central Tendency – Mean, median mode for raw and grouped data, measures of dispersion – Range, standard deviation, variance, coefficient of variation, mean deviation, mean absolute deviation, measures of symmetry: Skewness and Kurtosis.

Unit 5

Elements of Probability and Sampling Distributions

9 Hours

Experiments and events, Basic Relations of Probability, Conditional Probability, Joint Probability, conditional probability on discrete case and continuous case, computing expectations by conditioning, introduction to Bayes theorem, problems related to Bayes Theorem, Discrete Probability Distribution (Binomial and Poisson), Continuous Probability Distribution (Normal). Various types of Probability and Non-probability Sampling, Sampling distribution of important statistic.

Text Books:

1. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication).
2. M K Venkataraman, Engineering mathematics, Volume I, 2nd ed., National Publishing Co. 2003

Reference Books:

1. Greenberg, M.D. Advanced Engineering Mathematics, Second Edition, Pearson Education Inc. (First Indian reprint), 2002
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).
3. T Veerarajan, Engg Mathematics McGraw-Hill Education (India) Pvt Limited, 2007
4. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education)

English-I

Course Objectives:

The course focuses on familiarizing the students with the English language's basics and its grammar.

Course Outcomes:

- Develop one's ability to use English Language in day-to-day and real-life situations
- Interpret isolated vocabulary words and phrases in familiar contexts
- Express ideas through written, oral and visual communication
- Compose meaningful sentences and paragraphs as a prominent life-long skill
- Demonstrate excellent reading and comprehension skills

Unit 1: **Everyday conversations**

9 Hours

- Introducing self/others
- Weather
- Classroom
- Asking about facilities around
- Asking for help, suggestions, ideas, directions and advice
- Describing a person/thing

Points to cover: Vocabulary, grammar, Construction of sentences, listening.

Unit 2: **Meeting people, expressing, and talking about**

9 Hours

- Greetings, Starting the Conversation, Small Talks, Closing the Conversation
 - Happiness/Displeasure, Preference, Doubts, Views.
 - Interests, Different Cultures, Clothes, Cars, Institutes, Situations, Schedules, Prices
- Points to cover: Vocabulary, grammar, Construction of sentences, listening.

Unit 3: **Comprehension**

9 Hours

- Comprehension passage 1
- Comprehension passage 2
- Comprehension passage 3
- Comprehension passage 4
- Comprehension passage 5

Points to cover: Vocabulary, grammar, Construction of sentences.

Unit 4: **Short Paragraph Writing**

9 Hours

- Punctuality
- Nutrition
- Exercise
- Global Warming
- Disciple Inflation
- Demonetization

Points to cover: Vocabulary, grammar, Construction of sentences.

Unit 5: **Review Writing**

9 Hours

- Topic 1 – Book [can be a story review for average students]
- Topic 2 - Movie review [different kinds of movies can be suggested too for practice]
- Topic 3 – Another Movie review
- Topic 4 – Hotel / Café / Recreations Centre Review
- Topic 5 – Electronic Gadget Review (Laptop/smartphone / speakers/ PSP/ etc.)
- What is a review? How to write a review? Different types of reviews.
- Writing for social media: Facebook, Inked-in
- Points to remember while writing on social media. How to write a profile summary.
- What is a blog? How to write a blog?

Points to cover: Vocabulary, grammar, Construction of sentences.

Reference:

- Speak Now Level I & II, Oxford Press
- Business Benchmark, Level – Upper Intermediate by Cambridge University Press.
- Practical English Usage by Michel Swan, Oxford University Press
- Cambridge Grammar for English: A comprehensive Guide for spoken & written English (South Asian edition),
Cambridge University Press.
- How English Works by Michael Swan & Catherine Walter, Oxford University.



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Environmental Science

Course Objectives:

- To make students realize the importance and their role in the protection and maintenance of a healthy environment for sustainable development.
- To enable students to grasp the significance and issues related to ecosystems, biodiversity and natural resources, and ways of managing/ protecting them.
- To enable students to have a nuanced understanding of environmental pollution, solid waste management and climate change and to act with concern on environmental issues.
- To make students aware of the environmental policies and movements, and the role of individuals and communities in environmental protection for educating and inspiring the young minds.

Course Outcome:

- Describe the main environmental issues, their causes, and their impacts on ecosystems and human well-being.
- Explain the interrelationships between ecosystems, biodiversity, and environmental health.
- Apply critical thinking skills to analyze environmental problems and propose potential solutions.
- Analyze the causes and consequences of climate change and global warming.
- Evaluate the ethical and social implications of environmental decisions and actions.

Unit I: Introduction to Environmental Science

9 Hours

Definition and scope of environmental science: The importance of interdisciplinary approaches, Overview of key environmental issues and their impact on ecosystems and human well-being

Ecosystems and Biodiversity: Understanding ecosystems: structure, function, and services, Biodiversity and its significance; Threats to biodiversity: habitat loss, invasive species, pollution, and climate change, Conservation strategies and initiatives

Unit II: Environmental Pollution

9 Hours

Types and sources of environmental pollution (air, water, soil, noise, and light), Impacts of pollution on ecosystems and human health, Pollution prevention and mitigation strategies, Environmental policies and regulations

Climate Change and Global Warming: Causes and consequences of climate change, Greenhouse gases and their effects, Mitigation and adaptation strategies, international agreements and efforts to combat climate change

Unit III: Sustainability and Social Responsibility

7 Hours

Understanding natural resources: renewable and non-renewable resources, Resource depletion and overexploitation, Sustainable management of resources: conservation, recycling, and sustainable agriculture, Sustainable development principles and practices

Environmental Ethics and Social Responsibility: Ethics and Values in environmental decision-making, Environmental justice and equity issues, Individual and collective responsibility for environmental stewardship, Promoting sustainable lifestyles

Unit IV: Environmental Impact Assessment and Advocacy

5 Hours

Introduction to environmental impact assessment (EIA): process and methods; Evaluating and mitigating environmental impacts of development projects, Case studies of successful and unsuccessful EIA processes

Environmental Education and Advocacy: Importance of environmental education for raising awareness and fostering action, Strategies for effective environmental communication, Engaging in environmental advocacy and community initiatives, Reflection and action planning for personal environmental commitments

Reference Material

1. Wright, R. T., & Boorse, D. F. (2021). Environmental Science: Toward a Sustainable Future.
2. Carson, R. (2002). Silent Spring.
3. Kolbert, E. (2015). The Sixth Extinction: An Unnatural History.
4. McDonough, W., & Braungart, M. (2002). Cradle to Cradle: Remaking the Way We Make Things.

Health and Wellness

COURSE OBJECTIVE:

- Understanding the importance of holistic well-being: We will examine the concept of holistic health and why it is essential to consider all aspects of our lives when it comes to our health.
- Building resilience and coping skills: We will discuss the importance of resilience in maintaining mental health and explore different strategies for building resilience and coping skills.
- Recognizing environmental hazards and their impact: We will discuss common environmental hazards and their potential impact on our health and well-being.
- Strategies for maintaining long-term health: We will discuss different strategies for maintaining long-term health, including healthy eating, physical activity, and stress management techniques.

COURSE OUTCOME:

- Define key concepts related to health and wellness, such as physical well-being, mental health, and social connections.
- Interpret the effects of lifestyle choices on individual well-being, such as nutrition, exercise, and stress management.
- Apply strategies for promoting physical well-being, including developing balanced diet plans and designing exercise routines.
- Analyze the impact of environmental factors on personal health and develop strategies for promoting environmental well-being.
- Develop a personalized action plan for long-term health promotion and disease prevention, considering individual needs and goals.

Unit I: Introduction to Health and Wellness

8 Hours

Defining health and wellness, the importance of holistic well-being, Determinants of Health, Understanding the mind-body connection, Nutrition and balanced diet, Physical activity and exercise, Sleep hygiene and its impact on health, Stress management techniques

Unit II: Mental and Emotional Well-being**9 Hours**

Understanding mental health and common disorders, building resilience and coping skills, Strategies for managing stress and anxiety, Emotional intelligence and self-awareness, the importance of social connections, Effective communication and active listening, Boundaries and healthy relationships, Building a support network

Unit III: Environmental and Occupational Health**8 Hours**

Promoting a sustainable lifestyle, recognizing environmental hazards and their impact, Work-life Balance and stress management in the Workplace, creating a healthy work environment, Hygiene and personal care practices, Time management and goal setting, Mindfulness and relaxation techniques, Practising self-compassion and self-care routines

Unit IV: Health Promotion and Disease Prevention**5 Hours**

Understanding preventive healthcare, Health screenings and immunizations, recognizing common health risks and preventive measures, Strategies for maintaining long-term health, reflecting on personal health and wellness journey, setting goals for continued self-improvement, Developing an action plan for sustainable lifestyle changes

Reference Material

1. Donatelle, R. J. (2020). Health: The Basics.
2. Procter, N., Hamer, H., McGarry, D., & Wilson, R. (2019). Mental Health: A Person-Centred Approach.
3. Buettner, D. (2012). The Blue Zones: Lessons for Living Longer From the People Who've Lived the Longest.
4. Tolle, E. (2004). The Power of Now: A Guide to Spiritual Enlightenment.
5. Carnegie, D. (1998). How to Win Friends and Influence People.
6. Benson, H., & Stuart, E. M. (1992). The Wellness Book: The Comprehensive Guide to Maintaining Health and Treating Stress-Related Illness.

Coding and Computational Thinking-1

COURSE OBJECTIVE:

Programming is both an art and science of telling the computer what to do, when to do, and how to do something by providing coding instructions to it. It involves programmers trying to solve and code a set of logical or mathematical problems in order to automate a process or task. And it requires creative problem-solving skills, logical thinking and debugging skills. Hacker rank, Code chef, Leetcode and many more offer platforms with complete environments for practicing, mastering and even taking up competitive programming. Most of these platforms are free and support all programming languages like C, C++, JAVA, Python etc.

COURSE OUTCOME:

1. Practice the basic programming constructs of Python to develop applications.
2. Solve coding challenges using technical skills and creativity.
3. Develop better problem-solving skills and efficient algorithms.
4. Demonstrate advanced Python programming skills to automate real-world problems.

Course content

Coding and Computational Thinking – I in the first semester, can help students take up Python programming practice on the platform HackerRank @www.hackerrank.com, register themselves and start practicing various challenges on the platform. For Python beginners, suggestive coding challenges as available on the platform can be taken up by students as follows:

| Sl no | Concept | Challenge | Max score | Difficulty levels |
|-------|------------------------|----------------------|-----------|-------------------|
| 1 | Introduction | Hello World! | 5 | Easy |
| 2 | Basic data types | List comprehension | 10 | Medium |
| 3 | Operators | Arithmetic operators | 5 | Easy |
| 4 | Conditional statements | Condition statements | 5 | Easy |

| | | | | |
|----|-----------------------|------------------------------------|----|--------|
| 5 | Loops | For-loop | 10 | Medium |
| 6 | Functions | Function to check leap year or not | 10 | Medium |
| 7 | Strings | Word order | 10 | Medium |
| 8 | Strings and functions | Capitalize! | 20 | Easy |
| 9 | Classes and objects | Find the Torsional angle | 20 | Medium |
| 10 | Collections | Collection.OrderedDict() | 20 | Easy |

Text Books:

1. Fundamentals of Python Programming by Richard L. Halterman.
2. Python Cookbook by David Beazley and Brian K. Jones.

References Books :

1. Guido Van Rossum, Fred. L. Drake 'Introduction to Python' – Network Theory Limited – March 2011.

Problem Solving Using Programming Lab

1. Write a Program to calculate and display the volume of a CUBE having its height ($h=10\text{cm}$), width ($w=12\text{cm}$) and depth ($d=8\text{cm}$).
2. Write a program to take input of name, roll no and marks obtained by a student in 4 subjects of 100 marks each and display the name, roll no with percentage score secured.
3. Write a program to print whether a given number is even or odd.
4. Write a program to find whether a character is consonant or vowel using switch statement.
5. Write a program to print positive integers from 1 to 10.
6. Write a program to insert 5 elements into an array and print the elements of the array.
7. Write a program to calculate factorial of a number using recursion.
8. Write a program to find the biggest among three numbers using pointer.
9. Write a C program to create, declare and initialize structure.
10. Write a program to create a file called emp.rec and store information about a person, in terms of his name, age and salary.
11. Write a C program to add two matrices A and B of size 3×3 and store the result in matrix C.
12. Multiplication of two matrices
13. Check whether the given string is a palindrome or not.
14. Converting a hexadecimal number into its binary equivalent.
15. Arranging N numbers in ascending and in descending order using bubble sort.
16. Write a C function that takes two integer parameters and swaps their values using call by reference and call by value.



SEMESTER – II

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Data Structures and Algorithms

Course Objectives:

A data structure is a named location that can be used to store and organize data. And, an algorithm is a collection of steps to solve a particular problem. Learning data structures and algorithms allow us to write efficient and optimized computer programs.

Course Outcomes:

- Recognize basic data structures such as arrays, linked lists, stacks and queues.
- Identify different parameters to analyze the performance of an algorithm.
- Apply Algorithms for solving problems like sorting, searching, insertion and deletion of data.
- Outline appropriate data structure while designing the algorithms.
- Compare the Trees, Graphs and its functionalities

UNIT-I

Fundamentals of Algorithms

9 Hours

Algorithm definitions, Asymptotic notations, O-notation, Omega notation and theta notation. Time complexity and space complexity, Average and worst case analysis, Analysing control statements, Recursion

UNIT-II

Types of algorithms:

9 Hours

Sorting and searching algorithms, Divide and conquer algorithms, Greedy algorithms, Dynamic programming, Graph Algorithms, String matching, The class P and NP problems.

UNIT-III

Linear Data Structures:

9 Hours

Arrays and operations. Stacks: LIFO structure, create, POP, PUSH, delete stack. Queues: FIFO structure Priority Queues, Circular Queues, operations on Queues. Linked Lists: Nodes, Linked List operations: Create List, Insert Node (empty list, beginning, Middle, end), Delete node (First, general case), Search list, Retrieve Node, add node, Remove node, Print List.

UNIT-IV

Trees:

9 Hours

Introduction to Trees, Binary Trees :Travesals (breadth-first, depth-first), Expression Trees: Infix, Prefix, Postfix Traversals. Search Trees, Binary Search Trees, B Trees, AVL trees. Heaps: Structure, Basic algorithms – Reheap Up, Reheap Down, Build heap, Insert, Delete.

UNIT-V

Graphs:

9 Hours

Terminology, Operations: Add vertex, Delete vertex, Add Edge, Delete Edge, Find vertex, Traverse Graph: Depth-First, Breadth-First. Graph Storage Structures :Adjacency Matrix, Adjacency List.

TEXT BOOKS:

1. Aaron M. Tenenbaum, Yeedidyah Langsam, Moshe J. Augenstein, “Data structures using C and C++”, Pearson Education.
2. Lipschutz: Schaum’s outline series Data structures Tata McGraw-Hill

REFERENCES:

1. Bandyopadhyay, Data Structures Using C Pearson Education, 1999
2. Introduction to Algorithms, TH Cormen, CE Leiserson, RL Rivest, C Stein, Third Ed, 2009, PHI
3. Data Structures - A Pseudocode Approach with C, Richard.F.Gilberg and Behrouz.A.Forouzan, Second Edition, Thomson Course Technology, 2007
4. Fundamentals of Data Structures, Ellis Horowitz and Sartaz Sahni

Database Management Systems

Course Objectives:

The Database Management Systems course is intended to deliver students the elementary concepts of a database management system and equips them to design and implement a database application built on those concepts. It also introduces advanced level areas like transaction processing, concurrency control, and recovery management.

Course Outcomes:

- Demonstrate the basic elements of a relational database management system
- Identify the data models for relevant problems
- Design entity relationships and convert entity-relationship diagrams into RDBMS and formulate SQL queries with the respective data
- Illustrate normalization for the development of application software
- Analyze the basic issues of transaction processing and concurrency control

Unit 1

Introduction:

6 Hours

Purpose of Database System -- Views of data – Data Models – Database Languages – Database System Architecture – Database users and Administrator – Entity– Relationship model (E-R model) – E-R Diagrams -- Introduction to relational databases.

Unit 2

Relational Model-I:

6 Hours

The relational Model – The catalog- Types– Keys - Relational Algebra – Domain Relational Calculus – Tuple Relational Calculus - Fundamental operations – Additional Operations- SQL fundamentals. Oracle data types, Data Constraints, Column level & table Level Constraints, working with Tables. Defining different constraints on the table, Defining Integrity Constraints in the ALTER TABLE Command, Select Command, Logical Operator, Range Searching, Pattern Matching, Oracle Function, Grouping data from Tables in SQL, Manipulation Data in SQL

Unit 3

Relational Model-II:**6 Hours**

Joining Multiple Tables (Equi Joins), Joining a Table to itself (self Joins), Sub queries Union, intersect & Minus Clause, Creating view, Renaming the Column of a view, Granting Permissions, - Updating, Selection, Destroying view Creating Indexes, Creating and managing User Integrity – Triggers - Security – Advanced SQL features –Embedded SQL– Dynamic SQL- Missing Information– Views – Introduction to Distributed Databases and Client/Server Databases.

Unit 4**Database Design:****6 Hours**

Functional Dependencies – Non-loss Decomposition – Functional Dependencies – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form-Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form

Unit 5**Transactions:****6 Hours**

Transaction Concepts - Transaction Recovery – ACID Properties – System Recovery – Media Recovery – Two Phase Commit - Save Points – SQL Facilities for recovery –Concurrency – Need for Concurrency – Locking Protocols – Two Phase Locking – Intent Locking – Deadlock- Serializability – Recovery Isolation Levels – SQL Facilities for Concurrency

TEXT BOOK

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Fifth Edition, Tata McGraw Hill, 2006
2. Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Fourth Edition, Pearson/Addision Wesley, 2007.

REFERENCE

1. Raghu Ramakrishnan, “Database Management Systems”, Third Edition, McGraw Hill, 2003.

Course Objectives:

- Understand Operating System Structure and Operations
- Discuss Process management
- Illustrate Process Synchronization in Operating System
- Analyze different Memory Management Strategies and File System
- Apply the concepts learnt to Windows-10 as a case study.

Course Outcomes:

- Explain Operating System Structure and Operations
- Describe Process management
- Identify Process Synchronization in Operating System
- Compare different Memory Management Strategies and File System
- Implement the concepts learnt in Windows-10 as a case study.

UNIT - I**Introduction to Operating Systems****6 Hours**

Computer System organization, Computer System architecture, Operating System structure, Operating System operations, Process management, Memory management, Storage management, Protection and security, Special-purpose systems, Computing environments, Operating System Services, User interface, System calls, System programs, Operating System design and implementation, Operating System structure, Operating System generation, System boot- Case Study.

Unit- II**Process Management****6****Hours**

Process concept, Process scheduling, Operations on processes, Inter-process communication, Multi-Threaded Programming Overview, Multithreading models, Thread Libraries, Threading issues, Process Scheduling Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple-Processor scheduling, Thread scheduling- Case Study.

Unit- III**Process Synchronization and Deadlocks****6 Hours**

Process Synchronization, The Critical section problem, Peterson's solution, Synchronization hardware, Semaphores, Classical problems of synchronization, Monitors, Deadlocks System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection and recovery from deadlock- Case Study.

Unit- IV**Memory Management and File System****6 Hours**

Memory Management Strategies, Background, Swapping, Contiguous memory allocation, Paging, Structure of page table, Segmentation, Virtual Memory Management Background, Demand paging, Copy-on-write, Page replacement, Allocation of frames, Thrashing, File System: File concept, Access methods, Directory structure, File system mounting, File sharing, Protection. Implementing File System: File system structure, File system implementation, Directory implementation, Allocation methods, Free space management- Case Study.

Unit -V**Introduction to Windows 10 -A case study.****6 Hours**

Introduction: Introduction to windows 10 operating system. New features in Windows 10, the important changes since Windows 8.1. Navigation and customization of the new enhanced user interface. Installing, Upgrading and Managing Windows 10, File Access, Printers and Network Connectivity with Windows 10, Securing, Optimizing and Maintaining Windows 10 Client, Configuring Mobile Computing and Remote Access in Windows 10:

Understanding different editions of Windows 10, the differences between Upgrade and Migration: Installing Windows 10 and upgrading to it, Points to consider when deciding between an upgrade or migration, the supported upgrade paths. Support authentication and authorization: Support user authentication, Support workgroup, home group, and domain membership, Configure local accounts and Microsoft accounts, Configure Workplace Join.

Text books:

1. "Operating System Concepts" by Abraham Silberschatz, Greg Gagne, and Peter B. Galvin - Tenth edition published in 2018
2. "Operating Systems: Principles and Practice" by Thomas Anderson and Michael Dahlin - Second edition published in 2014.
3. "Windows Internals, Part 2: Covering Windows Server 2016 and Windows 10" by Mark E. Russinovich, David A. Solomon, and Alex Ionescu - Seventh edition published in 2017

Reference Books:

1. "Modern Operating Systems" by Andrew S. Tanenbaum and Herbert Bos - Fourth edition published in 2014
2. "Operating Systems: Three Easy Pieces" by Remzi H. Arpaci-Dusseau and Andrea C. Arpaci-Dusseau - First edition published in 2015



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Knowledge Representation and Reasoning

Course Objectives:

- Enhancing the basic understanding of intelligent agents and their role in problem-solving and decision-making.
- Describe different problem-solving techniques and search algorithms to find optimal solutions.
- Explain about the gaming concept in AI.
- Develop knowledge and reasoning skills to represent, manipulate, and reason with knowledge.
- Explore different learning approaches and techniques to build adaptive and intelligent agents.

Course Outcomes:

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

- Understand the foundations, history and the role of intelligent agents in solving complex problems.
- Analyze and compare different search algorithms to find optimal solutions for well-defined problems.
- Design and implement knowledge-based systems using logical and rule-based representations.
- Develop planning agents capable of generating and executing plans in complex environments.
- Use the concept of gaming and know the decision making in checker, go, etc. games.

Unit 1:

6 hours

Intelligent System and Intelligent Agent

What is intelligence? Structure of intelligent system, Biological brain and Basic neural model. Intelligent Agents, How Agents Should Act, Structure of Intelligent Agents, Simple reflex agents, Goal-based agents, Utility-based agents, Environments, Environment programs.

Unit 2:

6 hours

Problem Solving by Searching

Problem-Solving Agents, Toy problems, Real-world problems, Searching for Solutions, Uniformed Search Strategies, Informed Search Strategies, Heuristic Functions.

Beyond Classical Search

Local Search Algorithms and Optimization Problems, Local Search in Continuous Spaces, Searching with Nondeterministic Actions, Searching with Partial Observations, Online Search Agents and Unknown Environments.

Unit 3:

6 hours

Adversarial Search

Games, Optimal Decisions in Games, Alpha-Beta Pruning, Imperfect Real-Time Decisions, Stochastic Games, Partially Observable Games, State-of-the-Art Game Programs, Alternative Approaches.

Unit 4:

6 hours

Constraint Satisfaction Problems

Introduction to Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for Constraint Satisfaction Problems, Local Search for Constraint Satisfaction Problems, The Structure of Problems.

Unit 5:

6 hours

Knowledge and Reasoning

Logical Agents: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic.

First-Order Logic: Syntax and Semantics, Extensions and Notational Variations, Using First-Order Logic.

Inference in First-Order Logic: Proposition vs First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

Text Books:

1. Artificial Intelligence: A Modern Approach, Stuart J. Russell and Peter Norvig, Second Edition, Pearson Education, Inc., Upper Saddle River; New Jersey 07458.
2. Artificial Intelligence: The Basics by Kevin Warwick, Professor of Cybernetics Kevin, 1st published 2012 by Routledge.
3. “Artificial intelligence A systems approach” by M. Tim Jones, INFINITY SCIENCE PRESS LLC, 2008.

Reference Books:

1. “Artificial Intelligence: Foundations of Computational Agents”, by D. Poole, Cambridge University Press, 2010.
2. “Artificial Intelligence and Intelligent Systems”, by Padhy N.P, 4th impression, Oxford University Press, 2007.
3. “Super Intelligence Paths, Dangers and Strategies”, by Nick Bostrom, Oxford University Press.

Mathematics-II

Course Objective

To develop the capability among students for handling abstract concepts and to provide the students with experience in axiomatic mathematics while keeping in close touch with the computational aspects of the subject.

Course outcome:

- Execute fundamental mathematical proofs and ability to verify.
- Apply basic counting techniques to solve combinatorial problems.
- Comprehend formal logical arguments and expression of mathematical properties formally via the formal language of propositional logic and predicate logic.
- Analyse and manipulate basic mathematical objects such as sets, functions, and relations and will also be able to verify simple mathematical properties that these objects possess.
- Formulate computer programs (e.g. recursive functions) using mathematical principle.

CONTENTS

Unit 1: Hypothesis Testing

9 Hours

Introduction to testing of hypothesis, Statistical assumptions for parametric test, Level of significance, confidence level, Type I Error, Type II error, Critical value, power of the test, sampling distribution, small sample test – t test for one sample and two sample mean, F test to test the equality of two sample variance, Large Sample test – Z test for equality of single mean with population mean, equality of two sample mean, equality of single proportion with population proportion and equality of two sample proportions.

Unit-2: Correlation and Regression Analysis

9 Hours

Correlation analysis, properties of correlation coefficients, significance of single correlation coefficient, significance of multiple correlation coefficients, concepts of multiple correlation and partial correlation, Introduction to linear model, concepts of factor, effect, residuals, dependency, independency, assumptions of linear model, difference between linear and nonlinear model, estimation of parameters of regression coefficients for simple and multiple linear regression model, properties of regression coefficients, significance of regression coefficients, diagnostic testing: auto correlation, multi collinearity, heteroscedasticity, normality, significance of estimated parameters in multiple linear regression,.

Unit 3: Differential Equations

9 Hours

Ordinary differential equations of the first order of the form $y'=f(x,y)$, Bernoulli's equation, exact differential equations, integrating factor, orthogonal trajectories, homogeneous differential equations, variable separable equations, linear differential equations of second order with constant coefficients, Method of variation of parameters, Cauchy-Euler equation

Unit-4: Limits and PDE

9 Hours

Evaluation of limits & Expansion of functions: Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits Taylor's Series and Maclaurin's Series, Convergence Tests for positive term series – Comparison.

Partial differentiation & Application of PDE: Partial Derivatives, Euler's Theorem on homogeneous functions, Total Derivatives & Implicit functions. Errors and Approximations, Maxima & Minima for two and several variables, Jacobians and their applications.

Unit-5: Integral Calculus

9 Hours

Integration as the inverse process of differentiation, definite integrals, and their properties, fundamental theorem of calculus. Double and triple integrals, change of order of integration, calculating surface areas and volumes using double integrals, calculating volumes using triple integrals.

Text Books

1. Discrete Mathematics for New Technology, Second Edition - Rowan Garnier, John Taylor, Institute of Physics Publishing Bristol and Philadelphia.
2. Theory and Problems of Discrete Mathematics, Third Edition - SEYMOUR LIPSCHUTZ, MARC LARS LIPSON, Schaum's Outline Series, McGRAW-HILL

Reference Books

1. Hand book of Discrete and Combinatorial Mathematics - KENNETH H. ROSEN, JOHN G. MICHAELS, JONATHAN L. GROSS, JERROLD W. GROSSMAN, DOUGLAS R SHIER, CRC Press.
2. Linear Algebra and Matrix Analysis for Statistics – Sudipto Banerjee, Anindya Roy, CRC Press.
3. Linear Algebra concepts and methods – Martin Anthony, Michele Harvey, Cambridge University Press.

Course Objective

To familiarize the students with the broad areas of communicative English

Course outcome:

- To know the working principles of a computer.
- To understand the basic terminology used in computer programming
- To write, compile and debug programs in C language.
- To design programs using decision structures, loops and functions.
- To understand the dynamics of memory by the use of pointers and Structures.

CONTENTS

Unit 1: Communication in Business 9 Hours

Introduction, Communication Process, Essentials of Business Communication, Barriers to Business Communication.

Unit-2: Types of Communication 9 Hours

Verbal Communication, Nonverbal Communication, Types of Communication Based on Style and Purpose

Unit 3: Reading Skills-I 9 Hours

Parts of Speech (Nouns, Pronouns, Adjectives, Verbs, Adverbs, Prepositions, Conjunctions, and Interjections)

Unit-4: Reading Skills-II 9 Hours

Sentences, Subject-Verb Agreement, Active and Passive Voice, Direct and Indirect Speech

Unit-5 : Communication in Organisation 9 Hours

Types of Communication, Meetings, Memo, Circulars and Notices. Business Correspondence: General Rules for All Business Correspondence, Guidelines for the Basic Cover Letter, Guidelines for Information Interviewing, Networking Letters, Guidelines for Thank You Letters, Guidelines for Job Offer, Acceptance Letters, Guidelines for Letters Declining a Job Offer, Style in Business Correspondence Business Report Writing: Cover Letters, Business Report Writing, The purpose of statistical studies, a sample of business correspondence

Recommended Readings:

1. Bhatia, R.C., Business Communication, New Delhi: Ane Books Pvt Ltd
2. Scot, O., Contemporary Business Communication, New Delhi: Biztnatra
3. Parikh, J.P. et al, Business Communication: Basic Concepts and Skills, Hyderabad: Orient Blackswan

Understanding India

Course Objective

- Overview of India's states and union territories: We will provide an overview of India's states and union territories, their geography, languages, and cultures, and the different historical events that have shaped them.
- Learners will gain an understanding of Hindu practices, including puja and yoga.
- Explore the changing roles and status of women in Indian society, the challenges they face, and initiatives for women's empowerment.

Course Outcome:

- Recognize the diversity of India's geography, languages, and religions.
- Explain the significance of major historical periods, empires, and movements in India.
- Apply cultural understanding to analyze and interpret the influence of Indian arts, literature, and festivals on society.
- Analyze the impact of colonization and the struggle for independence on Indian society and politics.
- Evaluate the socio-economic challenges and development initiatives in modern India.

CONTENTS

Unit I: Introduction to India and its History

9 Hours

Geographical Features and Diversity of India, Overview of India's states and union territories, Key historical periods and empires in India, Introduction to major religions and languages in India

Indus Valley Civilization and its Significance, The Maurya and Gupta empires, Islamic invasions and the Mughal Empire, British colonial rule and the struggle for independence

Unit II: Indian Philosophy and Culture

9 Hours

Hinduism: Concepts, deities, and practices; Buddhism: Origins, teachings, and spread; Jainism: Principles and influence; Sikhism: Beliefs and contributions

Indian Arts and Culture: Traditional Indian music, dance, and performing arts, Indian literature and languages; Visual arts: Painting, sculpture, and architecture; Festivals and celebrations across different regions

Unit III: Social Structure and Modern India

8 Hours

Caste system: Origins, impact, and contemporary issues, Gender roles and women's empowerment, Ethnic and linguistic diversity in India, Tribal communities and their cultural significance

Indian democracy and the Constitution, Socio-economic challenges and development initiatives, Contemporary social issues: Poverty, education, healthcare, and rural development; India's role in the global arena

Unit IV: Indian Cuisine and Cultural Exchange

4 Hours

Regional culinary traditions and flavours, Spices, Popular dishes and street food culture, reflecting on the learning journey and insights gained, sharing personal experiences and connections to Indian culture, Cultural exchange activities, such as food tasting or traditional art demonstrations

Reference Material

1. Keay, J. (2010). India: A History.
2. Guha, R. (2007). India After Gandhi: The History of the World's Largest Democracy.
3. Sen, A. (2006). The Argumentative Indian: Writings on Indian History, Culture, and Identity.
4. French, P. (2011). India: A Portrait.
5. Das, G. (2002). India Unbound: The Social and Economic Revolution from Independence to the Global Information Age.
6. Nehru, J. (1989). The Discovery of India.

Coding and Computational Thinking-II

COURSE OBJECTIVE:

Coding and Computational Thinking – II, students can take up coding practice and challenges on the platform Hackerrank @www.hackerrank.com suitable on:

1. Databases (<https://www.hackerrank.com/domains/databases>) and
2. SQL (<https://www.hackerrank.com/domains/sql>).

COURSE OUTCOME:

1. Discuss the applicability of mathematical concepts of sets, relations to database management systems.
2. Use SQL commands to query databases for relevant results.
3. Apply normalization techniques to create standardized relations.
4. Demonstrate SQL and relational databases skills to develop database management systems.

COURSE CONTENT

Students' understanding of the subject Database management systems can be supported by practicing and taking challenges for both on the Hackerrank platform. Following is a list of suggestive exercises that can be completed on the platform.

| Sl no | Concept | Challenge | Max score | Difficulty levels |
|-------|---|-------------------------------|-----------|-------------------|
| 1 | Basics of Sets and relations | Challenges 1,2,3 and 4 | 5 | Easy |
| 2 | Relational Algebra | Challenges 3 and 4 | 2 | Medium |
| 3 | Database Query Languages and procedural Languages | MCQ's | 2 | Easy |
| 4 | Normalization | Challenges for 1/2/3NF | 5 | Hard |
| 5 | Databases | Keys | 5 | Medium |
| 6 | SQL | Select All | 10 | Easy |
| 7 | SQL – DDL,DML | Weather observation station 5 | 30 | Easy |
| 8 | SQL | New Companies | 30 | Medium |

| | | | | |
|----|-----|---------------------|----|--------|
| 9 | SQL | Top Competitors | 30 | Medium |
| 10 | SQL | Contest LeaderBoard | 30 | Medium |

Text Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Fifth Edition, Tata McGraw Hill, 2006
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Fourth Edition, Pearson/Addison Wesley.



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Data Structures and Algorithms Lab

Practical List on Data Structures Using C++

1. Write a program in C to count the frequency of each element of an array.
2. Write a program in C to count a total number of duplicate elements in an array.
3. Write a program in C to insert New value in the array (sorted list).
4. Write an algorithm and find the efficiency of the same for following problems:
 - a. Finding Factorial – Iterative Approach and Recursive Approach
 - b. Printing Fibonacci Series – Iterative Approach and recursive approach
5. Design an algorithm and implement programs for any 3 of the below:
 - a. Insertion Sort
 - b. Selection Sort
 - c. Bubble Sort
 - d. Count Sort
 - e. Linear Search
6. Design an algorithm and implement a program for:
 - a. Merge Sort
 - b. Binary Search
7. Design an algorithm and implement a program to solve Knapsack Problem
8. C Program to Reverse a Stack using Recursion.
9. C Program to Implement Two Stacks using a Single Array & Check for Overflow & Underflow.
10. C Program to Check String is Palindrome using Stack.
11. C Program to Identify whether the String is Palindrome or not using Stack.
12. C Program to Implement Queues using Stacks.
13. Write a program to implement a linked list and traverse the list. Print all the elements traversed.
14. Write a program to illustrate insertion in linked list as per following:
 - . Insertion in the beginning.
 - a. insertion at the end
 - b. insertion in the intermediate position given by user.
15. Write a program to illustrate deletion in linked list as per following:
 - . deletion in the beginning.
 - a. deletion at the end
 - b. deletion in the intermediate position given by user.
16. Write a program to reverse the linked list.

17. Write a program to sort the elements in linked list.
18. Write a program to illustrate insertion in circular linked list as per following:
 - . Insertion in the beginning.
 - a. insertion at the end
 - b. insertion in the intermediate position given by user.
19. Write a program to implement binary tree.
20. Write a program to implement AVL tree.
21. Write a program to implement binary max heap.
22. Write a program to implement breadth first search using necessary data structure.
23. Write a program to find minimum spanning tree in graph using prims algorithm.
24. Write a program to find minimum spanning tree in graph using kruskals algorithm.



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Database Management System Lab

1. Perform following actions using SQL statements
 - a) Create a new user with name “shiva” and password “kumar@1”
 - b) Assign the following privileges
 - i. Create and drop tables
 - ii. Create and drop users
 - iii. Allow to assign above privileges to new users
 - a) List all tables in the database
 - b) List all users in the database
 - c) Logout from current user and log in as “shiva”
2. Create following tables and insert minimum 10 rows in to each table
 - a. Department table with following columns with appropriate data types
 - i. DeptId
 - ii. DeptName
 - iii. DeptLoc
 - b. Employee table with following columns with appropriate data types
 - i. EmpId
 - ii. EmpName
 - iii. DOB
 - iv. DOJ
 - v. Job
 - vi. Salary
 - c. Product table with following columns with appropriate data types
 - i. ProdId
 - ii. ProdName
 - iii. Price
 - d. Sales table with following columns with appropriate data types
 - i. SalesId
 - ii. Date
 - iii. Quantity
3. Update above tables with following features using SQL statements
 - a. Make DeptId in Department table as Primary Key
 - b. Make EmpId in Employee table as Primary Key
 - c. Add DeptId column to the Employee table and make it foreign key from Department table and update the values
 - d. Add EmpId and ProdId to the Sales table and make them foreign key from Employee and Product table and update the values
 - e. Update all columns in all tables with appropriate constraint such as not null, check and so on
4. Perform the following SQL statements
 - a. Create a view “EmpDeptView” from Employee and Department table which contains following columns
 - i. EmpName
 - ii. DOB
 - iii. Salary
 - iv. DeptId
 - v. DeptName
 - vi. Loc
 - a. Retrieve all employees whose salary between 25,000 to 30,000



- b. Retrieve all employees who is working in Accounts department (If it is not there add this row to Department table)
 - c. Retrieve all employees who is working other than Accounts department
 - d. Retrieve all employee who is working in Sales department and Bangalore location
 - e. Retrieve all employees who completed minimum 5 years
 - f. Retrieve all employees who completed minimum 5 years and salary less than 30,000
5. Perform the following SQL statements
 - a. Retrieve all employees whose salary more than 30,000
 - b. Retrieve employee details who is getting maximum salary
 - c. Retrieve employee details who is getting minimum salary
 - d. Retrieve employee details who is getting 3rd maximum salary
 - e. Retrieve employee details who is getting 5th minimum salary
 - f. Retrieve total number of employees in each department in Bangalore location
 - g. Retrieve total number of employees in each location
 - h. Retrieve total number of employees in each location in Accounts department
 - i. Retrieve total number of employees who complete more than 10 years in each department
6. Write a PL/SQL Procedure to find prime number from 1 to n, n is a user input or parameter
7. Write a PL/SQL Functions to return number of days an employee working using EmpId
8. Write a PL/SQL Procedure to find sum of salaries of all employee working in a particular location
9. Write a PL/SQL Function to return sum of sales by ProdId
10. Write a PL/SQL Function to return sum of sales by EmpId
11. Write a PL/SQL Procedure to generate Employee Report department wise as follows

| DeptName | EmpName | Job | Location | Salary | Cumulative_Salary |
|----------|---------|-----|----------|--------|-------------------|
| | | | | | |
12. Write a PL/SQL Trigger to insert row into OldEmployee table when a employee deleted from Employee table (Create OldEmployee table)
13. Write a PL/SQL Trigger not to delete more than 2 employees at a time
14. Write a PL/SQL Trigger not to update employee salary if it cross 67000
15. Write a PL/SQL Package with following procedures and functions
 - a. Procedures
 - i. Print Total Quantity Sales Summary Report(SalesId, Date, Quantity and Total Quantity)
 - ii. Print Total Quantity Sales Summary Report by Date wise
 - b. Functions
 - i. Return employee name who made maximum sales till date
 - ii. Return product name soled maximum quantity till date