
SCHEME OF INSTRUCTION AND SYLLABUS

B.Tech in Computer Science and Engineering

Regulation:VR23

w.e.f.2023-24



Department of Computer Science and Engineering

VELAGAPUDI RAMAKRISHNA SIDDHARTHA ENGINEERING COLLEGE

(An Autonomous, ISO 9001:2015 Certified Institution)

(Approved by AICTE, Accredited by NAAC with 'A+' Grade,
Affiliated to JNTUK, Kakinada)

(Sponsored by Siddhartha Academy of General & Technical Education)

Vijayawada, Andhra Pradesh - 520007, INDIA.

www.vrsiddhartha.ac.in



Institute Vision

To nurture excellence in various fields of engineering by imparting timeless core values to the learners and to mould the institution into a centre of academic excellence and advanced research.

Institute Mission

To impart high quality technical education in order to mould the learners into globally competitive technocrats who are professionally deft, intellectually adept and socially responsible. The institution strives to make the learners inculcate and imbibe pragmatic perception and proactive nature so as to enable them to acquire a vision for exploration and an insight for advanced enquiry.

Department Vision

The department vision is clearly defined and is in line with the college's vision. The vision of the department is "To evolve as a centre of academic excellence and advanced research in Computer Science and Engineering discipline."

Department Mission

This mission of the department is concise and supports the college's mission. The mission of the Computer Science and Engineering department is "To inculcate students with profound understanding of fundamentals related to discipline, attitudes, skills, and their application in solving real world problems, with an inclination towards societal issues and research."



Program Educational Objectives (Undergraduate)

We have program educational objectives for our Computer Science and Engineering program. Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.

Our program educational objectives are:

The graduates of the program will

1. Have knowledge and analytical skills, including mathematics, science and basic engineering.
2. Have in-depth learning skills to function productively as leadership role or as supportive members in multidisciplinary teams with effective communication.
3. Have extensive knowledge in state-of the- art frameworks in Artificial Intelligence to design industry accepted AI solutions using modern tools for allied domains with realistic constraints or pursue higher studies and continue to develop their professional knowledge.
4. Practice the profession with ethics, integrity, leadership and social responsibility.



Program Outcomes

On successful completion of the B.Tech in CSE programme the student will be able to:

PO1 - *Engineering knowledge:* Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 - *Problem analysis:* Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 - *Design/development of solutions:* Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 - *Conduct investigations of complex problems:* Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 - *Modern tool usage:* Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6 - *The engineer and society:* Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7 - *Environment and sustainability:* Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 - *Ethics:* Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 - *Individual and team work:* Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 - *Communication:* Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11 - *Project management and finance:* Demonstrate knowledge and understanding of the

engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 - Lifelong learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

PSO1: Develop software applications or solutions as per the needs of Industry and society.

PSO2: Adopt new and fast emerging technologies in computer science and engineering.

SCHEME OF INSTRUCTION

COURSE CATEGORY ABBREVIATIONS

1. Humanities and Sciences-HS
2. Basic Sciences-BS
3. Basic Sciences and Humanities-BSH
4. Engineering Science-ES
5. Program Core-PC
6. Soft Skills-SS
7. Skill Enhancement Course-SEC
8. Audit Course-AC
9. Mandatory Course-MC
10. Program Elective-PE
11. Open Elective-OE
12. Humanities and Social Sciences-HSS

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
SCHEME OF INSTRUCTION FOR FOUR YEAR UG PROGRAMME [VR23]**

Semester I

Contact Hours							27
S. No.	Course Code	Course Category	Course Name	L	T	P	C
1	23BS1101	BS	Linear Algebra & Calculus	3	0	0	3
2	23BS1102	BS	Engineering Physics	3	0	0	3
3	23ES1103A	ES	Basic Civil and Mechanical Engineering	3	0	0	3
4	223ES1104	ES	Introduction to Programming	3	0	0	3
5	23HS1105	HSS	Communicative English	2	0	0	2
6	23BS1151	BS	Engineering Physics Lab	0	0	2	1
7	23ES1152	ES	Computer Programming Lab	0	0	3	1.5
8	23HS1153	HSS	Communicative English Lab	0	0	2	1
9	23ES1154	ES	Engineering Workshop	0	0	3	1.5
10	23ES1155	ES	IT Workshop	0	0	2	1
11	23BS1156	BS	NSS/NCC/Community Service	0	0	1	0.5
12	23MC1106	MC	Induction Program				
Total				14	0	13	20.5

Semester II

Contact Hours							28
S. No.	Course Code	Course Category	Course Name	L	T	P	C
1	23BS2101	BS	Differential Equations Vector Calculus	3	0	0	3
2	23BS2102B	BS	Chemistry	3	0	0	3
3	23ES2103B	ES	Basic Electrical and Electronics Engineering	3	0	0	3
4	23PC2104A	PC	Data Structures	3	0	0	3
5	23ES2105	ES	Engineering Graphics	1	0	4	3
6	23BS2151B	BS	Chemistry Lab	0	0	2	1
7	23PC2152A	PC	Data Structures Lab	0	0	3	1.5
8	23ES2153	ES	Basic Electrical and Electronics Workshop	0	0	3	1.5
9	23BS2154B	BS	Health and wellness, Yoga and Sports	-	-	1	0.5
10	23MC2106	MC	Design Thinking	2	0	0	-
Total				15	0	13	19.5

Semester III

Contact Hours							24
S. No.	Course Code	Course Category	Course Name	L	T	P	C
1	23HS3101	HS	Engineering Economics & Management	2	0	0	2
2	23HS3102	BSH	Universal Human Values 2 -Understanding Harmony	2	1	0	3
3	23ES3103C	ES	Digital Logic & Computer Organisation	3	0	0	3
4	23CS3304	PC	Advanced Data Structures & Algorithms Analysis	3	0	0	3
5	23CS3305	PC	Object Oriented Programming Through Java	3	0	0	3
6	23TP3106	SS-1	Logic & Reasoning	0	0	2	1
7	23CS3651	SEC	Python Programming Lab	0	0	2	1
8	23CS3352	PC	Advanced Data Structures and Algorithms Lab	0	0	3	1.5
9	23CS3353	PC	Object Oriented Programming through Java Lab	0	0	3	1.5
Total				13	1	10	19

Semester IV

Contact Hours							30
S. No.	Course Code	Course Category	Course Name	L	T	P	C
1	23BS4101B	ES	Discrete Mathematics and Graph Theory	3	0	0	3
2	23BS4102B	BS	Probability & Statistics	3	0	0	3
3	23CS4303	PC	Operating Systems	3	0	0	3
4	23CS4304	PC	Database Management Systems	3	0	0	3
5	23CS4305	PC	Software Engineering	2	1	0	3
6	23TP4106	SS-2	English For Professionals	0	0	2	1
7	23MC4107	AC	Environmental Science	2	0	0	-
8	23CS4651	SEC	Full Stack Development-I	0	0	2	1
9	23ES4152	ES	Design Thinking & Innovation	1	0	2	2
10	23CS4353	PC	Operating Systems Lab	0	0	3	1.5
11	23CS4354	PC	Database Management Systems Lab	0	0	3	1.5
Total				17	1	12	22
Summer Internship 6 weeks (Mandatory) during summer vacation (EPICS)							
Honors/ Minor Courses (the hours distribution can be 4-0-0, 3-0-2 or 3-1-0 also)				4	0	0	4

[L - Lecture, T - Tutorial, P - Practical, C - Credits]

Semester V

S. No.	Course Code	Course Category	Course Name	Contact Hours			27
				L	T	P	C
1	23CS5301	PC	Machine Learning	3	0	0	3
2	23CS5302	PC	Computer Networks	3	0	0	3
3	23CS5303	PC	Formal Languages and Automata Theory	3	0	0	3
4	23CS5404	PE I	1. Object Oriented Analysis and Design 2. Artificial Intelligence 3. Microprocessors & Microcontrollers 4. Data Warehousing & Data Mining 5. 12 week MOOC Swayam/ NPTEL course recommended by the BoS	3	0	0	3
5	23CS5205	OE-I	Open Elective-I	3	0	0	3
6	23CS5351	PC Lab - 1	Machine Learning Lab	0	0	3	1.5
7	23CS5352	PC Lab - 2	Computer Networks Lab	0	0	3	1.5
8	23CS5361	SEC	Full Stack Development -II	0	0	2	1
9		SS-3	Personality Development	0	0	2	1
10		HSS	Advanced Communication skills lab	0	0	2	1
11		Evaluation of Community Service Internship	EPICS	-	-	-	2
12		AC	Technical Paper Writing and & IPR	2	0	0	0
Total				17	0	12	23
Honors/ Minor Courses (the hours distribution can be 4-0-0, 3-0-2 or 3-1-0 also)				4	0	0	4

[L - Lecture, T - Tutorial, P - Practical, C - Credits]

Semester VI

S. No	Course Code	Course Category	Course Name	Contact Hours			30
				L	T	P	C
1	23CS6301	PC	Compiler Design	3	0	0	3
2	23CS6302	PC	Cloud Computing	3	0	0	3
3	23CS6303	PC	Cryptography & Network Security	3	0	0	3
4	23CS6404	PE II	1. Software Testing Methodologies 2. Cyber Security 3. DevOps 4. Embedded Systems 5. Any of the 12-Week SWAYAM / NPTEL Course suggested by the BoS	3	0	0	3
5	23CS6405	PE III	1. Software Project Management 2. Mobile Adhoc Networks 3. Natural Language Processing 4. Distributed Operating System 5. Any of the 12-Week SWAYAM / NPTEL Course suggested by the BoS	3	0	0	3
6	23CS6206	OE II	Open Elective -II	3	0	0	3
7	23CS6351	PC Lab-I	Cloud Computing Lab	0	0	3	1.5
8	23CS6352	PC-II	Cryptography & Network Security Lab	0	0	3	1.5
9		SS - 4	Quantitative Aptitude	0	0	2	1
10		AC	Humanities Elective	2	0	0	-
Total				20	0	8	22
Honors/ Minor Courses (the hours distribution can be 4-0-0, 3-0-2 or 3-1-0 also)				4	0	0	4

[L - Lecture, T - Tutorial, P - Practical, C - Credits]

Semester VII

Contact Hours							21
S. No.	Course Code	Course Category	Course Name	L	T	P	C
1	23CS7301	PC	Deep Learning	2	1	0	3
2	23CS7402	HSS	Human Resource Management	2	0	0	2
3	23CS7403	PE IV	1. Software Architecture & Design Patterns 2. Blockchain Technology 3. Augmented Reality & Virtual Reality 4. Internet of Things 5. 12 week MOOC Swayam/ NPTEL course recommended by the BoS	3	0	0	3
4	20CS7404	PE V	1. Agile methodologies 2. Metaverse 3. Computer Vision 4. Cyber Physical Systems 5. 12 week MOOC Swayam/ NPTEL course recommended by the BoS	3	0	0	3
5	20CS7205	OE III	Open Elective III	3	0	0	3
6	20CS7206	OE IV	Open Elective IV	3	0	0	3
7		ASC	Corporate Readiness Skills	0	0	2	2
8		AC	Constitution of India	2	0	0	-
9		Internship	Evaluation of Industry Internship	-	-	-	2
Total				20	1	0	21
Industrial/ Research Internship six weeks (Mandatory) during summer vacation							
Honors/ Minor Courses (the hours distribution can be 4-0-0, 3-0-2 or 3-1-0 also)				0	0	0	4

L - Lecture, T - Tutorial, P - Practical, C - Credits]

Note: Open Elective II and Open Elective IV are self-learning. Students may opt from any MOOCs platforms. They have to submit the certificate before the last instruction day of VII semester. Course selection for MOOCs is subject to approval by the Head of the Department.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
SCHEME OF INSTRUCTION FOR FOUR YEAR UG PROGRAMME [VR23]
Semester VIII

				Contact Hours			24
S. No.	Course Code	Course Category	Course Name	L	T	P	C
1	20CS8551	Internship/ Project**	Major Project and Internship (6 Months)	0	0	24	12
Total				0	0	24	12

[L - Lecture, T - Tutorial, P - Practical, C - Credits]

Note: The student should undergo internship and simultaneously he/she should work on a project with well-defined objectives. At the end of the semester the student should submit an internship completion certificate and a project report. If any of our associated company comes forward to offer an emerging course that will be offered as an industry offered course in V, VI or VII semesters under program elective with the approval of BoS. This is incorporated to enhance student skills and employability in cutting edge technologies.

Minor: To obtain Minor Engineering, student needs to obtain 18 credits by successfully completing any of the following courses in the concern stream.

For Minor in AI & ML: L-T-P-C

- | | |
|--|-----------|
| 1. Advanced Data Structures & Algorithm Analysis | 3-0-3-4.5 |
| 2. Principles of Artificial Intelligence | 3-0-3-3 |
| 3. Operating Systems | 3-0-3-4.5 |
| 4. Computer Networks | 3-0-0-3 |
| 5. Machine Learning | 3-0-0-3 |
| 6. Deep Learning | 3-0-0-3 |
| 7. Cloud computing | 3-0-0-3 |

For Minor in Cyber Security: L-T-P-C

- | | |
|--|-----------|
| 1. Operating Systems | 3-0-3-4.5 |
| 2. Computer Networks | 3-0-0-3 |
| 3. Principles of Artificial Intelligence | 3-0-3-4.5 |
| 4. Cloud computing | 3-0-0-3 |
| 5. Cyber Security | 3-0-0-3 |
| 6. Cryptography & Network Security | 3-0-3-4.5 |
| 7. Blockchain technology | 3-0-0-3 |

For Minor in Data Science: L-T-P-C

- | | |
|--|-----------|
| 1. Advanced Data Structures & Algorithm Analysis | 3-0-0-3 |
| 2. Principles of Artificial Intelligence | 3-0-0-3 |
| 3. Introduction to Data Science | 3-0-3-4.5 |
| 4. Machine Learning | 3-0-0-3 |
| 5. Data Engineering | 3-0-3-4.5 |
| 6. Big Data Analytics | 3-0-0-3 |
| 7. Cloud computing | 3-0-0-3 |

Open Electives, offered to other department students:

Open Elective I: Java Programming

Open Elective II: Operating Systems

Open Elective III: Data Base Management Systems

Open Elective IV: Computer Networks

COURSES OFFERED FOR HONOURS DEGREE IN CSE

Note: To obtain Honor's degree, student needs to obtain 18 credits by successfully completing any of the following courses in the concern stream.

- | | |
|--|--------------|
| 1. Unmanned Arial Systems & Robotics | 3-0-0(MOOCs) |
| 2. Social Network Analysis | 3-0-0(MOOCs) |
| 3. Applied Linear Algebra in AI & ML | 3-0-0(MOOCs) |
| 4. Applied Time-Series Analysis | 3-0-0(MOOCs) |
| 5. Parallel Computer Architecture | 3-0-0(MOOCs) |
| 6. Privacy and Security in Online Social Media | 3-0-0(MOOCs) |

- | | |
|---|--------------|
| 7. Reinforcement Learning | 3-0-0(MOOCs) |
| 8. GPU Architecture and Programming | 3-0-0(MOOCs) |
| 9. Principles of Knowledge Graphs | 3-0-0 |
| 10. Frontend Technologies | 3-0-0 |
| 11. MEAN Technologies | 3-0-0 |
| 12. Backend Technologies | 3-0-0 |
| 13. Framework and Micro Services | 3-0-0 |
| 14. Any of the MOOC Course recommended by the BoS | |

SEMESTER III

23HS3101

ENGINEERING ECONOMICS AND MANAGEMENT

Course Category	Humanities and Sciences	Credits	2
Course Type	Theory	L-T-P	2-0-0
Prerequisites	–	Continuous Eval	30
		Semester End Eval	70
		Total Marks	100

COURSE OUTCOMES

1. Understand the principles of management and various forms of organizations.
2. Understand the various aspects of business economics.
3. Perceive the knowledge on Human resources and Marketing functions.
4. Evaluate various alternatives economically and methods of calculating depreciation.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 – Medium, 3 – High)

CO	PO												PSO		BTL	POI
	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
1	2											2		2	2	1.7.1, 1.2.2, 1.6.1 12.4.1, 12.6.1
2	2				3							2		2	2	1.7.1, 1.2.2, 1.6.1, 5.4.1, 5.5.2, 12.6.1
3	2											2		2	2	1.7.1, 1.2.2, 1.6.1 12.5.2
4	2				3							2		2	3	1.7.1, 1.2.2, 1.6.1, 5.4.1, 5.5.2, 12.6.2

COURSE CONTENT

UNIT I

Management: Introduction to Management, Functions of Management, Principles of Scientific Management, Modern Principles of Management.

Forms of Business Organization: Salient Features of Sole Proprietorship, Partnership, Joint Stock Company, Co-operative Society and Public Sector.

UNIT II

Introduction to Economics: Introduction to Basic Economic Concepts, Utility Analysis: Marginal Utility and Total Utility, Law of Diminishing Marginal Utility, Law of Equi Marginal Utility.

Demand Analysis: Theory of Demand: Demand Function, Factors Influencing Demand, Demand Schedule and Demand Curve, Shift in Demand, Elasticity of Demand: Elastic and Inelastic Demand, Types of Elasticity.

Supply Analysis: Supply Schedule and Supply Curve, Factors Influencing Supply, Supply Function.

UNIT III

Human Resource Management: Meaning and difference between Personnel Management and Human Resource Management, Functions of Human Resource Management.

Marketing Management: Concept of Selling And Marketing – Differences, Functions of Marketing, Product Life Cycle, Concept of Advertising, Sales Promotion, Types of Distribution Channels, Marketing Research, Break-Even Analysis.

UNIT IV

Financial Management: Functions of Financial Management, Time value of money with cash flow diagrams, Concept of Simple and Compound Interest.

Economic Alternatives: Methods of Evaluating Alternatives under Present worth method, Future worth method, Annual Equivalent method - Problems. **Depreciation:** Causes of depreciation, Factors influencing depreciation, common methods of Depreciation: Straight Line Method, Declining Balance Method, Sum of Year's Digits Method –Problems.

TEXTBOOKS

1. M. Mahajan, Industrial Engineering and Production Management, Dhanpat Rai Publications, 2nd Edition, 2015.
2. Martand Telsang, Industrial & Business Management, S.Chand publications, 1st Edition, 2001.

REFERENCE BOOKS

1. R.Paneerselvam, Production and Operations Management, PHI, 3rd Edition, 2012.
2. Philip Kotler & Gary Armstrong, Principles of Marketing, Pearson Prentice Hall, New Delhi, 17th Edition, 2012.
3. IM Pandey, Financial Management, Vikas Publications 11th Edition, 2011.
4. B.B Mahapatro, Human Resource Management, New Age , 1st Edition, 2011.

E-RESOURCES AND OTHER DIGITAL MATERIALS

1. Law of Supply, <https://www.toppr.com/guides/fundamentals-of-economics-and-management/supply/supply-function/>, Last Accessed On : 22/05/2024.
2. Personnel Management Vs. Human Resource Management, <https://keydifferences.com/\difference-between-personnel-management-and-human-resource-management.html>, Last Accessed On: 12/06/2024.
3. Product Life Stages Cycle, <http://productlifecyclestages.com/>, Last Accessed On: 10/04/2024.

23HS3102

UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY

Course Category	Basic Sciences and Humanities	Credits	3
Course Type	Mandatory course (suggested by AICTE)	L-T-P	2-1-0
Prerequisites	Universal Human Values 1	Continuous Eval	30
		Semester End Eval	70
		Total Marks	100

COURSE OUTCOMES

1. Understand and aware of themselves and their surroundings(family, society and nature).
2. Handle problems with sustainable solutions, while keeping human relationships and human nature in mind.
3. Exhibit critical ability and become sensitive to their commitment towards their understanding of human values, human relationship and human society.
4. Apply what they have learnt to their own self in different day-to-day settings in real life.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO												PSO		BTL	POI
	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
1						1			2						2	6.1.1, 9.2.1, 9.2.2, 9.2.3
2			3												2	3.1.1, 3.2.3
3						2									2	6.2.1
4								3				2			3	8.1.1, 8.2.2 12.1.1, 12.2.2

COURSE CONTENT

UNIT I

Course introduction, need, basic guidelines, content and process for value education:

Part-1: Purpose and motivation for the course, recapitulation from UHV-I, Self-exploration: what is it?, its content and process, 'Natural acceptance' and experiential validation- as the process for self-exploration. Continuous Happiness and Prosperity

– A look at basic Human Aspirations.

Part-2: Right understanding, Relationship and Physical Facility – the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly – A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels. (Practice sessions are to be included to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking).

UNIT II *Understanding Harmony in the Human Being – Harmony in Myself:*

Part-1: Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’. Understanding the needs of Self (‘I’) and ‘Body’ – happiness and physical facility, Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer).

Part-2: Understanding the characteristics and activities of ‘I’ and harmony in ‘I’. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health. (Practice sessions are to be included to discuss the role others have played in making material goods available to me. Identifying from one’s own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs. dealing with disease).

UNIT III *Understanding Harmony in the Family and Society – Harmony in Human-Human Relationship:*

Part-1: Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship.

Part-2: Understanding the harmony in the society (society being an extension of family); Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society–Undivided Society, Universal Order–from family to world family. (Practice sessions are to be included to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education, etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students’ lives).

UNIT IV *Understanding Harmony in Nature & Existence – Whole existence as Coexistence:*

Part-1: Understanding the harmony in the Nature, Inter-connectedness and mutual fulfillment among the four orders of Nature – recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

Part-2: Natural acceptance of human values, Definitiveness of ethical human conduct, Basis for humanistic education, humanistic constitution and humanistic universal order, Competence in professional ethics: a) ability to utilize the professional competence for augmenting universal human order, b) ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, c) ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) at the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) at the level of society: as mutually enriching institutions and organizations.

(Part-1: Practice sessions are to be included to discuss human being as cause of imbalance in nature (film “Home” can be used), pollution, depletion of resources and role of technology, etc.

Part-2: Practice exercises and case studies are to be taken up in practice (tutorial) sessions eg. to discuss the conduct as an engineer or scientist, etc.)

TEXTBOOKS

1. R. R. Gaur, R. Asthana and G. P. Bagaria, A Foundation Course in Human Values and Professional Ethics, Excel Books Private Limited, New Delhi, 2nd Revised Edition, 2019.
2. R. R. Gaur, R. Sangal and G. P. Bagaria, A Foundation Course in Human Values and Professional Ethics, Excel Books Private Limited, New Delhi, 1st Edition, 2010

REFERENCE BOOKS

1. Pandit Sunderlal, Prabhath Prakashan, Bharat Mein Angreji Raj, Delhi , 2018
2. J. C. Kumarappa, Sarva-Seva-Sangh Prakashan, Economy of Permanence, Varanasi, 2017.
3. Annie Leonard, The Story of Stuff: The impact of overconsumption on the planet, our communities, and our health and how we can make it better, Free Press, New York, 2010.
4. Romain Rolland, Advaita Ashrama, The Life of Vivekananda and the Universal gospel, India, 2010.
5. Mohandas Karamchand Gandhi, The story of my experiments with truth: Mahatma Gandhi Autobiography, B. N. Publishing, 2008.
6. Cecile Andrews, Slow is beautiful: New Visions of Community, New Society Pub-

- lishers, Canada, 2006.
7. A. N. Tripathi, Human Values, New Age International Publishers, New Delhi, 2004.
 8. Dharampal, Rediscovering India, Society for Integrated Development of Himilaya, 2003.
 9. Romain Rolland, Srishti Publishers & Distributors, Mahatma Gandhi: The Man who become one with the Universal Being, New Delhi, 2002.
 10. A. Nagaraj, JeevanVidya Prakashan, Amarkantak, JeevanVidya: EkParichaya, 1999.
 11. Maulana Abul Kalam Azad, Orient Blackswan, India Wins Freedom: The Complete Version, 1988.
 12. E. F. Schumacher, Small is beautiful: A study of economics as if people mattered, Vintage Books, London, 1993

E-RESOURCES AND OTHER DIGITAL MATERIALS

1. A Foundation Course in Human Values and Professional Ethics, <https://dokumen.pub/a-foundation-course-in-human-values-and-professional-ethicsfirstnbsped-9788174467812.html>, Last Accessed On: 12/05/2024.
2. AICTE – SIP, https://www.youtube.com/channel/UCo8MpJB_aaVwB4LWLx6AhQ, Last Accessed On: 16/3/2024.
3. AICTE UHV Teaching Learning Material, <https://fdp-si.aicte-india.org/download.php#1>, Last Accessed On: 28/3/2024.

23ES3103C

DIGITAL LOGIC & COMPUTER ORGANISATION

Course Category	Engineering Science	Credits	3
Course Type	Theory	L-T-P	3-0-0
Prerequisites	23ES2103B	Continuous Eval	30
	Basic Electrical and Electronics	Semester End Eval	70
	Engineering	Total Marks	100

COURSE OUTCOMES

1. Understand digital logic principles and basic structure of a computer.
2. Apply concepts of combinational and sequential logic to design digital circuits.
3. Apply algorithms to perform arithmetic operations on fixed point and floating point data.
4. Understand Processor, Memory and I/O organization of basic computer.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 – Medium, 3 – High)

CO	PO												PSO		BTL	POI
	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
1	2													2	2	1.2.1, 1.7.1
2	1	2	2										1		3	1.7.1, 2.7.1, 2.7.2, 3.7.1, 3.8.1
3	1	2													3	1.6.1, 1.7.1, 2.7.1, 2.8.1
4	1	2												2	2	1.7.1, 2.7.1, 2.8.1

COURSE CONTENT

UNIT I

Data Representation: Binary Numbers, Fixed Point Representation, Floating Point Representation, Number base conversions, Octal and Hexadecimal Numbers, Complements, Signed binary numbers, Binary codes.

Digital Logic Circuits-I: Basic Logic Functions, Logic gates, universal logic gates, Minimization of Logic Expressions. K-Map Simplification, Combinational Circuits, Decoders, Multiplexers

UNIT II

Digital Logic Circuits-II: Sequential Circuits, Flip-Flops, Binary counters, Registers, Shift Registers, Ripple counters.

Basic Structure of Computers: Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers, Computer Generations, VonNeumann Architecture.

UNIT III

Computer Arithmetic : Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations.

Processor Organization: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control and Multi programmed Control.

UNIT IV

The Memory Organization: Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage.

Input/Output Organization: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interface.

TEXTBOOKS

1. Morris Mano, Digital Logic and Computer Design, Pearson Education, 16th Impression, 2016.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, McGraw Hill, 5th Edition, 2014.
3. William Stallings, Computer Organization and Architecture, Pearson Education, 11th Edition, 2012.

REFERENCE BOOKS

1. M.Moris Mano, Computer Systems Architecture, Pearson Education, 3rd Edition, 2009.
2. Design, David A. Paterson, John L. Hennessy, Elsevier, Computer Organization and 2nd Edition, 2010.
3. Roth, Fundamentals of Logic Design, Thomson, 5th Edition, 2014.

E-RESOURCES AND OTHER DIGITAL MATERIALS:

1. IIT Guwahati Prof. Jatindra Kumar Deka <https://nptel.ac.in/courses/106103068>, Computer Organization and Architecture, Last Accessed On: 31-05-2024.

23CS3304**ADVANCED DATA STRUCTURES & ALGORITHMS ANALYSIS**

Course Category	Program Core	Credits	3
Course Type	Theory	L-T-P	3-0-0
Prerequisites	23PC2104A	Continuous Eval	30
	Data Structures	Semester End Eval	70
		Total Marks	100

COURSE OUTCOMES

1. Understand the functions of different nonlinear data structures- binary trees, search trees.
2. Apply graph-based algorithms, design technique - divide and conquer, and greedy methods for solving complex problems.
3. Apply dynamic programming and backtracking design techniques to solve complex problems.
4. Apply the concepts of Branch and Bound techniques to solve complex problems.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 – Medium, 3 – High)

CO	PO												PSO		BTL	POI
	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
1	1	2											1	1	2	1.2.1, 1.6.1, 1.7.1, 2.5.2
2	1	2	3										1	1	3	1.2.1, 1.6.1, 1.7.1, 2.5.2, 2.6.4, 3.5.1
3	1	2	3										1	1	3	1.2.1, 1.6.1, 1.7.1, 2.5.2, 2.7.1, 3.5.1
4	1	2	3										1	1	3	1.2.1, 1.6.1, 1.7.1, 2.5.2, 2.6.4, 2.7.1, 3.5.1

COURSE CONTENT**UNIT I**

Introduction to Algorithm Analysis: Space and Time Complexity analysis, Asymptotic Notations.

AVL Trees Creation, Insertion, Deletion operations and Applications.

B-Trees Creation, Insertion, Deletion operations and Applications.

Heap Trees (Priority Queues) Min and Max Heaps, Operations and Applications.

UNIT II

Graphs: Terminology, Representations, Basic Search and Traversals, Connected Components and Biconnected Components, applications

Divide and Conquer: The General Method, Quick Sort, Merge Sort, Stassen's matrix multiplication, Convex Hull

Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths.

UNIT III

Dynamic Programming: General Method, All pairs shortest paths, Single Source Shortest Paths– General Weights (Bellman Ford Algorithm), Optimal Binary Search Trees, 0/1 Knapsack, String Editing, Travelling Salesperson problem.

Backtracking: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem.

UNIT IV

Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem.

NP Hard and NP Complete Problems: Basic Concepts, Cook's theorem.

NP Hard Graph Problems: Clique Decision Problem (CDP), Chromatic Number Decision Problem (CNDP), Traveling Salesperson Decision Problem (TSP).

NP Hard Scheduling Problems: Scheduling Identical Processors, Job Shop Scheduling.

TEXTBOOKS

1. Reema Thareja, Data Structures using C, Oxford University Press, 2nd Edition, 2014. (Unit I)
2. Ellis Horowitz, Satraj Sahni and Rajasekharan, Fundamentals of Computer Algorithms, Galgotia Publications Pvt. Ltd, 2nd Edition, 2008. (Unit II, III, and IV).

REFERENCE BOOKS

1. Horowitz Sahni and Anderson-Freed, Fundamentals of Data Structures in C, Universities Press, 2nd Edition, 2008.
2. Richard F. Gilberg & B.A. Forouzan, Data Structures A Pseudo code Approach with C, Cengage Learning, 2nd Edition, 2007.
3. M.T. Goodrich and R. Tomassia, Algorithm Design: Foundations, Analysis and Internet examples, John Wiley and sons, 2nd Edition, 2006.
4. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, Mit Press, 3rd Edition, 2009.
5. Allen Weiss, Data structures and Algorithm Analysis in C, Pearson Education, 2nd Edition, 2002.

E-RESOURCES AND OTHER DIGITAL MATERIALS

1. Advanced Data Structures Course, <https://www.tutorialspoint.com/advanceddatastructures/index.asp>, Last Accessed On: 31/5/2024.
2. Computer Algorithms, <http://peterindia.net/Algorithms.html>, Last Accessed on: 24-06-2024.

23CS3305**OBJECT ORIENTED PROGRAMMING THROUGH JAVA**

Course Category	Program Core	Credits	3
Course Type	Theory	L-T-P	3-0-0
Prerequisites	23ES1104	Continuous Eval	30
	Introduction to	Semester End Eval	70
	Programming	Total Marks	100

COURSE OUTCOMES

1. Understand the basic concepts of object oriented programming.
2. Interpret multiple inheritances through interfaces for a given application.
3. Apply exceptions, thread capabilities and handling files on a given application.
4. Illustrate the use of functional programming and Collections framework for a given application.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 – Medium, 3 – High)

CO	PO												PSO		BTL	POI
	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
1	2	3													2	1.7.1, 2.5.1, 2.5.2, 2.7.1
2	2	2	3										2	2	3	1.7.1, 2.5.1, 2.5.2, 2.6.3, 2.7.1, 3.5.1, 3.8.2
3	2	2	3										2	2	3	1.7.1, 2.5.1, 2.5.2, 2.6.3, 2.6.4, 3.5.1, 3.8.2
4	1	2	3	2	2								2	2	3	1.7.1, 2.5.1, 2.5.2, 2.6.3, 2.6.4, 3.5.1, 3.6.2, 3.8.2, 4.6.2, 5.4.2

COURSE CONTENT**UNIT I**

Introduction, The History and Evolution of Java: Java history and evolution, Java features, Java's Magic: Byte Code, How Java differs from C and C++.

An Overview of Java: Object Oriented Programming: Two paradigms, Principles of OOP, A First simple Program and Control statements. Data Types, Variables and Arrays: Java keywords, Primitive types, Integers, Floating-Point Types, Characters, Booleans, Variables, Operators, Type Conversion, Casting and Arrays.

Introducing Classes and Objects: Class fundamentals, declaring objects, assigning object reference variables, introducing methods, constructors, this keyword, Garbage collection, overloading methods, using objects as parameters, returning objects, static and final keywords, nested and inner classes.

UNIT II

String Handling: The String Constructors, String Buffer Class, String Tokenizer class.

Inheritance: Inheritance basics, using super, multilevel hierarchy, method overriding, dynamic method dispatch, using abstract classes, final with inheritance.

Packages & Interfaces: Defining a package, finding package and CLASSPATH. Access protection, importing packages, Defining an interface, implementing interfaces, nested interfaces, applying interfaces, variables in interfaces.

UNIT III

Exception handling: Exception handling fundamentals, exception types, uncaught exceptions, using try and catch, multiple catch clauses, throw, throws, finally, creating your own exception subclasses.

I/O streams: Byte Streams- Input Stream, Output Stream, File Input Stream, File Output Stream, Character Streams- Reader, Writer, File Reader, and File Writer.

Multithread Programming: The Java Thread Model, Creating a thread: Implementing Runnable, Extending Thread, creating multiple threads, Thread Priorities, Synchronization- Using Synchronized methods, The synchronized Statement.

UNIT IV

Pragmatic Functional Programming using Lambdas: Introduction to Functional programming, Functional Programming concepts and terminology, Functional Interfaces, Working with Lambda Expressions and Method References.

Collections Framework: Collections overview, Collection interfaces: Collection, List, and Set. Collection Classes: Array List, Linked List, Hash Set. Map Classes: Hash Map, Tree Map

The Stream API: Stream basics, Reduction operations, Using parallel streams, Mapping, Collecting, Iterators and Streams.

TEXTBOOKS

1. Herbert Schildt, Java The Complete Reference, Oracle Press, 11th Edition, 2019.

REFERENCE BOOKS

1. Herbert Schildt, Dale Skrien, Java Fundamentals: A Comprehension Introduction, McGraw-Hill Education India Pvt., Special Indian Edition, Ltd, 2017.
2. E Balaguruswamy, Programming with Java, Mc Graw Hill, 4th Edition, 2020.
3. Paul J. Dietel and Dr.Harvey M. Deitel, “Java How to Program”, Deitel & Associates, 11th Edition, 2018.

4. Timothy Budd, Understanding Object Oriented Programming with Java, Pearson Education, Updated edition, 2013.
5. Kathy Sierra & Bert Bates, Head First Java, Oreilly, 2nd Edition, 2023.

E-RESOURCES AND OTHER DIGITAL MATERIALS

1. Prof. Debasis Samanta, Department of Computer Science & Engineering, I.I.T, Kharagpur, Swayam, NPTEL, https://onlinecourses.nptel.ac.in/noc21_cs03/preview, Last Accessed On: 14/04/ 2024.
2. Evan Jones, Adam Marcus, Eugene Wu Introduction to Programming in Java, MIT OpenCourseWare, Massachusetts Institute of Technology, <https://ocw.mit.edu/courses/6-092-introduction-to-programming-in-java-january-iap-2010/>, Last Accessed On: 28/05/2024.
3. Prof. Owen Astrachan, Object Oriented Programming in Java, Duke University, <https://www.coursera.org/specializations/object-oriented-programming>, Last Accessed On: 21/05/2024.
4. Dheeru Mundluru, Java In-Depth: Become a Complete Java Engineer, Udemy, <https://www.udemy.com/course/java-in-depth-become-a-complete-java-engineer/>, Last Accessed On: 14/05/2024.
5. Prof. Olufisayo Omojokun, Introduction to OOPS with Java I: Foundations and Syntax Basics, Georgia Institute of Technology, edX, <https://www.edx.org/certificates/professional-certificate/gtx-introduction-to-object-oriented-programming-with-java>, Last Accessed On: 04/05/2024.

23TP3106

LOGIC & REASONING

Course Category	Soft Skill-1	Credits	1
Course Type	Theory	L-T-P	0-0-2
Prerequisites	–	Continuous Eval	100
		Semester End Eval	0
		Total Marks	100

COURSE OUTCOMES

1. Think reason logically in any critical situation.
2. Analyze given information to find correct solution.
3. To reduce the mistakes in day to day activities in practical life.
4. Develop time management skills by approaching different shortcut methods.
5. Use mathematical based reasoning to make decisions.
6. Apply logical thinking to solve problems and puzzles in qualifying exams for companies and in other competitive exams.

COURSE CONTENT

UNIT I

1. Series Completion
2. Coding-Decoding
3. Blood Relation
4. Puzzles test

UNIT II

1. Direction sense test
2. Logical Venn diagrams
3. Number test, ranking test
4. Mathematical operations

UNIT III

1. Arithmetical Reasoning
2. Inserting missing character
3. Syllogism
4. Binary logic
5. Data sufficiency

UNIT IV

1. Water images
2. Mirror images
3. Paper folding
4. Paper cutting
5. Embedded Figures
6. Dot situation

7. Cubes & Dice

TEXTBOOKS

1. R. S. Aggarwal, Verbal and non-verbal reasoning, S Chand publication, Revised Edition, 2017, ISBN:81-219-0551-6,
2. Vikramjeeth, Reasoning Guru Verbal & Non-Verbal Reasoning, Multilingual Edition, 2023, ISBN :978-9358706000.

23CS3651

PYTHON PROGRAMMING LAB

Course Category	Skill Enhancement Course	Credits	1
Course Type	Laboratory	L-T-P	0-0-2
Prerequisites	23ES1152 Computer Programming Lab	Continuous Eval	30
		Semester End Eval	70
		Total Marks	100

COURSE OUTCOMES

1. Introduce core programming concepts of Python programming language.
2. Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
3. Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO												PSO		BTL	POI
	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
1	2	2	1											1	1	1.6.1, 1.7.1, 2.5.2, 3.6.1, 3.7.2
2	2	2		2										1	1	1.7.1, 1.5.1, 2.5.1, 2.6.2, 4.4.2, 4.5.1
3	3		2		2									1	1	1.6.1, 1.7.1, 3.6.1, 3.6.3, 3.8.3, 5.4.2

UNIT-I:

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupiter Notebook.

Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.

Control Flow Statements: if statement, if-else statement, if...elif...else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

Sample Experiments:

1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples. i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators
5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number.

UNIT-II:

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments. Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings. Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

Sample Experiments:

1. Write a program to define a function with multiple return values.
2. Write a program to define a function using default arguments.
3. Write a program to find the length of the string without using any library functions.
4. Write a program to check if the substring is present in a given string or not.
5. Write a program to perform the given operations on a list: i. Addition ii. Insertion iii. Slicing 6. Write a program to perform any 5 built-in functions by taking any list.

UNIT-III:

Dictionaries: Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement. Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset.

Sample Experiments:

1. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
2. Write a program to count the number of vowels in a string (No control flow allowed).
3. Write a program to check if a given key exists in a dictionary or not.
4. Write a program to add a new key-value pair to an existing dictionary.
5. Write a program to sum all the items in a given dictionary.

UNIT-IV:

Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules. Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism.

Sample Experiments:

1. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
2. Python program to print each line of a file in reverse order.
3. Python program to compute the number of characters, words and lines in a file.
4. Write a program to create, display, append, insert and reverse the order of the items in the array.
5. Write a program to add, transpose and multiply two matrices.
6. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter.
7. Implement subclasses for different shapes like circle, triangle, and square.

UNIT-V:

Introduction to Data Science: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.

Sample Experiments:

1. Python program to check whether a JSON string contains complex object or not.
2. Python Program to demonstrate NumPy arrays creation using array () function.
3. Python program to demonstrate use of ndim, shape, size, dtype.
4. Python program to demonstrate basic slicing, integer and Boolean indexing.
5. Python program to find min, max, sum, cumulative sum of array
6. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows: a) Apply head () function to the pandas data frame b) Perform various data selection operations on Data Frame
7. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

TEXT BOOKS

1. Anuradha A. Puntambekar, Programming and Problem Solving using Python (Fundamentals and Applications), Technical Publication, 1st Edition, 2020.

REFERENCE BOOKS

1. Gowri shankar S, Veena A, Introduction to Python Programming, CRC Press, Special Indian Edition, 2019.
2. S Sridhar, J Indumathi, V M Hariharan, Python Programming, Pearson Education, 2nd Edition, 2024
3. Daniel Liang, Introduction, to Programming Using Python, Y, Pearson Education, 1st Edition, 2023.

E-RESOURCES AND OTHER DIGITAL MATERIALS

1. Python for Data Science, AI & Development, <https://www.coursera.org/learn/python-for-applied-data-science-ai>, Last Accessed On: 19/03/2024.
2. Programming for Everybody (Getting Started with Python), <https://www.coursera.org/learn/python?specialization=python#syllabus>, Last Accessed On: 05/04/2024.

23CS3352**ADVANCED DATA STRUCTURES & ALGORITHMS LAB**

Course Category	Program Core	Credits	1.5
Course Type	Laboratory	L-T-P	0-0-3
Prerequisites	23PC2152A	Continuous Eval	30
	Data Structures Lab	Semester End Eval	70
		Total Marks	100

COURSE OUTCOMES

1. Implement AVL trees, B-Trees, and Heap Trees, efficient binary trees, M-way search trees, graph traversal and shortest path algorithms.
2. Implement graph-based algorithms, design technique - divide and conquer, and greedy methods for solving complex problems.
3. Implement solutions for problems using dynamic programming and backtracking.
4. Apply Branch and Bound techniques to write programs for different problems.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 – Medium, 3 – High)

CO	PO												PSO		BTL	POI
	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
1	2	2											3		3	1.2.1, 1.7.1, 2.5.1, 2.5.2, 2.5.3, 2.6.3
2	2	3	3										3		3	1.7.1, 2.5.1, 2.5.2, 2.6.3, 2.6.4, 3.5.1
3	2	3	3										3		3	1.7.1, 2.5.1, 2.5.2, 2.6.3, 2.6.4, 3.5.1
4	2	3	3										3		3	1.7.1, 2.5.1, 2.5.2, 2.6.3, 2.6.4, 3.5.1

Experiments covering the Topics:

1. Operations on AVL trees, B-Trees, Heap Trees
2. Graph Traversals
3. Sorting techniques
4. Minimum cost spanning trees
5. Shortest path algorithms
6. 0/1 Knapsack Problem
7. Travelling Salesperson problem
8. Optimal Binary Search Trees

9. N-Queens Problem
10. Job Sequencing

Sample Programs:

1. Construct an AVL tree for a given set of elements which are stored in a file. And implement insert and delete operation on the constructed tree. Write contents of tree into a new file using in-order.
2. Construct B-Tree an order of 5 with a set of 100 random elements stored in array. Implement searching, insertion and deletion operations.
3. Construct Min and Max Heap using arrays, delete any element and display the content of the Heap.
4. Implement BFT and DFT for given graph, when graph is represented by a) Adjacency Matrix b) Adjacency Lists
5. Write a program for finding the biconnected components in a given graph.
6. Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).
7. Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists.
8. Implement Job Sequencing with deadlines using Greedy strategy.
9. Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.
10. Implement N-Queens Problem Using Backtracking.
11. Use Backtracking strategy to solve 0/1 Knapsack problem.
12. Implement Travelling Sales Person problem using Branch and Bound approach.

TEXTBOOKS

1. Reema Thareja, Data Structures using C, Oxford University Press, 2nd Edition, 2014.
2. Ellis Horowitz, Satraj Sahni and Rajasekharan, Fundamentals of Computer Algorithms, Galgotia Publications Pvt. Ltd, 2nd Edition, 2008.

REFERENCE BOOKS

1. Horowitz Sahni and Anderson-Freed, Fundamentals of Data Structures in C, Universities Press, 2nd Edition, 2008.
2. Richard F.Gilberg & B.A.Forouzan, Data Structures A Pseudo code Approach with C, Cengage Learning, 2nd Edition, 2007.
3. M.T.Goodrich and R.Tomassia, Algorithm Design: Foundations, Analysis and Internet examples, John Wiley and sons, 2nd Edition, 2006.
4. T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein, Introduction to Algorithms, Mit Press, 3rd Edition, 2009.
5. Allen Weiss, Data structures and Algorithm Analysis in C, Pearson Education, 2nd Edition, 2002.

E-RESOURCES AND OTHER DIGITAL MATERIALS

1. Advanced Data Structures Course, <https://www.tutorialspoint.com/advanceddatastructures/index.asp>, Last Accessed On: 31/5/2024.
2. Computer Algorithms, <http://peterindia.net/Algorithms.html>, Last Accessed on: 24-06-2024.

23CS3353**OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB**

Course Category	Program Core	Credits	1.5
Course Type	Laboratory	L-T-P	0-0-3
Prerequisites	23ES1152	Continuous Eval	30
	Computer –	Semester End Eval	70
	Programming Lab	Total Marks	100

COURSE OUTCOMES

1. Apply the basic concepts of object oriented programming.
2. Apply multiple inheritance through interfaces for a given application.
3. Apply exceptions, thread capabilities and handling files on a given application.
4. Apply functional programming and Collections framework for a given application.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 – Medium, 3 – High)

CO	PO												PSO		BTL	POI
	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
1	2	3													3	1.7.1, 2.5.1, 2.5.2, 2.7.1
2	2	2	3										2	2	3	1.7.1, 2.5.1, 2.5.2, 2.6.3, 2.7.1, 3.5.1, 3.8.2
3	2	2	3										2	2	3	1.7.1, 2.5.1, 2.5.2, 2.6.3, 2.6.4 3.5.1, 3.8.2
4	1	2	3										2	2	3	1.7.1, 2.5.1, 2.5.2, 2.6.3, 2.6.4, 3.5.1, 3.6.2, 3.8.2

COURSE CONTENT

Task 1: Apply fundamentals of Java Data types, Variables, Operators, and Control Statements to a given application.

Task 2: Apply the concepts of Classes and Objects to a given application.

Task 3: Apply the concepts of Arrays to a given application.

Task 4: Apply Inheritance and types of Inheritance of a given application.

Task 5: Use concepts of String and String Tokenizer classes and develop a java application.

Task 6: Use Interfaces and develop a java application.

Task 7: Create a package and access members of a package.

Task 8: Apply the concepts of Method Overloading and Method Overriding.

Task 9: Apply the concepts of Exception Handling.

Task 10: Develop a Java application to copy content from one file to another file using I/O Streams.

Task 11: Apply the concepts of Threads and Multithreading on a given application.

Task 12: Apply the concepts of Lambda Expressions, Collections Framework and Stream API.

Lab Projects:

1. Design and develop an automated ballot vote system.
2. Design and develop a banking application.

TEXTBOOKS

1. Herbert Schildt, Java The Complete Reference, Oracle Press, 11th Edition, 2019.

REFERENCE BOOKS

1. Herbert Schildt, Dale Skrien, Java Fundamentals: A Comprehension Introduction, McGraw-Hill Education India Pvt., Special Indian Edition, Ltd, 2017.
2. E Balaguruswamy, Programming with Java, Mc Graw Hill, 4th Edition, 2020.
3. Paul J. Dietel and Dr. Harvey M. Deitel, “Java How to Program”, Deitel & Associates Inc., 11th Edition, 2018.
4. Timothy Budd, Understanding Object Oriented Programming with Java, Pearson Education, Updated edition, 2013.
5. Kathy Sierra & Bert Bates, Head First Java, Oreilly, 2nd Edition, 2023.

E-RESOURCES AND OTHER DIGITAL MATERIALS

1. Prof. Debasis Samanta, Department of Computer Science & Engineering, I.I.T, Kharagpur, Swayam, NPTEL, <https://onlinecourses.nptel.ac.in/>, Last Accessed On: 14/04/ 2024.
2. Evan Jones, Adam Marcus, Eugene Wu, Introduction to Programming in Java, MIT OpenCourseWare, Massachusetts Institute of Technology, https://ocw.mit.edu/search/?s=department_course_numbers.sort_coursenum, Last Accessed On: 28/05/2024.
3. Prof. Owen Astrachan, Object Oriented Programming in Java, Duke University, <https://www.coursera.org/specializations/object-oriented-programming>, Last Accessed On: 21/05/2024.
4. Dheeru Mundluru, Java In-Depth: Become a Complete Java Engineer, Udemy, <https://www.udemy.com/course/java-in-depth-become-a-complete-java-engineer/>, Last Accessed On: 14/05/2024.
5. Prof. Olufisayo Omojokun, Introduction to OOPS with Java I: Foundations and Syntax Basics, Georgia Institute of Technology, edX, <https://www.edx.org/certificates/professional-certificate/gtx-introduction-to-object-oriented-programming-with-java>, Last Accessed On: 04/05/2024.

SEMESTER IV

23BS4101B

DISCRETE MATHEMATICS & GRAPH THEORY

Course Category	Engineering Science	Credits	3
Course Type	Theory	L-T-P	3-0-0
Prerequisites		Continuous Eval	30
		Semester End Eval	70
		Total Marks	100

COURSE OUTCOMES

1. Analyze of propositional calculus and first order logic.
2. Apply the basic and advanced counting techniques.
3. Analyze of relations and digraphs and their applications.
4. Analyze of graphs and their applications.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 – Medium, 3 – High)

CO	PO												PSO		BTL	POI
	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
1	3	3		1								1			4	1.2.1, 1.7.1, 2.5.1, 4.6.3, 12.4.2
2	3	3		1								1			3	1.2.1, 2.5.1, 2.5.3, 4.6.3, 12.4.2
3	3	3		1								1			4	1.2.1, 2.8.1, 4.4.1, 12.4.2
4	3	3		1								1			4	1.2.1, 1.7.1, 2.5.1, 4.6.3, 12.4.2

COURSE CONTENT

UNIT I

Propositional Calculus:

Fundamentals of Logic: Propositions, Connectives, Propositional functions, Truth tables, Tautology, Contradiction, Logical equivalences, Normal forms, Logical inferences, Methods of proof of an implication.

First Order Predicate Logic: Predicate, Quantifiers, Rules of inference for Quantified propositions.

UNIT II

Counting Techniques:

Basics of Counting: Sum and product rules, Indirect counting, One to one correspondence, Combinations and permutations, Enumerating combinations and permutations with and without repetitions.

Advanced Counting Techniques: Generating function of sequences, Recurrence relations, Solving recurrence relations – substitution- Generating functions-The method of characteristic roots, Solution of inhomogeneous recurrences relations.

UNIT III

Relations and Digraphs: Relations and basic graphs, Special properties of binary relations, Equivalence relation, Partially ordered sets, Hasse diagrams, Lattices, Operations on relations, Paths and closures, Directed graphs and Adjacency matrices, Transitive closure, Warshall's algorithm.

UNIT IV

Graph Theory: Introduction(graphs, sub graphs, circuits, trees) Sum of degrees theorem, Isomorphism and sub graphs, planar graphs, Euler's formula, Multi graphs and Euler's circuits, Hamiltonian graphs, Grin-berg's theorem, Graph coloring, Chromatic numbers.

TEXTBOOKS

1. Joe L. Mott, Abraham Kandel, and Theodore P. Baker: Discrete Mathematics for Computer Scientists & Mathematicians, PHI, 2nd Edition.

REFERENCE BOOKS

1. J. P. Tremblay and R.Manohar: Discrete Mathematical structures with applications to computer science, MGHE.
2. K. H. Rosen: Discrete Mathematics and its Applications, Mc Graw Hill Companies, 7th Edition.
3. D. S. Malik and M. K. Sen: Discrete Mathematical Structures: Theory and applications

E-RESOURCES AND OTHER DIGITAL MATERIALS

1. Prof. Arindama Singh Department of Maths IIT Madras, <https://nptel.ac.in/courses/111/106/111106052/>, Last accessed on: 15/11/2024.
2. Prof Soumen Maity, Department of Maths, IISER Pune, <https://nptel.ac.in/courses/111/106/111106102/>, Last accessed on: 15/11/2024.
3. Dr.L.Sunil Chandran, Department of Computer Science and Automation, IISC Bangalore, <https://nptel.ac.in/courses/106/108/106108051/>, Last accessed on: 15/11/2024.

23BS4102B

PROBABILITY AND STATISTICS

Course Category	Basic Science	Credits	3
Course Type	Theory	L-T-P	3-0-0
Prerequisites	23BS1101 Linear Algebra	Continuous Eval	30
		Semester End Eval	70
		Total Marks	100

COURSE OUTCOMES

1. Examine probability distributions with random variables.
2. Apply random phenomena of sample to test the Hypothesis concerning means.
3. Analyze the Hypothesis concerning variance and proportions.
4. Estimate Correlation and Regression coefficients.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 – Medium, 3 – High)

CO	PO												PSO		BTL	POI
	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
1	3	3		2											3	1.2.1, 1.2.2, 2.6.3, 4.6.1
2	3	3		2											3	1.2.2, 2.6.3, 4.6.1, 4.6.3
3	3	3		2											4	1.2.2, 2.6.3, 4.6.1, 4.6.3
4	3	3		2											3	1.2.1, 2.6.3, 4.6.1, 4.6.3

COURSE CONTENT

UNIT I

Probability Distributions: Random Variables (discrete and continuous) , Expectation, Variance and Standard deviation of discrete random variable, Binomial distribution, Poisson distribution. Expectations, Variance and standard deviation of continuous random variables, Normal distribution, Normal approximation to the Binomial distribution.

Joint distribution: Joint distributions-Discrete and Continuous.

UNIT II

Sampling Distributions: Introduction, Populations and Samples.

Inferences Concerning Mean: Point Estimation- Interval Estimation. Test of

Hypothesis – Null Hypothesis and Tests of Hypothesis – Hypothesis concerning one mean – Relation between tests and Confidence intervals –Operating characteristic curves - Inferences concerning two means.

UNIT III

Inferences Concerning Variances: Estimation of variances- Hypothesis concerning one variance- Hypothesis concerning two variances.

Inference Concerning Proportions: Estimation of Proportions- Hypothesis concerning one Proportion- Hypothesis concerning several Proportions – The Analysis of r x c Tables- Goodness of fit.

UNIT IV

Correlation: Types of Correlation, Scatter diagram, Karl Pearson's coefficient of correlation, Rank Correlation.

Regression Analysis: The method of least squares, Multiple Regression.

TEXTBOOKS

1. Johnson, R. A. (2011). Probability and statistics for engineers (8th ed.). Prentice Hall India Learning Private Limited.

REFERENCE BOOKS

1. Walpole, R. E., Myers, R. H., Myers, S. L., & Ye, K. (1993). Probability and statistics for engineers and scientists (Vol. 5). New York: Macmillan.
2. Biswal, P. C.(2007). Probability and statistics. Prentice Hall India Learning Private Limited.
3. Iyengar, T. K. V., Gandhi, B. K., Ranganadham, S., & Prasad, M. V. S. S. N, (2008). Probability and statistics. S. Chand Publishing.

E-RESOURCES AND OTHER DIGITAL MATERIALS

1. Prof. Somesh Kumar, Department of Maths, IIT Kharagpur, <https://nptel.ac.in/courses/111105090>, Last Accessed on: 10/11/2024.
2. Prof. Niladri Chatterjee, Department of Maths, IIT Delhi, <https://nptel.ac.in/courses/111102112>, Last Accessed on: 10/11/2024.
3. Prof. Soumen Maity, Department of Maths, IISER Pune, <https://nptel.ac.in/courses/111105042>, Last Accessed on: 10/11/2024.

23CS4303

OPERATING SYSTEMS

Course Category	Program Core	Credits	3
Course Type	Theory	L-T-P	3-0-0
Prerequisites	23ES1104	Continuous Eval	30
	Introduction to	Semester End Eval	70
	Programming	Total Marks	100

COURSE OUTCOMES

1. Understand the basic components of an Operating System.
2. Apply CPU Scheduling techniques and mechanisms used for process synchronization.
3. Analyse Memory management techniques and methods for handling deadlocks.
4. Analyse File system Implementation techniques and protection mechanisms.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 – Medium, 3 – High)

CO	PO												PSO		BTL	POI
	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
1	3												1	1	2	1.7.1
2	2	2	3										1	1	3	1.7.1, 2.6.3, 2.6.4, 2.8.3, 2.8.4, 3.7.1
3	2	2	3										1	2	4	1.7.1, 2.5.2, 2.6.3, 2.6.4, 2.8.4, 3.7.1
4	2	2	3										1	2	4	1.7.1, 2.5.2, 2.6.3, 2.6.4, 2.8.4, 3.7.1

COURSE CONTENT

UNIT I

System Structures: Operating System Services, User and Operating-System Interface, system calls, Types of System Calls, system programs, operating system Design and Implementation, operating system structure, Building and Booting an Operating System, Operating system debugging.

Processes: Process Concept, Process scheduling, Operations on processes, Inter-process communication.

Threads and Concurrency: Multithreading models, Thread libraries, threading issues.

UNIT II

CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, multiple processor scheduling.

Synchronization Tools: The Critical Section Problem, Peterson's Solution, Mutex Locks, Semaphores, Monitors, Classic problems of Synchronization.

UNIT III

Deadlocks: system Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock.

Memory-Management Strategies: Introduction, Contiguous memory allocation, Paging, Structure of the Page Table, Swapping.

Virtual Memory Management: Introduction, Demand paging, Copy-on-write, Page replacement, Allocation of frames, Thrashing.

Storage Management: Overview of Mass Storage Structure, HDD Scheduling.

UNIT IV

File System: File System Interface: File concept, Access methods, Directory Structure; File system Implementation: File-system structure, File-system Operations, Directory implementation, Allocation method.

Free space management: File-System Internals: File-System Mounting, Partitions and Mounting, File Sharing.

Protection: Goals of protection, Principles of protection, Protection Rings, Domain of protection, Access matrix.

TEXTBOOKS

1. Silberschatz A, Galvin P B, Gagne G, Operating System Concepts, Wiley, 10th Edition, 2018.
2. Tanenbaum A S, Modern Operating Systems, Galgotia Publications Pvt. Ltd, 4th Edition, 2016.

REFERENCE BOOKS

1. Stallings W, Operating Systems -Internals and Design Principles, Pearson, 9th Edition, 2018.
2. D.M Dhamdhere, Operating Systems: A Concept Based Approach, McGraw- Hill, 3rd Edition, 2013.

E-RESOURCES AND OTHER DIGITAL MATERIALS

1. Prof Santanu Chattopadhyay - NPTEL Course on Operating Sytems, <https://nptel.ac.in/courses/106/105/106105214/>, Last Accessed On: 28/10/2024.
2. Stanford University - Lecture Notes on Operating Systems, <https://www.scs.stanford.edu/21wi-cs140/notes>, Last Accessed on: 28/10/2024.
3. IIT Bombay – Lecture Notes on Operating Systems , <https://www.cse.iitb.a>

c.in/~mythili/os/, Last Accessed on: 28/10/2024.

23CS4304

DATABASE MANAGEMENT SYSTEMS

Course Category	Program Core	Credits	3
Course Type	Theory	L-T-P	3-0-0
Prerequisites	23PC2104A:	Continuous Eval	30
	Data Structures	Semester End Eval	70
	23CS3304: Advanced Data Structures & Algorithms Analysis	Total Marks	100

COURSE OUTCOMES

1. Apply database management techniques using relational SQL database to real world applications.
2. Analyse the Entity-Relationship models, in turn develop the Relational models that leads to database design.
3. Apply various normalization techniques to relational models in order to improve database design quality.
4. Understand database transactions processing, protocols for Concurrency control and Recovery techniques in database.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 – Medium, 3 – High)

CO	PO												PSO		BTL	POI
	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
1	1	2	3										2	2	3	1.7.1, 2.5.2, 2.5.3, 2.6.3, 2.6.4, 2.8.4, 3.5.6.
2	1	2	3										1	1	4	1.7.1, 2.5.2, 2.5.3, 2.6.3, 2.7.2, 3.5.6, 3.6.2
3	1	2	3										1	1	3	1.7.1, 2.5.2, 2.5.3, 2.6.3, 2.7.2, 3.5.6, 3.6.2
4	1	2											1	1	2	1.7.1, 2.5.2, 2.6.3, 2.7.2

COURSE CONTENT

UNIT I

Introduction: Database system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of

different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update). Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions (Date and Time, Numeric, String conversion). Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view (updatable and non updatable), relational set operations.

UNIT II

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Database Design using ER-to-Relational Mapping.

UNIT III

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Lossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd normal form (BCNF), MVD, Fourth normal form (4NF), Fifth Normal Form (5NF).

UNIT IV

Transaction Processing, Concurrency Control, and Recovery: Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability, Two-Phase Locking Techniques for Concurrency Control, Recovery Concepts, NO-UNDO/REDO Recovery Techniques based on Deferred Update, Recovery Techniques Based on Immediate Update, Shadow Paging, The ARIES Recovery Algorithm.

TEXTBOOKS

1. Raghurama Krishnan, Johannes Gehrke, TMH, Database Management Systems, 3rd Edition. (For Chapters 2, 3, 4)
2. Silberschatz, Korth, Sudarsan, TMH, Database System Concepts, 5th Edition, (For Chapter 1 and Chapter 5)

REFERENCE BOOKS

1. C J Date, Introduction to Database Systems, Pearson, 8th Edition, Ltd,.
2. Ramez Elmasri, Shamkant ,B. Navathe, Database Management System, Mc Graw Hill, Pearson, 6th Edition.
3. Corlos Coronel, Steven Morris, Peter Robb, Database Principles Fundamentals of Design Implementation and Management, Cengage Learning.

E-RESOURCES AND OTHER DIGITAL MATERIALS

1. Dr S.Srinath IIT-Madras “Conceptual design process “ <https://nptel.ac.in/courses/106/106/106106093/>, Last accessed on: 12/11/2024.
2. Prof P.Srinivasa Kumar IIT-Madras “ Normalization process” <https://nptel.ac.in/courses/106/106/106106095/> Lecture 7, Last accessed on 12/11/2024.
3. Prof D.Janakiram IIT-Madras Concurrency Control techniques, <https://nptel.ac.in/courses/106/106/106106093/> Lecture 20,21,22,23, Last accessed on: 12/11/2024.
4. Andy Pavlo, Carnegie Mellon University, Relational model concepts, <https://15445.courses.cs.cmu.edu/fall2017/slides/01-introduction.pdf> Last accessed on: 12/11/2024.

23CS4305

SOFTWARE ENGINEERING

Course Category	Program Core	Credits	3
Course Type	Theory	L-T-P	2-1-0
Prerequisites	–	Continuous Eval	30
		Semester End Eval	70
		Total Marks	100

COURSE OUTCOMES

1. Understand the basic concepts of software engineering process models.
2. Apply the concepts of Estimation and Requirements for any given application.
3. Apply Design and Testing techniques for any given application.
4. Apply Software Development Life Cycle process using Case Tools.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 – Medium, 3 – High)

CO	PO												PSO		BTL	POI
	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
1	2	2											2	2	2	1.6.1, 1.7.1, 2.5.1, 2.5.2, 2.6.5, 2.7.1.
2	2	2	3										1	2	3	1.6.1, 1.7.1, 2.6.2, 2.7.1, 3.5.1, 3.5.2, 3.5.3, 3.5.6.
3	2	2	3										1	2	3	1.6.1, 1.7.1, 2.5.1, 2.7.1, 3.5.1, 3.6.1, 3.6.3, 3.8.1, 3.8.2.
4	2	2	3										1	2	3	1.6.1, 1.7.1, 2.5.2, 2.6.2, 2.7.1, 3.5.4, 3.6.1, 3.6.2.

COURSE CONTENT

UNIT I

Introduction: Evolution, Software development projects, Exploratory style of software developments, Emergence of software engineering, Notable changes in software development practices, Computer system engineering.

Software Life Cycle Models: Basic concepts, Waterfall model and its extensions, Rapid application development, Agile development model, Spiral model.

Agility: Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, Tool Set for the Agile Process (Text Book 2).

UNIT II

Software Project Management: Software project management complexities, Responsibilities of a software project manager, Metrics for project size estimation, Project estimation techniques, Empirical Estimation techniques, COCOMO, Halstead's software science, risk management.

Requirements Analysis And Specification: Requirements gathering and analysis, Software Requirements Specification (SRS), Formal system specification, Axiomatic specification, Algebraic specification, Executable specification and 4GL.

UNIT III

Software Design: Overview of the design process, how to characterize a good software design? Layered arrangement of modules, Cohesion and Coupling. approaches to software design.

Function-Oriented Software Design: Overview of SA/SD methodology, Structured analysis, Developing the DFD model of a system, Structured design, Detailed design, and Design Review.

User Interface Design: Characteristics of a good user interface, Basic concepts, Types of user interfaces, Fundamentals of component-based GUI development, and user interface design methodology.

Coding and Testing: Coding, Code review, Software documentation, Testing, Black-box testing, White-Box testing, Debugging, Program analysis tools, Integration testing, testing object-oriented programs, Smoke testing, and Some general issues associated with testing.

UNIT IV

Software Reliability and Quality Management: : Software reliability. Statistical testing, Software quality, Software quality management system, ISO 9000. SEI Capability maturity model. Few other important quality standards, and Six Sigma.

Computer-Aided Software Engineering (Case): CASE and its scope, CASE environment, CASE support in the software life cycle, other characteristics of CASE tools, Towards second generation CASE Tool, and Architecture of a CASE Environment.

Software Maintenance: Characteristics of software maintenance, Software reverse engineering, Software maintenance process models and Estimation of maintenance cost.

Software Reuse: reuse- definition, introduction, reason behind no reuse so far, Basic issues in any reuse program, A reuse approach, and Reuse at organization level.

TEXTBOOKS

1. Rajib Mall, Fundamentals of Software Engineering, -PHI Publication, 5th Edition.
2. Roger S. Pressman, Software Engineering A Practitioner's Approach, Mc-Graw Hill International Edition, 9th Edition.

REFERENCE BOOKS

1. Ian Sommerville, Software Engineering, Pearson, 10th Edition, Ltd,.
2. Deepak Jain, Software Engineering, Principles and Practices, Oxford University Press.

E-RESOURCES AND OTHER DIGITAL MATERIALS

1. Prof. Rajib Mall, IIT Kharagpur, Software Engineering, <https://nptel.ac.in/courses/106/105/106105182/>, Last accessed on: 22/10/2024.
2. Roger S Pressman, The future of Software Engineering, <https://www.youtube.com/watch?v=vbPo0yNOLQo> Lecture 7, Last accessed on: 22/11/2024.

20TP4106

ENGLISH FOR PROFESSIONALS

Course Category	Soft Skill-2	Credits	1
Course Type	Theory	L-T-P	0-0-2
Prerequisites	–	Continuous Eval	30
		Semester End Eval	70
		Total Marks	100

COURSE OUTCOMES

1. How conversations are made
2. The usage of grammar
3. Apply speaking skills through activities
4. Apply Etiquettes and manners

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 – Medium, 3 – High)

CO	PO												PSO		BTL	POI
	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
1	2	2											2	2	2	1.6.1, 1.7.1, 2.5.1, 2.5.2, 2.6.5, 2.7.1.
2	2	2	3										1	2	3	1.6.1, 1.7.1, 2.6.2, 2.7.1, 3.5.1, 3.5.2, 3.5.3, 3.5.6.
3	2	2	3										1	2	3	1.6.1, 1.7.1, 2.5.1, 2.7.1, 3.5.1, 3.6.1, 3.6.3, 3.8.1, 3.8.2.
4	2	2	3										1	2	3	1.6.1, 1.7.1, 2.5.2, 2.6.2, 2.7.1, 3.5.4, 3.6.1, 3.6.2.

COURSE CONTENT

UNIT I

Introduction: Beginners, Functional, Situational Conversations Introduction -Importance of spoken English in the placements and Group Discussion Beginners Conversation -Self Introduction-Introducing Self -Introducing each other in a team (Pair Activity) Functional Conversation -Seeking Permission from Seniors Teachers and other superiors (Team Activity) -Asking Direction-Direction from stranger or from Helpline -Making Requests-Requests for borrowing books, applications, or any other help from office staff in college or outside. Just a minute: -Give a topic and ask the student to

talk impromptu. -To present the topic in a structured manner.

UNIT II

Structuring and forming sentences -Structure of mother tongue and pit falls in translation to English. -Formation of sentences in English Errors in Usage -Difficulty in right usage of words. -Difficulty in Pronunciation-Phonetic differences in mother tongue and English –areas to improve. -Idioms and Phrase –Frequently used Idiom and Phrases which help to enhance the quality of presentation and make the presentation meaningful. -Meaning of frequently used Idioms and Phrases.

UNIT III

Introduction to different ways of speaking. -Elocution, Debate and Extempore - Principles of Elocution and its challenges practice in session. -Principles of Debates and its challenges –practice session. -Principles of Extempore - its pitfalls- practice sessions.

UNIT IV

Etiquette -Need of Etiquette in Social arena -Dining Etiquette -Social Etiquette in conversation -formal and informal gathering. -Book a table etc. Versant Test -Mode of versant Test, -Aim of the test and various methods it follows -Practice session.

REFERENCE BOOKS

1. Kamalesh Sadanand, “A Spoken English”, VOL 1&2; Orient BlackSwan, Second Edition,2014.
2. “Communicative English”; Pearson; 2010

23MC4107

ENVIRONMENTAL SCIENCE

Course Category	Audit Course	Credits	-
Course Type	Theory	L-T-P	2-0-0
Prerequisites	–	Continuous Eval	30
		Semester End Eval	70
		Total Marks	100

COURSE OUTCOMES

1. Identify various factors causing degradation of natural resource.
2. Identify various ecosystem and need for biodiversity.
3. Realize and explore the problems related to environmental pollution and its management.
4. Apply the information and technology to analyze social issues, use acts associated with environment.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 – Medium, 3 – High)

CO	PO												PSO		BTL	POI
	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
1	2	2													2	1.6.1, 1.7.1, 2.5.1
2	2	2													2	1.6.1, 1.7.1, 2.5.1
3	2	2													2	1.6.1, 1.7.1, 2.5.1
4	2	2													3	1.6.1, 1.7.1, 2.5.1

COURSE CONTENT

UNIT I

Multidisciplinary Nature Of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness. Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT II

Ecosystems: Ecosystems: Concept to an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem. b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity And Its Conservation: Introduction Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT III

Environmental Pollution: Definition, Cause, effects and control measures of: a. Air Pollution. b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies.

Disaster management: floods, earthquake, cyclone and landslides.

UNIT IV

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies.

Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Waste and reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environment legislation

Public awareness: Human Population And The Environment, Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health, Case studies.

Field Work: Visit to a local area to document environmental assets River/ forest grassland/ hill/ mountain – Visit to a local polluted site – Urban/Rural/Industrial, Agricultural Study of common plants, insects, and birds – river, hills, lakes, etc.

Self Study:

Water resources, soil resources, mineral resource: radioactive elements, Threats to biodiversity, Solid waste management, Role of Information Technology in environment and human health.

TEXTBOOKS

1. Erach Bharucha. 2004, Environmental Studies for undergraduate courses, University Grants Commission, New Delhi, Bharati Vidyapeeth Institute of Environment Education and Research.
2. Palaniswamy, Environmental Studies, Pearson education.
3. S.AzeemUnnisa, "Environmental Studies" Academic Publishing Company.
4. K.RaghavanNambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", Scitech Publications (India), Pvt.Ltd.

REFERENCE BOOKS

1. AnjaneyuluY. Introduction to Environmental sciences, B S Publications PVT Ltd, Hyderabad
2. Anjireddy.M Environmental science & Technology, BS Publications PVT Ltd, Hyderabad.
3. Benny Joseph, 2005, Environmental Studies, The Tata McGraw- Hill publishing company limited, New Delhi.
4. Principles of Environmental Science. &Engg. P.Venu Gopala Rao, 2006, Prentice-Hall of India Pvt. Ltd., New Delhi.
5. Ecological and Environmental Studies – Santosh Kumar Garg, Rajeswari Garg (or) Rajani Garg, 2006, Khanna Publishers, New Delhi. Essentials of Environmental Studies, Kurian Joseph & R Nagendran, Pearson Education publishers, 2005.
6. A.K Dee – Environmental Chemistry, New Age India Publications.
7. BharuchaErach- Biodiversity of India, Mapin Publishing Pvt.Ltd..

REFERENCE BOOKS

1. Erach Bharucha. 2004, Environmental Studies for undergraduate courses, University Grants Commission, New Delhi, Bharati Vidyapeeth Institute of Environment Education and Research.<https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf>
2. NPTEL Courses - Environmental Studies by Dr. Tushar Banerjee, Devi Ahilya Viswavidyalaya, Indore.

23CS4651

FULL STACK DEVELOPMENT-I

Course Category	Skill Enhancement Course	Credits	1
Course Type	Laboratory	L-T-P	0-0-2
Prerequisites	–	Continuous Eval	30
		Semester End Eval	70
		Total Marks	100

COURSE OUTCOMES

1. Understand the fundamentals of HTML elements, CSS Styles.
2. Apply HTML elements and their attributes for designing static web pages.
3. Create a web page by applying appropriate CSS styles and HTML elements.
4. Create dynamic web application and validate forms using JavaScript.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

CO	PO												PSO		BTL	POI
	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
1	2	2													2	1.7.1, 2.5.1, 2.5.2
2	2	2	3		2								2	2	3	1.7.1, 2.5.1, 2.5.2, 2.6.3, 3.5.1, 5.5.2
3	2	2	3		2								2	2	6	1.7.1, 2.5.1, 2.5.2, 2.6.3, 2.6.4, 3.5.1, 5.5.2
4	2	2	3		2								2	2	6	1.7.1, 2.5.1, 2.5.2, 2.6.3, 2.6.4, 3.5.1, 5.5.2

1. Lists, Links and Images

- Write a HTML program, to explain the working of lists Note: It should have an ordered list, unordered list, nested lists and ordered list in an unordered list and definition lists.
- Write a HTML program, to explain the working of hyperlinks using <a>tag and href, target Attributes
- Create a HTML document that has your image and your friend's image with a specific height and width. Also when clicked on the images it should navigate to their respective profiles

- Write a HTML program, in such a way that, rather than placing large images on a page, the preferred technique is to use thumbnails by setting the height and width parameters to something like to 100*100 pixels. Each thumbnail image is also a link to a full sized version of the image. Create an image gallery using this technique

2. HTML Tables, Forms and Frames

- Write a HTML program, to explain the working of tables. (use tags: `<table>`, `<tr>`, `<th>`, `<td>` and attributes: border, rowspan, colspan)
- Write a HTML program, to explain the working of tables by preparing a timetable (Note: Use `<caption>` tag to set the caption to the table& also use cell spacing, cell padding, border, rowspan, colspan etc.)
- Write a HTML program, to explain the working of forms by designing Registration form (Note: Include text field, password field, number field, date of birth field, checkboxes, radio buttons, list boxes using `<select>`& `<option>` tags, `<text area>` and two buttons ie: submit and reset. Use tables to provide a better view)
- Write a HTML program, to explain the working of frames, such that page is to be divided into 3 parts on either direction. (Note: first frame image, second frame paragraph, third frame hyperlink. And also make sure of using “no frame” attribute such that frames to be fixed)

3. HTML 5 and Cascading Style Sheets, Types of CSS

- Write a HTML program, that makes use of `<article>`, `<aside>`, `<figure>`, `<figcaption>`, `<footer>`, `<header>`, `<main>`, `<nav>`, `<section>`, `<div>`, `` tags
- Write a HTML program, to embed audio and video into HTML web page
- Write a program to apply different types (or levels of styles or style specification formats) - inline, internal, external styles to HTML elements. (identify selector, property and value)

4. Selector forms

- Write a program to apply different types of selector forms
 - (i) Simple selector (element, id, class, group, universal)
 - (ii) Combinator selector (descendant, child, adjacent sibling, general sibling)
 - (iii) Pseudo-class selector
 - (iv) Pseudo-element selector
 - (v) Attribute selector

5. CSS with Color, Background, Font, Text and CSS Box Model

- Write a program to demonstrate the various ways you can reference a color in CSS.
- Write a CSS rule that places a background image halfway down the page, tilting it horizontally. The image should remain in place when the user scrolls up or down.
- Write a program using the following terms related to CSS font and text:
 - (i) font-size
 - (ii) font-weight
 - (iii) font-style
 - (iv) text-decoration
 - (v) text-transformation
 - (vi) text-alignment
- Write a program, to explain the importance of CSS Box model using
 - (i) Content
 - (ii) Border
 - (iii) Margin
 - (iv) Padding

6. Applying JavaScript - internal and external, I/O, Type Conversion

- Write a program to embed internal and external JavaScript in a web page
- Write a program to explain the different ways for displaying output
- Write a program to explain the different ways for taking input
- Create a webpage which uses prompt dialogue box to ask a voter for his name and age. Display the information in table format along with either the voter can vote or not

7. JavaScript Pre-defined and User-defined Objects

- Write a program using document object properties and methods
- Write a program using window object properties and methods
- Write a program using array object properties and methods
- Write a program using math object properties and methods
- Write a program using string object properties and methods
- Write a program using regex object properties and methods
- Write a program using date object properties and methods
- Write a program to explain user-defined object by using properties, methods, accessors, constructors and display.

8. JavaScript Conditional Statements and Loops

- Write a program which asks the user to enter three integers, obtains the numbers from the user and outputs HTML text that displays the larger number followed by the words “LARGER NUMBER” in an information message dialog. If the numbers are equal, output HTML text as “EQUAL NUMBERS”.
- Write a program to display week days using switch case.
- Write a program to print 1 to 10 numbers using for, while and do-while loops.
- Develop a program to determine whether a given number is an ‘ARM-STRONG NUMBER’ or not. [Eg: 153 is an Armstrong number, since sum of the cube of the digits is equal to the number i.e., $1^3 + 5^3 + 3^3 = 153$]
- Write a program to display the denomination of the amount deposited in the bank in terms of 100’s, 50’s, 20’s, 10’s, 5’s, 2’s & 1’s. (Eg: If deposited amount is Rs.163, the output should be 1-100’s, 1-50’s, 1- 10’s, 1-2’s & 1-1’s)

9. Javascript Functions and Events

- Design a appropriate function should be called to display
 - (i) Factorial of that number
 - (ii) Fibonacci series up to that number
 - (iii) Prime numbers up to that number
 - (iv) Is it palindrome or not
- Design a HTML having a text box and four buttons named Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate function should be called to display
 - (i) Factorial of that number
 - (ii) Fibonacci series up to that number
 - (iii) Prime numbers up to that number
 - (iv) Is it palindrome or not
- Write a program to validate the following fields in a registration page
 - (i) Name (start with alphabet and followed by alphanumeric and the length should not be less than 6 characters)
 - (ii) Mobile (only numbers and length 10 digits)
 - (iii) E-mail (should contain format like xxxxxxxx@xxxxxx.xxx)

TEXTBOOKS

1. Programming the World Wide Web, 7th Edition, Robert W Sebesta, Pearson, 2013.
2. Web Programming with HTML5, CSS and JavaScript, John Dean, Jones & Bartlett Learning, 2019 (Chapters 1-11).

3. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasani Subramanian, 7th, APress, O'Reilly.

E-RESOURCES AND OTHER DIGITAL MATERIALS

1. <https://www.w3schools.com/html>, Last Accessed on: 10/10/2024.
2. <https://www.w3schools.com/css>, Last Accessed on: 10/10/2024.
3. <https://www.w3schools.com/js/>, Last Accessed on: 10/10/2024.
4. <https://www.w3schools.com/nodejs>, Last Accessed on: 10/10/2024.
5. <https://www.w3schools.com/typescript>, Last Accessed on: 10/10/2024.

23ES4152

DESIGN THINKING AND INNOVATION

Course Category	Engineering Science	Credits	2
Course Type	Theory	L-T-P	1-0-2
Prerequisites	–	Continuous Eval	30
		Semester End Eval	70
		Total Marks	100

COURSE OUTCOMES

1. Understand the fundamentals of Design Thinking and innovation.
2. Apply the design thinking techniques for solving problems in various sectors.
3. Analyse to work in a multidisciplinary environment.
4. Analyse the value of creativity.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 – Medium, 3 – High)

CO	PO												PSO		BTL	POI
	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
1	2	2											2	2	2	1.7.1, 2.6.2, 2.7.1
2	2	2											1	2	3	1.6.1, 1.7.1, 2.6.2, 2.7.1
3	2	2											1	2	4	1.6.1, 1.7.1, 2.5.1, 2.7.1
4	2	2											1	2	4	1.6.1, 1.7.1, 2.6.2, 2.7.1

COURSE CONTENT

UNIT I

Introduction to Design Thinking: Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

Design Thinking Process: Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development.

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT II

Innovation: Art of innovation, Difference between innovation and creativity, role

of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT III

Product Design: : Software reliability. Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.

Activity: Importance of modeling, how to set specifications, Explaining their own product design.

UNIT IV

Design Thinking in Business Processes: : Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes..

Activity: How to market our own product, about maintenance, Reliability and plan for startup.

TEXTBOOKS

1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

REFERENCE BOOKS

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003.

E-RESOURCES AND OTHER DIGITAL MATERIALS

1. IDEO U - Design Thinking Online Courses, Created by IDEO, pioneers in design thinking, "Foundations in Design Thinking" and "Advanced Design Thinking Methods", https://www.ideo.com/products/design-thinking-certificate?_pos=8&_sid=0c2902189&_ss=r, Last Accessed On: 12/12/2024.
2. Interaction Design Foundation (IxDF) Design Thinking Guide Rich articles and in-depth tutorials with an engineering focus, <https://www.youtube.com/watch?v=ldYzbVONDp8>, Last Accessed On: 12/12/2024.
3. AI x Design Thinking Workshop Series, https://www.ideo.com/products/aiworkshop?_pos=1&_sid=0c2902189&_ss=r

23CS4353

OPERATING SYSTEMS LAB

Course Category	Program Core	Credits	1.5
Course Type	Laboratory	L-T-P	0-0-3
Prerequisites	23ES1104	Continuous Eval	30
	Introduction to Programming	Semester End Eval	70
		Total Marks	100

COURSE OUTCOMES

1. Implement UNIX concepts for creation of Shell Scripts
2. Apply CPU Scheduling algorithms, page replacement algorithms, thread implementation
3. Analyze Bankers Algorithm for Dead Lock avoidance and process Synchronization
4. Analyze the memory management techniques

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 – Medium, 3 – High)

CO	PO												PSO		BTL	POI
	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
1	1	2											1	1	3	1.7.1, 2.6.4
2	1	3	3	2									1	1	3	1.7.1, 2.6.3, 2.6.4, 2.8.3, 2.8.4, 3.7.1, 4.6.1
3	1	3	3	2									1	1	4	1.7.1, 2.5.2, 2.6.3, 2.6.4, 2.8.4, 3.7.1, 4.6.1
4	1	3	3	2									1	1	4	1.7.1, 2.5.2, 2.6.3, 2.6.4, 2.8.4, 3.7.1, 4.6.1

COURSE CONTENT

Task 1: Practicing of Basic UNIX Commands.

Task 2: Write programs using the following UNIX operating system calls fork, exec, getpid, exit, wait, close, stat, opendir and readdir

Task 3: Simulate UNIX commands like cp, ls, grep, etc.,

Task 4: Simulate the following CPU scheduling algorithms a) FCFS b) SJF c) Priority d) Round Robin

Task 5: Control the number of ports opened by the operating system with a) Semaphore b) Monitors.

Task 6: Write a program to illustrate concurrent execution of threads using pthreads library.

Task 7: Write a program to solve producer-consumer problem using Semaphores.

Task 8: Implement the following memory allocation methods for fixed partition a) First fit b) Worst fit c) Best fit

Task 9: Simulate the following page replacement algorithms a) FIFO b) LRU c) LFU

Task 10: Simulate Paging Technique of memory management.

Task 11: Implement Bankers Algorithm for Dead Lock avoidance and prevention

Task 12: Simulate the following file allocation strategies a) Sequential b) Indexed c) Linked

Task 13: Download and install nachos operating system and experiment with it

REFERENCE BOOKS

1. Silberschatz A, Galvin P B, Gagne G, Operating System Concepts, Wiley, 10th Edition, 2018.
2. Tanenbaum A S, Modern Operating Systems, Galgotia Publications Pvt. Ltd, 4th Edition, 2016.
3. Stallings W, Operating Systems -Internals and Design Principles, Pearson, 9th Edition, 2018.
4. D.M Dhamdhere, Operating Systems: A Concept Based Approach, McGraw- Hill, 3rd Edition, 2013.

E-RESOURCES AND OTHER DIGITAL MATERIALS

1. Prof Santanu Chattopadhyay - NPTEL Course on Operating Sytems, <https://nptel.ac.in/courses/106/105/106105214/>, Last Accessed On: 28/10/2024.
2. Stanford University - Lecture Notes on Operating Systems, <https://www.scs.stanford.edu/21wi-cs140/notes>, Last Accessed on: 28/10/2024.
3. IIT Bombay – Lecture Notes on Operating Systems , <https://www.cse.iitb.ac.in/~mythili/os/>, Last Accessed on: 28/10/2024.

23CS4354**DATABASE MANAGEMENT SYSTEMS LAB**

Course Category	Program Core	Credits	1.5
Course Type	Laboratory	L-T-P	0-0-3
Prerequisites	23PC2104A Data Structures	Continuous Eval	30
	23CS3304	Semester End Eval	70
	Advanced Data Structure & algorithms Analysis	Total Marks	100

COURSE OUTCOMES

1. Apply DDL, DML and DCL statements with integrity constraints
2. Design relational database and manipulate the same using simple and complex queries in SQL.
3. Develop Entity Relationship and the corresponding Relational models for the given real-world application.
4. Analyze database objects like Procedure, Functions, Triggers and Package using PL/SQL

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 – Medium, 3 – High)

CO	PO												PSO		BTL	POI
	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
1	1	2	2		2								1	1	3	1.2.1, 1.7.1, 2.5.2, 2.5.3, 2.6.3, 3.5.1, 3.6.2, 5.4.2
2	1	3	3		3								1	1	6	1.2.1, 1.7.1, 2.5.2, 2.5.3, 2.6.3, 3.5.1, 3.6.2, 5.4.2, 5.5.2
3	1	3	3		3								1	1	6	1.2.1, 1.7.1, 2.5.2, 2.5.3, 2.6.3, 3.5.1, 3.6.2, 5.4.2, 5.5.2
4	1	2	2		2								1	1	4	1.2.1, 1.7.1, 2.5.2, 2.5.3, 2.6.3, 3.5.1, 3.6.2, 5.4.2

COURSE CONTENT

Task 1: Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.

Task 2: Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length,

substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)

Task 3: Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION, INTERSET, Constraints. Example: Select the roll number and name of the student who secured fourth rank in the class.

Task 4: Implementation of basic building blocks of Queries(Joins,Aggregate Functions,Set Operations,Cartesian Product,GROUP BY, HAVING clause),Creation and dropping of Views.

Task 5: Draw ER diagram for an application with at least 3 entities and establish relationships between them using a tool. Perform ER to Relational mapping to derive Relational database.

Task 6: Implementation of first, second, third, BCNF, fourth Normal forms and conversions.

Task 7: (I) Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
(II) Insert data into student table and use COMMIT, ROLLBACK and SAVE-POINT in PL/SQL block.

Task 8: Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.

Task 9: Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE- APPLICATION ERROR.

Task 10: Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.

Task 11: Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.

Task 12: Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.

Task 13: Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers.

Task 14: Real Time Database Application for uploads(File,Image,Video).

TEXT BOOKS

1. Oracle: The Complete Reference by Oracle Press
2. Nilesh Shah, Database Systems Using Oracle, PHI, 2007
3. Rick F Vander Lans, Introduction to SQL, Pearson, 4th Edition, 2007.

REFERENCE BOOKS

1. Gordon S Linoff, Data Analysis Using SQL and Excel, Wiley, 2nd Edition, 2016.
2. Joan Casteel, Oracle 12c:SQL, Cengage Learning, 2017

3. J D Ullman, —Principles of database systems, Computer Science Press, 2001.

E-RESOURCES AND OTHER DIGITAL MATERIALS

1. Prof Arnab Bhattacharya, IIT Kanpur, SQL Introduction, <https://nptel.ac.in/courses/106104135/10>, Last accessed on: 12/11/2024
2. Prof Arnab Bhattacharya, IIT Kanpur, SQL: Updates, Joins, Views and Triggers <https://nptel.ac.in/courses/106104135/11>, Last accessed on: 12/11/2024
3. Geoff Allix and Graeme Malcolm: Microsoft , Querying with Transact-SQL (edX), <https://www.mooc-list.com/course/querying-transact-sql-edx> Last accessed on: 12/11/2024.