**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**
**(Effective for the batches admitted in 2023-24)**

**Semester I (First year)**

| Sl. No. | Category | Course Code | Course Title | Hours per week | | | Credits | CIE | SEE | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | | | |
| 1 | HM | 23AHM9901 | Communicative English | 2 | 0 | 0 | 2 | 30 | 70 | 100 |
| 2 | BS | 23ABS9901 | Chemistry | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3 | BS | 23ABS9904 | Linear Algebra & Calculus | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4 | ES | 23AES0101 | Basic Civil& Mechanical Engineering | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 5 | ES | 23AES0501 | Introduction to Programming | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 6 | HM | 23AHM9902 | Communicative English Lab | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| 7 | BS | 23ABS9906 | Chemistry Lab | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| 8 | ES | 23AES0302 | Engineering Workshop | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 9 | ES | 23AES0502 | Computer Programming Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 10 | HM | 23AHM9903 | Health and wellness, Yoga and Sports | 0 | 0 | 1 | 0.5 | 50 | - | 50 |
| | | | **Total** | **14** | **0** | **11** | **19.5** | **320** | **630** | **950** |

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**Semester II (First year)**

| Sl. No. | Category | Course Code | Course Title | Hours per week | | | Credits | CIE | SEE | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | | | |
| 1 | BS | 23ABS9903 | Engineering Physics | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2 | BS | 23ABS9905 | Differential Equations &Vector Calculus | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3 | ES | 23AES0201 | Basic Electrical & Electronics Engineering | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4 | ES | 23AES0301 | Engineering Graphics | 1 | 0 | 4 | 3 | 30 | 70 | 100 |
| 5 | ES | 23AES0503 | IT Workshop | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| 6 | PC | 23APC0501 | Data Structures | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 7 | BS | 23ABS9908 | Engineering Physics Lab | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| 8 | ES | 23AES0202 | Electrical & Electronics Engineering Workshop | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 9 | PC | 23APC0502 | Data Structures Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 10 | HM | 23AHM9904 | NSS/NCC/Scouts & Guides/Community Service | 0 | 0 | 1 | 0.5 | 50 | - | 50 |
| | | | **Total** | **13** | **0** | **15** | **20.5** | **320** | **630** | **950** |

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**Semester III (Second year)**

| Sl. No. | Category | Course Code | Course Title | Hours per week | | | Credits | CIE | SEE | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | | | |
| 1 | BS | 23ABS9913 | Discrete Mathematics & Graph Theory | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2 | HM | 23AHM9905 | Universal Human Values | 2 | 1 | 0 | 3 | 30 | 70 | 100 |
| 3 | PC | 23APC0503 | Digital Logic & Computer Organization | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4 | PC | 23APC0504 | Advanced Data Structures & Algorithms analysis | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 5 | PC | 23APC0506 | Object-Oriented Programming Through JAVA | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 6 | PC | 23APC0505 | Advanced Data Structures and Algorithms analysis Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 7 | PC | 23APC0507 | Object-Oriented Programming Through JAVA Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 8 | SC | 23ASC0501 | Python programming | 0 | 1 | 2 | 2 | 30 | 70 | 100 |
| 9 | MC | 23AMC9901 | Environmental Science | 2 | 0 | 0 | - | 30 | - | - |
| | | | **Total** | **16** | **2** | **8** | **20** | **270** | **560** | **830** |

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**Semester IV (Second year)**

| Sl. No. | Category | Course Code | Course Title | Hours per week | | | Credits | CIE | SEE | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | | | |
| 1 | HM | 23AES0305 | Optimization Techniques | 2 | 0 | 0 | 2 | 30 | 70 | 100 |
| 2 | BS | 23ABS9916 | Probability & Statistics | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3 | PC | 23APC0510 | Operating Systems | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4 | PC | 23APC0508 | Database Management Systems | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 5 | PC | 23APC0512 | Software Engineering | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 6 | PC | | Operating Systems & Software Engineering Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 7 | PC | 23APC0509 | Database Management Systems Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 8 | SC | | Python with DJango | 0 | 1 | 2 | 2 | 30 | 70 | 100 |
| 9 | ES | 23AES0304 | Design Thinking & Innovation | 0 | 1 | 2 | 2 | 30 | 70 | 100 |
| | | | **Total** | **14** | **2** | **10** | **21** | **270** | **630** | **900** |
| **Mandatory Community Service Project Internship of 08 weeks duration during summer vacation** | | | | | | | | | | |

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**Semester V (Third year)**

| Sl. No. | Category | Course Code | Course Title | Hours per week | | | Credits | CIE | SEE | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | | | |
| 1 | Professional Core | | Advanced Java | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2 | Professional Core | | Computer Networks | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3 | Professional Core | | Automata Theory & Compiler Design | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4 | Professional Elective-I | | 1. Object Oriented Analysis and Design<br>2. Cyber Security<br>3. Artificial Intelligence<br>4. Microprocessors & Microcontrollers<br>Data Warehousing & Data Mining | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 5 | Open Elective- I | | | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 6 | Professional Core | | Advanced Java Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 7 | Professional Core | | Computer Networks Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 8 | Skill Enhancement course | | Full Stack Development-1 | 0 | 1 | 2 | 2 | 30 | 70 | 100 |
| 9 | Engineering Science | | Tinkering Lab | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| 10 | Evaluation of Community Service Internship | | | - | - | - | 2 | | | |
| | | | **Total** | 15 | 1 | 10 | 23 | | | 900 |
| **Mandatory Community Service Project Internship of 08 weeks duration during summer vacation** | | | | | | | | | | |

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**Semester VI (Third year)**

| Sl. No. | Category | Course Code | Course Title | Hours per week | | | Credits | CIE | SEE | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | | | |
| 1 | Professional Core | | Cloud Computing | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2 | Professional Core | | Cryptography & Network Security | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3 | Professional Core | | Machine Learning | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4 | Professional Elective-II | | 1. Software Testing Methodologies<br>2. Augmented Reality & Virtual Reality<br>3. DevOps<br>4. Embedded Systems<br>12 week MOOC Swayam/NPTEL course recommended by the BoS | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 5 | Professional Elective-III | | 1. Software Project Management<br>2. Mobile Adhoc Networks<br>3. Natural Language Processing<br>4. Distributed Operating System<br>12 week MOOC Swayam/NPTEL course recommended by the BoS | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 6 | Open Elective – II | | | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 7 | Professional Core | | Cloud Computing Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 8 | Professional Core | | Machine Learning Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 9 | Skill Enhancement course | | Soft skills<br>OR<br>IELTS | 0 | 1 | 2 | 2 | 30 | 70 | 100 |
| 10 | Audit Course | | Technical Paper Writing & IPR | 2 | 0 | 0 | - | | | |
| | | | **Total** | **20** | **1** | **08** | **23** | | | **900** |
| **Mandatory Community Service Project Internship of 08 weeks duration during summer vacation** | | | | | | | | | | |

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**Semester VII (Fourth year)**

| Sl. No. | Category | Course Code | Course Title | Hours per week | | | Credits | CIE | SEE | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | | | |
| 1 | Professional Core | | Blockchain Technology | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2 | Management Course-II | | Human Resource Management | 2 | 0 | 0 | 2 | 30 | 70 | 100 |
| 3 | Professional Elective-IV | | 1. Software Architecture & Design Pattern<br>2. Deep Learning<br>3. Computer Vision<br>4. Internet of Things<br>12 week MOOC Swayam/NPTEL course recommended by the BoS | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4 | Professional Elective-V | | 1. Agile methodologies<br>2. Metaverse<br>3. Big Data Analytics<br>4. Cyber Physical Systems<br>12 week MOOC Swayam/NPTEL course recommended by the BoS | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 5 | Open Elective-III | | | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 6 | Open Elective-IV | | | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 7 | Skill Enhancement Course | | Prompt Engineering | 0 | 1 | 2 | 0 | 30 | 70 | 100 |
| 8 | Audit Course | | Constitution of India | 2 | 0 | 0 | 2 | 30 | 70 | 100 |
| 9 | Internship | | Evaluation of Industry Internship | - | - | - | - | 30 | 70 | 100 |
| | | | **Total** | **19** | **1** | **02** | **21** | | | **900** |
| **Mandatory Community Service Project Internship of 08 weeks duration during summer vacation** | | | | | | | | | | |

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**Semester VIII (Fourth year)**

| Sl. No. | Category | Course Code | Course Title | Hours per week | | | Credits | CIE | SEE | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | | | |
| 1 | Internship & Project Work | | Full semester Internship & Project Work | 0 | 24 | 12 | 1 | 30 | 70 | 100 |
| | | | | | | | | | | |

**Note :** ***Student need to do at least ONE MOOC Course (of 3 credits out of 160 credits) to meet the mandatory requirement (11th criteria, as per R23 Regulations)***

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**Semester I (First year)**

| Sl. No. | Category | Course Code | Course Title | Hours per week | | | Credits | CIE | SEE | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | | | |
| 1 | HM | 23AHM9901 | Communicative English | 2 | 0 | 0 | 2 | 30 | 70 | 100 |
| 2 | BS | 23ABS9901 | Chemistry | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3 | BS | 23ABS9904 | Linear Algebra & Calculus | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4 | ES | 23AES0101 | Basic Civil& Mechanical Engineering | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 5 | ES | 23AES0501 | Introduction to Programming | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 6 | HM | 23AHM9902 | Communicative English Lab | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| 7 | BS | 23ABS9906 | Chemistry Lab | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| 8 | ES | 23AES0302 | Engineering Workshop | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 9 | ES | 23AES0502 | Computer Programming Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 10 | HM | 23AHM9903 | Health and wellness, Yoga and Sports | 0 | 0 | 1 | 0.5 | 50 | - | 50 |
| | | | **Total** | **14** | **0** | **11** | **19.5** | **320** | **630** | **950** |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI**
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**Computer Science & Information Technology (CSIT)**
**Year: I B.Tech** **(Common to all branches)** Semester: I

| Subject Code | Subject Name | L T P | Credit: 2 | CLC: 2 |
|---|---|---|---|---|
| 23AHM9901 | **COMMUNICATIVE ENGLISH** | 2 0 0 | | |

| Pre-Requisites | Communicative English | Semester | **I & II** |
|---|---|---|---|

**Course Outcomes (CO):** Student will be able to

**CO1**: Understand reading / listening texts and to write summaries based on global comprehension of these texts**. (Listening & Reading)**
**CO2:** Apply grammatical structures to formulate sentences and correct word forms**. (Grammar)**
**CO3:** Analyze discourse markers to speak clearly on a specific topic in formal and informal conversations. (**Speaking)**
**CO4:** Analyze a coherent paragraph interpreting graphic elements, figure/graph/chart/table.**(Read & Write)**
**CO5:** Create a coherent essay, letter writing, report writing and design a resume**.(Writing)**

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Bloom s level |
|---|---|---|---|---|---|
| **1** | Understand | reading / listening texts and to write summaries based on global comprehension of these texts. | | | L2 |
| **2** | Apply | grammatical structures to formulate sentences and correct word forms | | | L3 |
| **3** | Analyze | Analyze discourse markers to speak clearly on a specific topic in formal and informal conversations... | | | L4 |
| **4** | Analyze | coherent paragraph interpreting a graphic element. | | | L4 |
| **5** | Create | coherent essay, letter writing, report writing and design a resume | | | L6 |

**UNIT I**
**Lesson: HUMAN VALUES:** Gift of Magi **(Short Story)**
**Listening:** Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.
**Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.
**Reading:** Skimming to get the main idea of a text; scanning to look for specific pieces of information.
**Writing:** Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.
**Grammar:** Parts of Speech, Basic Sentence Structures-forming questions
**Vocabulary:** Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

**UNIT II**
**Lesson: NATURE: The Brook by Alfred Tennyson (Poem)**
**Listening:** Answering a series of questions about main ideas and supporting ideas after listening to audio texts.
**Speaking:** Discussion in pairs/small groups on specific topics followed by short structure talks.
**Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
**Writing:** Structure of a paragraph - Paragraph writing (specific topics)
**Grammar:** Cohesive devices - linkers, use of articles and zero article; prepositions.
**Vocabulary:** Homonyms, Homophones, Homographs.

**UNIT III**

**Lesson: BIOGRAPHY: Elon Musk**

**Listening:** Listening for global comprehension and summarizing what is listened to.

**Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed

**Reading:** Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension.

**Writing:** Summarizing, Note-making, paraphrasing

**Grammar:** Verbs - tenses; subject-verb agreement**.**

**Vocabulary:** Compound words, Collocations

**UNIT IV**

**Lesson: INSPIRATION: The Toys of Peace by** Saki

**Listening:** Making predictions while listening to conversations/ transactional dialogues without video; listening with video.

**Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.

**Reading:** Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.

**Writing:** Letter Writing: Official Letters, Resumes, Cover letters

**Grammar:** Reporting verbs, Direct & Indirect speech, Active & Passive Voice

**Vocabulary:** Words often confused, Jargons

**UNIT V**

**Lesson: MOTIVATION:** The Power of Intrapersonal Communication (An Essay)

**Listening:** Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.

**Speaking:** Formal oral presentations on topics from academic contexts

**Reading:** Reading comprehension.

**Writing:** Writing structured essays on specific topics.

**Grammar:** Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

**Vocabulary**: Idiom and phrases & Phrasal verbs

**Textbooks:**

1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition, Orient Black Swan, 2023 (Units 1,2 & 3)
2. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)

**Reference Books:**


1. Dubey, Sham Ji& Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.


**WEB RESOURCES**:

**GRAMMAR:**

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

**VOCABULARY**

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

**Correlation of COs with the POs & PSOs for B.Tech**

| Course Outcomes COs | Programme Outcomes (POs) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | | | | | | | | | | 2 | | |
| CO2 | | | | | | | | | 2 | 2 | | |
| CO3 | | | | | | | | | | 3 | | |
| CO4 | | | | | | | | | | 3 | | |
| CO5 | | | | | | | | | | 3 | | |

***3: Highly Correlated, 2: Moderately Correlated, 1: Weakly Correlated**

**CO-PO mapping justification:**

| **CO** | **Percentage of contact hours over the total planned contact hours** | | | **CO** | | **Program Outcome (PO)** | **PO(s): Action verb and BTL (for PO1 to PO5)** | **Level of Correlation (0-3)** |
|---|---|---|---|---|---|---|---|---|
| | **Lesson Plan (Hrs)** | **%** | **corr** | **Verb** | **BTL** | | | |
| **1** | 12 | 22 | 3 | Understand | **L2** | PO10 | Thumb Rule | 2 |
| **2** | 12 | 22 | 3 | Apply | **L3** | PO9,PO10 | Thumb Rule | 2,2 |
| 3 | 10 | 18 | 2 | Analyze | L4 | PO10 | Thumb Rule | 3 |
| 4 | 10 | 18 | 2 | Analyze | L4 | PO10 | Thumb Rule | 3 |
| 5 | 10 | 18 | 2 | Create | L6 | PO10 | Thumb Rule | 3 |

**CO1:** Understand reading / listening text and to write summaries based on global comprehension of these texts.

**Action Verb: Understand (L2)**

CO1 Action Verb Understand is of BTL 2. Using Thumb rule, L2 correlates PO6 to PO12 as moderate (2).

**CO2: Apply grammatical structures to formulate sentences and correct word forms.**

**Action Verb: Apply (L3)**

CO2 Action Verb Apply is of BTL 3. Using Thumb rule, L3 correlates PO6 to PO12 as moderate (2) & (2)

**CO3: Analyze discourse markers to speak clearly on a specific topic in Formal and informal Conversations.**

**Action Verb: Analyze (L4)**

CO3 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 to PO12 as high (3).

**CO4:** Analyze a coherent paragraph interpreting graphic elements, figure/graph/chart/table **(Read & Write)**

**Action Verb: Analyze (L4)**

CO4 Action Verb Analyze is of BTL 4. Using Thumb rule, L6 correlates PO6 to PO12 as high (3).

**CO5: Create a coherent essay, letter writing, report writing and design a resume.(Writing)**

**Action Verb: Create(L6)**

CO5 Action Verb Create is of BTL 6. Using Thumb rule, L5 correlates PO6 to PO12 as high (3).

| | |
|---|---|
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**Year: I B.Tech** **(**Semester: I **CSE, CIC, CSD, CSIT & EEE)** (Semester: II **ECE, AI&DS & AI&ML**)

| **Subject Code:** 23ABS9901 | **Subject Name:** Chemistry | L | T | P | Credits: 3 | CLC 3 |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | | |

Course Outcomes (CO): At the end of the course students will be able to

1. **Understand** the interaction of energy levels between atoms and molecules
2. **Apply** the principle of Band diagrams in the conductors and semiconductors
3. **Apply** the electrochemical principles to the construction of batteries, fuel cells and sensors
4. **Analyze** the preparation and mechanism of plastics, Elastomers and conducting polymers
5. **Analyze** the separation of liquid mixtures using instrumental methods.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| 1 | **Understand** | the interaction of energy levels | | between atoms and molecules | L2 |
| 2 | **Apply** | principle of Band diagrams | conductors and semiconductors | | L3 |
| 3 | **Apply** | electrochemical principles to the construction of batteries, fuel cells and sensors | | | L3 |
| 4 | **Analyze** | preparation and mechanism of plastics, Elastomers and conducting polymers | | | L4 |
| 5 | **Analyze** | the separation of liquid mixtures | using instrumental methods | | L4 |

**UNIT I: Structure and Bonding Models**

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and $\Psi^2$, particle in one dimensional box, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order.

**UNIT II: Modern Engineering materials**

**Semiconductors:** Introduction, basic concept, application
**Super conductors**: Introduction basic concept, applications.
**Super capacitors**: Introduction, Basic Concept-Classification – Applications.
**Nano materials**: Introduction, classification, properties and applications of Fullerenes, carbon Nano tubes and Graphines nanoparticles.

**UNIT III Electrochemistry and Applications**

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry-potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).

**Electrochemical sensors** – potentiometric sensors with examples, amperometric sensors with examples.
**Primary cells** – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygenfuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

**UNIT IV Polymer Chemistry**

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation.
**Plastics** –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.
**Elastomers**–Buna-S, Buna-N–preparation, properties and applications.
**Conducting polymers** – polyacetylene, polyaniline, – mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), Polyl Lactic Acid (PLA).

**UNIT V Instrumental Methods and Applications**

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. Chromatography-Basic Principle, Classification-HPLC: Principle, Instrumentation and Applications.

**Textbooks:**


1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e,Oxford University Press, 2010.


**Reference Books:**


1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
2. J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb.2008
3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition


Mapping of COs to POs and PSOs

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | | | | | | | | | | | | | |
| 2 | 3 | | | | | | | | | | | | | |
| 3 | 3 | | | | | | | | | | | | | |
| 4 | | 3 | | | | | | | | | | | | |
| 5 | | 3 | | | | | | | | | | | | |

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**CO-PO mapping justification:**

| **CO** | **Percentage of contact hours over the total planned contact hours** | | | | **CO** | | **Program Outcome (PO)** | **PO(s): Action verb and BTL (for PO1 to PO5)** | **Level of Correlation (0-3)** |
|---|---|---|---|---|---|---|---|---|---|
| | **Register (Hrs)** | **Lesson Plan (Hrs)** | **%** | **corr** | **Verb** | **BTL** | | | |
| 1 | 10 | 10 | 15.6 | 2 | Understand | L2 | PO1 | PO1: Apply (L3) | 2 |
| 2 | 10 | 17 | 26.5 | 3 | Apply | L3 | PO1 | PO1: Apply (L3) | 3 |
| 3 | 10 | 12 | 18.7 | 3 | Apply | L3 | PO2 | PO1: Apply (L3) | 3 |
| 4 | 10 | 13 | 20.3 | 3 | Analyze | L4 | PO2 | PO2: Analyze (L4) | 3 |
| 5 | 10 | 12 | 18.7 | 3 | Analyze | L4 | PO1 | PO2: Analyze (L4) | 3 |

**CO1: Understand the fundamentals of Atoms and Molecules**
**Action Verb: Understand (L2)**
PO1 Verbs: Apply (L3)
CO1 Action Verb is less than PO1 verb by one level; Therefore, correlation is moderate (2).

**CO2: Apply electrochemical principles to construct batteries**
**Action Verb: Apply (L3)**
PO1 Verbs: Apply (L3)
CO2 Action Verb is equal to PO1 verb; Therefore, correlation is high (3).

**CO3: Apply electrochemical principles to the construction of batteries, fuel cells and electrochemical sensors**
**Action Verb: Apply (L3)**
PO2 Verb: Apply (L3)
CO3 Action Verb level is equal to PO1 verb; Therefore, correlation is high (3).

**CO4: Analyze the preparation and mechanism of polymers**
**Action Verb: Analyze (L4)**
PO2 Verb: Analyze (L4)
CO3 Action Verb level is equal to PO2 verb; Therefore, correlation is high (3).

**CO5: Analyze the identification of individual components**
**Action Verb: Analyze (L4)**
PO1 Verb: Analyze (L4)
CO5 Action Verb level is equal to PO2 verb; Therefore, correlation is high (3).

| | |
|---|---|
| | **ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI**<br>**(Autonomous)**<br>(Effective for the batches admitted from 2023-24) |

**Year :** I **Semester** : I **Branch of Study :** Common to All

| **Subject Code:** 23ABS9904 | **Subject Name: Linear Algebra & Calculus** | **L** | **T** | **P** | **Credits** | **CLC** |
|---|---|---|---|---|---|---|
| | | **3** | **0** | **0** | **3** | **3** |

**Course Outcomes (CO):**

Student will be able to

CO1. **Analyze** the matrix algebraic techniques for engineering applications.
CO2. **Understand** the concept of Eigen values, Eigen vectors and quadratic forms.
CO3. **Analyze** the mean value theorems for real time applications.
CO4. **Apply** the concepts of partial differentiation to functions of several variables.
CO5. **Apply** the multivariable integral calculus for computation of Area and Volume.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| **1** | **Analyze** | the matrix algebraic techniques | for engineering applications. | | **L4** |
| **2** | **Understand** | the concept of eigen values, eigen vectors and quadratic forms. | - | | **L2** |
| **3** | **Analyze** | the mean value theorems | for real time applications. | | **L4** |
| **4** | **Apply** | the concept of Maxima and Minima | to functions of several variables. | | **L3** |
| **5** | **Apply** | the multivariable integral calculus | for computation of Area and volume. | | **L3** |

**Unit I: Matrices** **12hrs**

Rank of a matrix by Echelon form, Normal form, Cauchy-Binet formula (without proof).Inverse of Non-singular matrices by Gauss-Jordan method, system of linear equations: solving system of Homogeneous and Non-homogeneous equations by Gauss Elimination method, Jacobi and Gauss Seidel Iteration methods.

**Unit II: Eigen values, Eigen vectors and Orthogonal Transformation** **9hrs**

Eigen values, Eigen vectors and their properties, Diagonalization of a matrix, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, Quadratic forms and Nature of the Quadratic forms, Reduction of quadratic form to canonical forms by Orthogonal Transformation.

**Unit III: Calculus** **9hrs**

Mean Value Theorems: Rolle's theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proof), problems and applications on the above theorems.

**Unit IV: Partial differentiation and Applications(Multi Variable Calculus)** **10hrs**

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Directional derivative, Taylor's and Maclaurin's series expansion of functions of two variables, Jacobians, Functional dependence, Maxima and Minima of functions of two variables, method of Lagrange multipliers.

**Unit V: Multiple Integrals** **10hrs**

Double integrals, triple integrals change of order of integration, change of Variables to polar, Cylindrical and Spherical coordinates, Finding areas(by double integrals) and volumes (by double integrals and triple integrals).

**Textbooks:**


1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.


**References:**


1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass,Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar,Alpha Science International Ltd., 25th Edition(9th reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearsonpublishers, 2018, 5 th Edition.
4. Advanced Engineering Mathematics, Micheael Greenberg, , Pearsonpublishers, 9 th edition.
5. Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. Chand Publications,2014, Third Edition (Reprint 2021)

**Mapping of COs to POs**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 3 | | | | | | | | | | |
| 2 | | 2 | | | | | | | | | | |
| 3 | | 3 | | | | | | | | | | |
| 4 | 3 | | | | | | | | | | | |
| 5 | 3 | | | | | | | | | | | |

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**CO-PO mapping justification:**

| **CO** | **Percentage of contact hours over the total planned contact hours** | | | **CO** | | **Program Outcome (PO)** | **PO(s): Action verb and BTL (for PO1 to PO5)** | **Level of Correlation (0-3)** |
|---|---|---|---|---|---|---|---|---|
| | **Lesson Plan (Hrs)** | **%** | **correlation** | **Verb** | **BTL** | | | |
| **1** | **10** | 14 | 2 | **Analyze** | **L4** | PO2 | **Analyze** | 3 |
| **2** | **15** | 21.4 | 3 | **Understand** | **L2** | PO2 | **Apply** | 2 |
| **3** | **15** | 21.4 | **3** | **Analyze** | **L4** | PO2 | **Analyze** | 3 |
| **4** | **16** | 22.8 | **3** | **Apply** | **L3** | PO1 | **Apply** | 3 |
| **5** | **14** | 20 | **3** | **Apply** | **L3** | PO1 | **Apply** | 3 |

**CO1:** Analyze the matrix algebraic techniques that are needed for engineering applications.
**Action Verb: Analyze(L4)**
PO2 Verbs: Analyze (L4)
CO1 Action Verb is equal toPO2 verb ; Therefore correlation is high (3).

**CO2:** Understand the concept of eigen values, eigen vectors and quadratic forms.
**Action Verb: Understand (L2)**
PO1 Verbs: Apply (L3)
CO2 Action Verb is low level to PO1 verb by one level; Therefore correlation is moderate (2).

**CO3:** Analyze the mean value theorems for real life problems.
**Action Verb:** Analyze **(L4)**
PO1 Verb: Analyze (L4)
CO3 Action Verb level is equal to PO2 verb; Therefore correlation is high (3).

**CO4:**Apply the concept of Maxima and Minima of functions of several variables.
**Action Verb: Apply (L3)**
PO2 Verb: Apply (L3)
CO4 Action Verb level is equal to PO1 verb; Therefore correlation is high (3).

**CO5:** Apply the multivariable integral calculus for computation of area and volume.
**Action Verb: Apply(L3)**
PO1 Verb: Apply (L3)
CO5 Action verb is high level to PO1 verb; therefore the correlation is high (3).

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | Basic Civil & Mechanical Engineering | L | T | P | C |
|---|---|---|---|---|---|---|
| 23AES0101 | I-I | | 3 | 0 | 0 | 3 |

**Course Outcomes:**

After studying the course, student will be able to

CO1: Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society
CO2: Apply the methods of surveying in finding the measurements on Earth surface
CO3: Understand the importance of transportation, water resources and environmental engineering
CO4: Understand the applications and role of various materials in Mechanical Engineering.
CO5: Understand the different manufacturing processes and the basics of thermal engineering with its applications.
CO6: Understand the working of different mechanical power transmission systems, power plants and applications of robotics.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| **CO1** | Understand | Various sub-divisions of Civil Engineering | | Role in ensuring better society | L2 |
| **CO2** | Apply | Methods of surveying | Finding the measurements | On Earth surface | L3 |
| **CO3** | Understand | Importance of transportation, water resources and environmental engineering | | | L2 |
| **CO4** | Understand | applications and role of various materials in Mechanical Engineering | | | L2 |
| **CO5** | Understand | different manufacturing processes and the basics of thermal engineering with its applications | | | L2 |
| **CO6** | Understand | working of different mechanical power transmission systems, power plants and applications of robotics | | | L2 |

## BASICS OF CIVIL ENGINEERING (PART-A)

**UNIT I**

**Basics of Civil Engineering:**

Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering- Transportation Engineering Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline - Building Construction and Planning- Construction Materials-Cement - Aggregate - Bricks- Cement concrete- Steel. Introduction to Prefabricated construction Techniques.

**UNIT II**

**Surveying:** Objectives of Surveying- Horizontal Measurements- Angular Measurements- Introduction to Bearings Levelling instruments used for levelling -Simple problems on levelling and bearings-Contour mapping.

**UNIT III**

**Transportation Engineering:** Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering.

**Water Resources and Environmental Engineering**:

Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting- Water Storage andConveyance Structures (Simple introduction to Dams and Reservoirs).

**Textbooks:**


1. Basic Civil Engineering, M.S.Palanisamy, , Tata Mcgraw Hill publications (India) Pvt.Ltd. Fourth Edition.
2. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers.2022. First Edition.
3. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition


**Reference Books:**


1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. FifthEdition
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, KhannaPublishers, Delhi. 2016
3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38th Edition
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012

**PART-B**

**BASICS OF MECHANICAL ENGINEERING**

**UNIT I**

**Introduction to Mechanical Engineering:** Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

**Engineering Materials** - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

**UNIT II**

**Manufacturing Processes:** Principles of Casting, Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.

**Thermal Engineering** – working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

**UNIT III**

**Power plants** – working principle of Steam, Diesel, Hydro, Nuclear power plants.

**Mechanical Power Transmission** - Belt Drives, Chain, Rope drives, Gear Drives and their applications.

**Introduction to Robotics** - Joints & links, configurations, and applications of robotics.

**Textbooks:**


1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India)Pvt. Ltd.
2. A Tear book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications,(India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.


**Reference Books:**


1. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I
2. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak MPandey, Springer publications
3. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt.Ltd.
4. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, TataMcGraw Hill publications (India) Pvt. Ltd.


**Mapping of COs to POs**

| **COs** | **Programme Outcomes (POs) & Programme Specific Outcomes (PSOs)** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 2 | 2 | | | | | 2 | | | | | | | |
| CO2 | 3 | 2 | | | | 2 | | | | | | | | |
| CO3 | 2 | 2 | | | | | 2 | | | | | | | |
| CO4 | 2 | | | | | 2 | | | | | | | | |
| CO5 | 2 | | | | | | 2 | | | | | | | |
| CO6 | 2 | | | | 2 | | 2 | | | | | | | |

**CO-PO mapping justification:**

| CO | CO | | | | | Program Outcomes (PO) | PO(s): Action Verb and BTL (for PO1 to PO5) | Level of Correlation |
|---|---|---|---|---|---|---|---|---|
| | Lesson Plan (Hrs) | % | Correlation | Verb | BTL | | | |
| 1 | 11/33 | 33 | 2 | Understand | L2 | PO1<br>PO2<br>PO7 | Apply (L3)<br>Analyze (L3)<br>Thumb Rule | 2<br>2<br>2 |
| 2 | 12/33 | 34 | 3 | Apply | L3 | PO1<br>PO2<br>PO6 | Apply (L3)<br>Analyze (L4)<br>Thumb Rule | 3<br>2<br>2 |
| 3 | 11/33 | 33 | 2 | Understand | L2 | PO1<br>PO2<br>PO7 | Apply (L3)<br>Analyze (L3)<br>Thumb Rule | 2<br>2<br>2 |
| 4 | 9/30 | 30 | 3 | Understand | L2 | PO1<br>PO6 | Identify-L3<br>Thumb Rule | 2<br>2 |
| 5 | 12/30 | 40 | 3 | Understand | L2 | PO1<br>PO7 | Identify-L3<br>Thumb Rule | 2<br>2 |
| 6 | 9/30 | 30 | 3 | Understand | L2 | PO1<br>PO5<br>PO7 | Apply(Identify)-L3<br>Apply-L3<br>Thumb Rule | 2<br>2<br>2 |

**Justification Statements:**

**CO1:** Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.

**Action Verb: Understand (L2)**

PO1 Verb: **Apply (L3)**

CO1 Action verb is not same level as PO1 verb. Therefore, the correlation is medium (2)

PO2 Verb: **Analyze(L4)**

CO1 Action verb is not same level as PO2 verb. Therefore, the correlation is medium (2)

PO7 Verb: **Thumb Rule**

CO1 correlates medium with PO7. Therefore, the correlation is medium (2)

**CO2:** Apply the methods of surveying in finding the measurements on Earth surface.

Action Verb: **Apply (L3)**

PO1 Verb: **Apply (L3)**

CO2 Action verb is same level as PO1 verb. Therefore, the correlation is high (3)

PO2 Verb: **Analyze(L4)**

CO2 Action verb is not same level as PO2 verb. Therefore, the correlation is medium (2)

PO6 Verb: **Thumb Rule**

CO2 correlates medium with PO6. Therefore, the correlation is medium (2)

**CO3:** Understand the importance of transportation, water resources and environmental engineering.

Action Verb: Understand (L2)

PO1 Verb: **Apply (L3)**

CO3 Action verb is not same level as PO1 verb. Therefore, the correlation is medium (2)

PO2 Verb: **Analyze(L4)**

CO3 Action verb is not same level as PO2 verb. Therefore, the correlation is medium (2)

PO7 Verb: **Thumb Rule**

CO3 correlates medium with PO7. Therefore, the correlation is medium (2)

**CO4:** Understand the applications and role of various materials in Mechanical Engineering.

Action Verb: **Understand (L2)**

PO1 Verb: **Apply (L3)**

CO4 Action verb is less than PO1 verb by one level. Therefore, the correlation is medium (2)

PO3 Verb: **Review-L2**

CO4 Action verb is same level as PO2 verb. Therefore, the correlation is high (3)

PO7 Verb: **Thumb Rule**

CO4 correlates moderately with PO6. Therefore, the correlation is medium (2).

**CO5**: Understand the different manufacturing processes and the basics of thermal engineering with its applications.

Action Verb: **Understand (L2)**

PO1 Verb: **Apply (L3)**

CO5 Action verb is less than PO1 verb by one level. Therefore, the correlation is medium (2)

PO3 Verb: **Review-L2**

CO5 Action verb is same level as PO2 verb. Therefore, the correlation is high (3)
PO7 Verb: **Thumb Rule**
CO5 correlates moderately with PO6. Therefore, the correlation is medium (2).
**CO6:** Understand the working of different mechanical power transmission systems, power plants and applications of robotics.
Action Verb: **Understand (L2)**
PO1 Verb: **Apply (L3)**
CO5 Action verb is less than PO1 verb by one level. Therefore, the correlation is medium (2)
PO3 Verb: **Review-L2**
CO5 Action verb is same level as PO2 verb. Therefore, the correlation is high (3)
PO7 Verb: **Thumb Rule**
CO5 correlates moderately with PO6. Therefore, the correlation is medium (2).

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | INTRODUCTION TO PROGRAMMING | L | T | P | C |
|---|---|---|---|---|---|---|
| 23AES0501 | I-I | **(Common to All branches of Engineering)** | **3** | **0** | **0** | **3** |

**Course Outcomes:**

After studying the course, student will be able to

CO 1: **Understand** the computer Programming concepts and Algorithms.
CO 2: **Analyze** the control structures to implement basic programs.
CO 3: **Understand** the concept of Arrays and string to manipulate the stored data.
CO 4: **Create** the dynamic memory allocation using pointers and structures.
CO 5: **Create** the user defined functions and files for modifying stored data.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| **CO1** | Understand | the computer Programming concepts and Algorithms. | | | L2 |
| **CO2** | Analyze | the control structures | | to implement basic programs. | L4 |
| **CO3** | Understand | the concept of Arrays and string | | to manipulate the stored data | L2 |
| **CO4** | Create | the dynamic memory allocation | using pointers and structures. | | L6 |
| **CO5** | Create | user defined functions and files | | for modifying stored data. | L6 |

| **UNIT - I** | **Introduction to Programming and Problem Solving** | **10 Hrs** |
|---|---|---|
| **History of Computers, Basic organization of a computer:** ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program- Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting.<br>**Problem solving techniques:** Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms. | | |
| **UNIT - II** | **Control Structures** | **9 Hrs** |
| Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do- while) Break and Continue. | | |
| **UNIT - III** | **Arrays and Strings** | **9 Hrs** |
| Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings. | | |
| **UNIT - IV** | **Pointers & User Defined Data types** | **9 Hrs** |
| Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types-Structures and Unions. | | |
| **UNIT - V** | **Functions & File Handling** | **9 Hrs** |
| Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, Basics of File Handling | | |

**Textbooks:**


1. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice- Hall, 1988
2. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education, 1996.


**Reference Books:**


1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education, 2008.
2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition


**Mapping of course outcomes with program outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **2** | **3** | **2** | | | | | | | | | | **3** | |
| **CO2** | **3** | **3** | **3** | | | | | | | | | **2** | **2** | |
| **CO3** | **2** | **3** | | | | | | | | | | **2** | **2** | |
| **CO4** | **3** | **3** | **3** | | | | | | | | | **2** | **2** | |
| **CO5** | **3** | **3** | **3** | | | | | | | | | **3** | **2** | **2** |

**Correlation matrix**

| Unit No. | CO | | | | | Program Outcome (PO) | PO(s) :Action Verb and BTL(for PO1 to PO12) | Level of Correlation (0-3) |
|---|---|---|---|---|---|---|---|---|
| | Lesson plan(Hrs) | % | Correlation | Co's Action verb | BTL | | | |
| 1 | 19 | 25% | 3 | CO1: Understand | L2 | PO1<br>PO2<br>PO3 | PO1: Apply(L3)<br>PO2: Review(L2)<br>PO3:Develop(L3) | 2<br>3<br>2 |
| 2 | 10 | 14% | 2 | CO2: Analyze | L4 | PO1<br>PO2<br>PO3<br>PO12 | PO1: Apply(L3)<br>PO2: Analyze (L4)<br>PO3: Develop (L3)<br>PO12: Thumb rule | 3<br>3<br>3<br>2 |
| 3 | 19 | 25% | 3 | CO3: Understand | L2 | PO1<br>PO2<br>PO12 | PO1: Apply(L3)<br>PO2: Review (L2)<br>PO12: Thumb rule | 2<br>3<br>2 |
| 4 | 15 | 20% | 2 | CO4: Create | L6 | PO1<br>PO2<br>PO3<br>PO12 | PO1: Apply(L3)<br>PO2: Review (L2)<br>PO3: Develop (L3)<br>PO12: Thumb rule | 3<br>3<br>3<br>2 |
| 5 | 12 | 16% | 2 | CO5: Create | L6 | PO1<br>PO2<br>PO3<br>PO12 | PO1: Apply(L3)<br>PO2: Review(L2)<br>PO3: Develop (L3)<br>PO12: Thumb rule | 3<br>3<br>3<br>3 |
| | 75 | 100 % | | | | | | |

**Justification Statements :**

**CO1: Understand** the computer Programming concepts and Algorithms.
**Action Verb: Understand (L2)**
**PO1 Verb: Apply (L3)**
CO1 Action verb is less than PO1 verb by one level. Therefore, the correlation is moderate (2)
**PO2 Verb: Review (L2)**
CO1 Action verb is same as than as PO2 verb by two level. Therefore, the correlation is High (3)
**PO3 Verb: Develop (L3)**
CO1 Action verb is less than as PO2 verb by one level. Therefore, the correlation is moderate (2)
**CO2: Analyze** the control structures to implement basic programs**.**
**Action Verb: Analyze (L4)**
**PO1: Apply (L3)**
CO2 Action verb is greater than as PO1 verb. Therefore, the correlation is high (3)
**PO2: Analyze (L4)**
CO2 Action verb is equal to PO2 verb. Therefore, the correlation is high (3)
**PO3: Develop (L3)**
CO2 Action verb is greater than PO3 verb. Therefore, the correlation is high (3)
**PO12: Thumb rule**
**Some of the flow of control statements knowledge are used to solve various problems. Therefore, the correlation is moderate (2)**
**CO3: Understand** the concept of Arrays and string to manipulate the stored data.
**Action Verb: Understand (L2)**
**PO1: Apply (L3)**
CO3 Action verb is less than PO1 verb by one level. Therefore, the correlation is moderate (2)
**PO2: Review (L2)**
CO3 Action verb is Same as PO2 verb. Therefore, the correlation is High (3)
**PO12: Thumb rule**
For some matrix operations array and string concepts were used Therefore, the correlation is moderate (2)
**CO4: Create** the dynamic memory allocation using pointers and structures.
**Action Verb: Create (L6)**
**PO1: Apply (L3)**
CO4 Action verb is greater than PO1 verb by two levels. Therefore, the correlation is high (3)
**PO2: Review (L2)**
CO4 Action verb is greater than as PO2 verb. Therefore, the correlation is high (3)
**PO3: Develop (L3)**
CO4 Action verb is greater than PO3 verb. Therefore, the correlation is high (3)
**PO12: Thumb rule**
For some mathematical operations Pointers and structures are used to manipulate the memory references. Therefore, the correlation is moderate (2)

**CO5: Create** the user defined functions and files for modifying stored data.
**Action Verb: Create (L6)**
**PO1: Apply (L3)**
CO5 Action verb is greater than PO1 verb by two levels. Therefore, the correlation is high (3)
**PO2: Review (L2)**
CO5 Action verb is greater than as PO2 verb. Therefore, the correlation is high (3)
**PO3: Develop (L3)**
CO5 Action verb is greater than as PO3 verb. Therefore, the correlation is high (3)
**PO12: Thumb rule**
In today's world file handling techniques were used in most of the areas. Therefore, the correlation is high (3)

| | |
|---|---|
| | **ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI**<br>**(Autonomous)**<br>**Computer Science & Information Technology (CSIT)**<br>(Effective for the batches admitted from 2023-24) |

**Year: I B.Tech** **(Common to all branches)** Semester: I & II

| **Subject Code**<br>**23AHM9902** | Subject Name<br>**COMMUNICATIVE ENGLISH LAB** | L T P<br>0 0 2 | Credit: 1 |
|---|---|---|---|

**Course Outcomes (CO):** Student will be able to

CO1: **Understand**-the different aspects of the English language proficiency with emphasis On LSRW skills.
CO2: **Apply** communication skills through various language learning activities.
CO3: **Analyze** the English speech sounds, for better listening and speaking.
CO4: **Evaluate** and exhibit professional is min participating in debates and group discussions.
CO5: **Analyze** the mselves to face interviews in future.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| **1** | **Understand** | the different aspects of the English language proficiency with emphasis on LSRW skills | | | L2 |
| **2** | **Apply** | communication skills through various language learning activities | | | L3 |
| **3** | **Analyze** | the English speech sounds, for better listening and speaking. | | | L4 |
| **4** | **Evaluate** | and exhibit professionalism in participating in debates and group discussions | | | L5 |
| **5** | **Analyze** | themselves to face interviews in future | | | L4 |

**List of Topics:**

1. Vowels & Consonants (CO3)
2. Non Verbal Communication (CO2)
3. Communication Skills(CO2)
4. Role Playor Conversational Practice (CO1,CO2)
5. E-mail Writing (CO1)
6. Just A Minute (CO1,CO2)
7. Group Discussions-methods&practice (CO4)
8. Debates-Methods &Practice (CO4)
9. PPT Presentations/Poster Presentation (CO2)
10. Interviews Skills (CO5)

**Suggested Software:**

- Walden Infotech
- Young India Films

**Reference Books:**


1. RamanMeenakshi,Sangeeta-Sharma.*TechnicalCommunication*.OxfordPress.2018.
2. TaylorGrant:*EnglishConversationPractice*,TataMcGraw-HillEducationIndia,2016
3. Hewing's, Martin. Cambridge *AcademicEnglish*(B2).CUP,2012.
4. J.Sethi & P.V.Dhamija. *ACourse in Phonetics and Spoken English*,(2nd Ed),Kindle,2013.

**Web Resources:**
**Spoken English:**

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

**Voice & Accent:**

1. https://www.youtube.com/user/letstalkaccent/videos
2. https://www.youtube.com/c/EngLanguageClub/featured
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

**Mapping of COs to POs and PSOs**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | | 2 | | |
| 2 | | | | | | | | | 2 | 2 | | |
| 3 | | | | | | | | | | 3 | | |
| 4 | | | | | | | | | 3 | 3 | | |
| 5 | | | | | | | | | | 3 | | |

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**CO-PO mapping justification:**

| **CO** | **Percentage of contact hours over the total planned contact hours** | | | **CO** | | **Program Outcome (PO)** | **PO(s): Action verb and BTL (for PO1 to PO5)** | **Level of Correlation (0-3)** |
|---|---|---|---|---|---|---|---|---|
| | **Lesson Plan (Hrs)** | **%** | **corr** | **Verb** | **BTL** | | | |
| 1 | | | | Understand | L2 | 10 | Thumb Rule | 2 |
| 2 | | | | Apply | L3 | 9,10 | Thumb Rule | 2,2 |
| 3 | | | | Analyze | L4 | 10 | Thumb Rule | 3 |
| 4 | | | | Evaluate | L5 | 9,10 | Thumb Rule | 3,3 |
| 5 | | | | Analyze | L4 | 10 | Thumb Rule | 3 |
| | | | | | | | | |

**CO1: Understand the different aspects of the English language proficiency with emphasis on LSRW skills**
**Action Verb: Understand (L2)**
CO1 Action Verb is understand of BTL 2. Using Thumb rule, L2 correlates PO6 to PO12 as moderate (2).
**CO2:**Apply communication skills through various language learning activities.
**Action Verb: Apply (L3)**
CO2 Action Verb is Apply of BTL 3. Using Thumb rule, L3 correlates PO6 to PO12 as moderate(2).
**CO3:**Analyze the English speech sounds, for better listening and speaking.
**Action Verb: Analyze (L4)**
CO3 Action Verb is Analyze of BTL 4. Using Thumb rule, L4 correlates PO6 to PO12 as high (3).
**CO4:** Evaluate and exhibit professionalism in participating in debates and group discussions.
**Action Verb: Evaluate (L5)**
CO4 Action Verb is Evaluate of BTL 5. Using Thumb rule, L5 correlates PO6 to PO12 as high (3).
**CO5: Analyze themselves to face interviews in future.**
**Action Verb: Develop (L4)**
CO5 Action Verb is Analyze of BTL 4. Using Thumb rule, L4 correlates PO6 to PO12 as high (3).

| | |
|---|---|
| | **ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI**<br>**(Autonomous)**<br>(Effective for the batches admitted from 2023-24) |

**Year: I B.Tech (Common to EEE, ECE, CSE, CSIT & allied branches) Semester: I &II**

| **Subject Code:** 23ABS9906 | **Subject Name: Chemistry Lab** | L<br>0 | T<br>0 | P<br>2 | Credits:1 |
|---|---|---|---|---|---|

**Course Objectives:** Students are expected to
Verify the fundamental concepts with experiments.

**Course Outcomes:** At the end of the course, the students will be able to
CO1: Determine the cell constant and conductance of solutions.
CO2: Prepare advanced polymer Bakelite materials.
CO3: Measure the strength of an acid present in secondary batteries.
CO4: Analyze the UV-Visible spectra of some organic compounds.
CO5: Estimate the unknown solution by volumetric analysis

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| **1** | **Determine** | Cell constant and conductance of solutions**.** | | | **L4** |
| **2** | **Prepare** | advanced polymer Bakelite materials | | | **L4** |
| **3** | **Measure** | Strength of an acid present in secondary batteries**.** | | | **L4** |
| **4** | **Analyze** | UV-Visible spectra of some organic compounds**.** | | | **L4** |
| **5** | **Estimate** | Unknown solution by volumetric analysis. | | | **L5** |

**List of Experiments:**

1. Measurement of 10Dq by spectrophotometric method( CO1)
2. Conductometric titration of strong acid vs. strong base (CO1)
3. Conductometric titration of weak acid vs. strong base (CO1)
4. Determination of cell constant and conductance of solutions (CO1)
5. Potentiometry - determination of redox potentials and emfs (CO5)
6. Determination of Strength of an acid in Pb-Acid battery (CO3)
7. Preparation of a Bakelite (CO2)
8. Verify Lambert-Beer's law (CO4)
9. Estimation of copper by Iodometry ( CO5)
10. Wavelength measurement of sample through UV-Visible Spectroscopy (CO1)
11. Preparation of nanomaterials by precipitation method ( CO1)
12. Estimation of Ferrous Iron by Dichrometry (CO5)

**Note: Any TEN of the listed experiments are to be conducted. Out of which any TWO Experiments may be conducted in virtual mode.**

**Reference:**


- "Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publicationsby J. Mendham, R.C.Denney, J.D.Barnes and B. Sivasankar


**Mapping of COs to POs and PSOs**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | 3 | | | | | | | | | | |
| 2 | | | | 3 | | | | | | | | | | |
| 3 | | | | 3 | | | | | | | | | | |
| 4 | | | | 3 | | | | | | | | | | |
| 5 | | | | 3 | | | | | | | | | | |

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**CO-PO mapping justification:**

| CO | Percentage of contact hours over the total planned contact hours | | | CO | | Program Outcome (PO) | PO(s): Action verb and BTL (for PO1 to PO5) | Level of Correlation (0-3) |
|---|---|---|---|---|---|---|---|---|
| | Lesson Plan (Hrs) | % | correlation | Verb | BTL | | | |
| 1 | | | | Determine | L4 | PO4 | PO4: Analyze (L4) | 3 |
| 2 | | | | Prepare | L4 | PO4 | PO4: Analyze (L4) | 3 |
| 3 | | | | Measure | L4 | PO4 | PO4: Analyze (L4) | 3 |
| 4 | | | | Analyze | L4 | PO4 | PO4: Analyze (L4) | 3 |
| 5 | | | | Estimate | L5 | PO4 | PO4: Analyze (L5) | 3 |

**Justification Statements**

**CO1:** Determine the cell constant and conductance of solutions**.**
**Action Verb:** Determine **(L4)**
PO4 Verb: Analyze (L4)
CO1 Action Verb is equal to PO4 verb; Therefore, correlation is high (3).
**CO2:** Prepare advanced polymer Bakelite materials**.**
**Action Verb:** Prepare **(L4)**
PO4 Verb: Analyze (L4)
CO2 Action Verb is equal to PO4 verb; Therefore, correlation is high (3).
**CO3:** Measure the strength of an acid present in secondary batteries**.**
**Action Verb:** Measure **(L4)**
PO4 Verb: Analyze (L4)
CO3 Action Verb is equal to PO4 verb; Therefore, correlation is high (3)
**CO4:** Analyze the UV-Visible spectra of some organic compounds.
**Action Verb:** Analyze **(L4)**
PO4 Verb: Analyze (L4)
CO4 Action Verb is equal to PO4 verb; Therefore, correlation is high (3)
**CO5:** Estimate the unknown solution by volumetric analysis**.**
**Action Verb:** Estimate **(L5)**
PO4 Verb: Analyze (L4)
CO5 Action Verb is greater than PO4; Therefore correlation is high (3).

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | Engineering Workshop | L | T | P | C |
|---|---|---|---|---|---|---|
| 23AES0302 | I-I | | 0 | 0 | 3 | 1.5 |

**Course Outcomes:**

After studying the course, student will be able to

**CO1: Apply** the wood working skills to prepare different joints.
**CO2: Analyze** the sheet metal and fitting operations to prepare various components
**CO3: Apply** the basic electrical engineering knowledge for house wiring practice.
**CO4: Apply** the Welding process for Lap and Butt Joints.
**CO5: Understand** the various plumbing pipe joints

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Bloom's level |
|---|---|---|---|---|---|
| CO1 | Apply | the wood working skills to prepare different joints | | | L3 |
| CO2 | Analyze | the sheet metal and fitting operations to prepare various components | | | L4 |
| CO3 | Apply | the basic electrical engineering knowledge for house wiring practice | | | L3 |
| CO4 | Apply | the Welding process for Lap and Butt joints | | | L3 |
| CO5 | Understand | the various plumbing pipe joints | | | L2 |

**SYLLABUS**

1. **Demonstration**: Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in woodworking and make following joints.
   a) Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridlejoint
3. **Sheet Metal Working**: Familiarity with different types of tools used in sheet metalworking, Developments of following sheet metal job from GI sheets.
   a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing
4. **Fitting:** Familiarity with different types of tools used in fitting and do the followingfitting exercises.
   a) V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire punctureand change of two-wheeler tyre
5. **Electrical Wiring**: Familiarity with different types of basic electrical circuits and makethe following connections.
   a) Parallel and series b) Two-way switch c) Godown lighting
   d) Tube light e) Three phase motor f) Soldering of wires
6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes,Preparation of Green Sand Moulds for given Patterns.
7. **Welding Shop**: Demonstration and practice on Arc Welding and Gas welding.Preparation of Lap joint and Butt joint.
8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe jointswith coupling for same diameter and with reducer for different diameters.

**Textbooks:**


1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.
2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.


**Reference Books:**


1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, MediaPromoters and Publishers, Mumbai. 2007, 14th edition
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.

**Mapping of COs to POs and PSOs**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | | | | | | 3 | | | | 3 | 3 |
| CO2 | 3 | 3 | 3 | | | | | | 3 | | | | 3 | 3 |
| CO3 | 3 | 3 | 3 | | | | | | 3 | | | | 3 | 3 |
| CO4 | 3 | 3 | 3 | | | | | | 3 | | | | 3 | 3 |
| CO5 | 2 | 2 | 2 | | | | | | 2 | | | | 3 | 3 |

**CO-PO mapping justification:**

| CO | CO | | | | | Program Outcomes (PO) | PO(s): Action Verb and BTL (for PO1 to PO5) | Level of Correlation |
|---|---|---|---|---|---|---|---|---|
| | Lesson Plan (Hrs) | % | Correlation | Verb | BTL | | | |
| 1 | - | - | 3 | Apply | L3 | PO1<br>PO2<br>PO3<br>PO9 | Apply-L3<br>Review-L2<br>Develop-L3<br>Thumb Rule-L3 | 3<br>3<br>3<br>3 |
| 2 | - | - | 3 | Analyze | L4 | PO1<br>PO2<br>PO3<br>PO9 | Apply-L3<br>Review-L2<br>Develop-L3<br>Thumb Rule-L3 | 3<br>3<br>3<br>3 |
| 3 | - | - | 1 | Apply | L3 | PO1<br>PO2<br>PO3<br>PO9 | Apply-L3<br>Review-L2<br>Develop-L3<br>Thumb Rule-L3 | 3<br>3<br>3<br>3 |
| 4 | - | - | 2 | Apply | L3 | PO1<br>PO2<br>PO3<br>PO9 | Apply-L3<br>Review-L2<br>Develop-L3<br>Thumb Rule-L3 | 3<br>3<br>3<br>3 |
| 5 | - | - | 2 | Understand | L2 | PO1<br>PO2<br>PO3<br>PO9 | Apply-L3<br>Review-L2<br>Develop-L3<br>Thumb Rule-L3 | 2<br>2<br>2<br>2 |

**Justification Statements:**

**CO1:** Apply the wood working skills to prepare different joints

Action Verb: **Apply** (L3)

PO1 Verb: **Apply** (L3)

CO1 Action verb is same level as PO1 verb. Therefore, the correlation is high (3)

PO2 Verb: **Review (L2)**

CO1 Action verb is same level as PO2 verb. Therefore, the correlation is high (3)

PO3 Verb: **Develop (L3)**

CO1 Action verb is same level as PO3 verb. Therefore, the correlation is high (3)

PO9 Verb: **Thumb Rule**

CO1 Action verb is same level as PO9 verb. Therefore, the correlation is high (3)

**CO2:** Analyze the sheet metal and fitting operations to prepare various components

Action Verb: **Analyse** (L4)

PO1 Verb: **Apply** (L3)

CO2 Action verb is same level (greater) as PO1 verb. Therefore, the correlation is high (3)

PO2 Verb: **Review (L2)**

CO2 Action verb is same level (greater) as PO2 verb. Therefore, the correlation is high (3)

PO3 Verb: **Develop (L3)**

CO2 Action verb is same level (greater) as PO3 verb. Therefore, the correlation is high (3)

PO9 Verb: **Thumb Rule**

CO2 Action verb is same level (greater) as PO9 verb. Therefore, the correlation is high (3)

**CO3:** Apply the basic electrical engineering knowledge for house wiring practice

Action Verb: **Apply** (L3)

PO1 Verb: **Apply** (L3)

CO3 Action verb is same level as PO1 verb. Therefore, the correlation is high (3)

PO2 Verb: **Review (L2)**

CO3 Action verb is same level as PO2 verb. Therefore, the correlation is high (3)
PO3 Verb: **Develop (L3)**
CO3 Action verb is same level as PO3 verb. Therefore, the correlation is high (3)
PO9 Verb: **Thumb Rule**
CO3 Action verb is same level as PO9 verb. Therefore, the correlation is high (3)

**CO4:** Apply the Welding process for Lap and Butt Joints

Action Verb: **Apply** (L3)
PO1 Verb: **Apply** (L3)
CO4 Action verb is same level as PO1 verb. Therefore, the correlation is high (3)
PO2 Verb: **Review (L2)**
CO4 Action verb is same level as PO2 verb. Therefore, the correlation is high (3)
PO3 Verb: **Develop (L3)**
CO4 Action verb is same level as PO3 verb. Therefore, the correlation is high (3)
PO9 Verb: **Thumb Rule**
CO4 Action verb is same level as PO9 verb. Therefore, the correlation is high (3)

**CO5:** Understand the various plumbing pipe joints.

Action Verb: **Understand (L2)**
PO1 Verb: **Apply** (L2)
CO5 Action verb is less than as PO1 verb. Therefore, the correlation is high (2)
PO2 Verb: **Review (L2)**
CO5 Action verb is less than as PO2 verb. Therefore, the correlation is high (2)
PO3 Verb: **Develop (L3)**
CO5 Action verb is less than as PO3 verb. Therefore, the correlation is high (2)
PO9 Verb: **Thumb Rule**
CO5 Action verb is less than as PO9 verb. Therefore, the correlation is high (2)

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | COMPUTER PROGRAMMING LAB (Common to All Branches of Engineering) | L | T | P | C |
|---|---|---|---|---|---|---|
| 23AES0502 | I-I | | 0 | 0 | 3 | 1.5 |

**Course Outcomes:**

After studying the course, student will be able to

**CO1: Understand** the basic syntax of C program to build applications.
**CO2: Create** the control structure for solving complex problems.
**CO3: Apply** the concepts of arrays, functions, basic concepts of pointers to organize the data.
**CO4: Apply** the concepts of structures, unions and linked list to manage heterogeneous data .
**CO5: Create** the file applications for storing and accessing data.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| **CO1** | **Understand** | the basic syntax of C program | | to build applications | L2 |
| **CO2** | **Create** | the control structure | | for solving complex problems | L6 |
| **CO3** | **Apply** | the concepts of arrays, functions, basic concepts of pointers | | to organize the data | L3 |
| **CO4** | **Apply** | the concepts of structures, unions and linked list | | to manage heterogeneous data | L3 |
| **CO5** | **Create** | the file applications | | for storing and accessing data | L6 |

**List of Experiments:**

**Exercise 1: Problem-solving using Computers[CO1]**

i) Basic Linux environment and its editors like Vi, Vim & Emacs etc.
ii) Exposure to Turbo C, gcc
iii) Writing simple programs using printf(), scanf()

**Exercise 2: Problem-solving using Algorithms and Flow charts.[CO1]**

i) Sum and average of 3 numbers
ii) Conversion of Fahrenheit to Celsius and vice versa
iii) Simple interest calculation

**Exercise 3: Variable types and type conversions[CO2]**

i) Finding the square root of a given number
ii) Finding compound interest
iii) Area of a triangle using heron's formulae
iv) Distance travelled by an object

**Exercise 4: Operators and the precedence and as associativity[CO2]**

i) Evaluate the following expressions.
a. A+B*C+(D*E) + F*G
b. A/B*C-B+A*D/3
c. A+++B---A
d. J= (i++) + (++i)
ii) Find the maximum of three numbers using conditional operator
iii) Take marks of 5 subjects in integers, and find the total, average in float
list and perform insertion, deletion, and traversal.

**Exercise 5: Branching and logical expressions[CO2]**

i) Write a C program to find the max and min of four numbers using if-else.
ii) Write a C program to generate electricity bill.
iii) Find the roots of the quadratic equation.
iv) Write a C program to simulate a calculator using switch case.
v) Write a C program to find the given year is a leap year or not.

**Exercise 6: Loops, while and for loops[CO2]**

i) Find the factorial of given number using any loop.
ii) Find the given number is a prime or not.
iii) Compute sine and cos series
iv) Checking a number palindrome
iv) Construct a pyramid of numbers.

**Exercise 7: 1 D Arrays: searching[CO3]**

i) Find the min and max of a 1-D integer array.
ii) Perform linear search on1D array.
iii) The reverse of a 1D integer array
iv) Find 2's complement of the given binary number.
v) Eliminate duplicate elements in an array.

**Exercise 8: 2 D arrays, sorting and Strings[CO3]**

i) Addition of two matrices
ii) Multiplication two matrices
iii) Sort array elements using bubble sort
iv) Concatenate two strings without built-in functions
v) Reverse a string using built-in and without built-in string functions

**Exercise 9: Pointers, structures and dynamic memory allocation[CO3]**

i. Write a C program to find the sum of a 1D array using malloc()
ii. Write a C program to find the total, average of n students using structures
iii. Enter n students data using calloc() and display failed students list
iv. Read student name and marks from the command line and display the student details along with the total.
v. Write a C program to implement realloc()

**Exercise 10: Bitfields, Self-Referential Structures, Linked lists[CO4]**

i) Create and display a singly linked list using self-referential structure.
ii) Demonstrate the differences between structures and unions using a C program.
iii) Write a C program to shift/rotate using bitfields.
iv) Write a C program to copy one structure variable to another structure of the same type.

**Exercise 11: Functions, call by value, scope and extent[CO2]**

i) Write a C function to calculate NCR value.
ii) Write a C function to find the length of a string.
iii) Write a C function to transpose of a matrix.
iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method

**Exercise 12: Recursion, the structure of recursive calls[CO4]**

i) Write a recursive function to generate Fibonacci series.
ii) Write a recursive function to find the lcm of two numbers.
iii) Write a recursive function to find the factorial of a number.
iv) Write a C Program to implement Ackermann function using recursion.
v) Write a recursive function to find the sum of series.

**Exercise 13: Call by reference, dangling pointers[CO4]**

i) Write a C program to swap two numbers using call by reference.
ii) Demonstrate Dangling pointer problem using a C program.
iii) Write a C program to copy one string into another using pointer.
v) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

**Exercise 14: File handling[CO5]**

i) Write a C program to write and read text into a file.
ii) Write a C program to write and read text into a binary file using fread() and fwrite()
iii) Copy the contents of one file to another file.
iv) Write a C program to merge two files into the third file using command-line arguments.
v) Find no. of lines, words and characters in a file
vi) Write a C program to print last n characters of a given file.

**Textbooks:**

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum' s Outline of Programming with C, McGraw Hill

**Reference Books:**

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice- Hall of India
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

**Mapping of course outcomes with program outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 2 | 2 | | | | | | | | | 2 | |
| CO2 | 3 | 3 | | 3 | | | | | | | | 2 | 2 | |
| CO3 | 3 | 3 | | 2 | 3 | | | | | | | 3 | 2 | |
| CO4 | 3 | 3 | 3 | 2 | | | | | | | | 2 | 2 | |
| CO5 | 3 | 3 | 3 | 3 | | | | | | | | 3 | 2 | |

**Correlation matrix**

| Unit No. | Co's Action verb | BTL | Program Outcome (PO) | PO(s) : Action Verb and BTL (for PO1 to PO12) | Level of Correlation (0-3) |
|---|---|---|---|---|---|
| **1** | CO1: understand | L2 | PO1<br>PO2<br>PO3<br>PO4 | PO1: Apply(L3)<br>PO2: Review(L2)<br>PO3: Develop(L3)<br>PO4: Analyze(L4) | 2<br>3<br>2<br>2 |
| **2** | CO2: Create | L6 | PO1<br>PO2<br>PO4<br>PO5<br>PO12 | PO1: Apply(L3)<br>PO2: Review (L3)<br>PO4: Analyze (L4)<br>PO5: Apply(L3)<br>PO12: Thumb rule | 3<br>3<br>3<br>3<br>2 |
| **3** | CO3: Apply | L3 | PO1<br>PO2<br>PO4<br>PO5<br>PO12 | PO1: Apply(L3)<br>PO2: Review (L3)<br>PO4: Analyze (L4)<br>PO5: Apply(L3)<br>PO12: Thumb rule | 3<br>3<br>2<br>3<br>3 |
| **4** | CO4: Apply | L3 | PO1<br>PO2<br>PO3<br>PO4<br>PO12 | PO1: Apply(L3)<br>PO2: Review (L2)<br>PO3: Develop(L3)<br>PO4: Analyze (L4)<br>PO12: Thumb rule | 3<br>3<br>3<br>2<br>2 |
| **5** | CO5: Create | L6 | PO1<br>PO2<br>PO3<br>PO4<br>PO12 | PO1: Apply(L3)<br>PO2: Review(L2)<br>PO3: Develop(L3)<br>PO4: Analyze (L4)<br>PO12: Thumb rule | 3<br>3<br>3<br>3<br>3 |

**Justification Statements :**
**CO1: Understand** the basic syntax of C program to build applications.
**Action Verb: Understand (L2)**
PO1 Verb: Apply (L3)
CO1 Action verb is less than PO1 verb by one level. Therefore, the correlation is moderate (2)
PO2 Verb: Review(L2)
CO1 Action verb is greater than PO2 verb. Therefore, the correlation is high (3)
PO3: Develop(L3)
CO1 Action verb is less than PO3 verb by one level. Therefore, the correlation is moderate (2)
PO4: Analyze(L4)
CO1 Action verb is less than PO1 verb by one level. Therefore, the correlation is moderate is (2)

**CO2: Create** the control structure for solving complex problems.
**Action Verb: Create (L6)**
PO1: Apply (L3)
CO2 Action verb is greater than as PO1 verb. Therefore, the correlation is high (3)
PO2: Review (L3)
CO2 Action verb is same level PO2 verb. Therefore, the correlation is high (3)
PO4: Analyze (L4)
CO2 Action verb is same as PO4 verb. Therefore, the correlation is high (3)
PO5: Apply(L3)

CO2 Action verb is same as PO5 verb. Therefore, the correlation is high (3)
PO12: Thumb rule
For some of Linear Data Structure applications, Linked lists concepts are used to write programs store the data. Therefore, the correlation is high (2)

**CO3: Apply** the concepts of arrays, functions, basic concepts of pointers to organize the data..
**Action Verb: Apply (L3)**
PO1: Apply (L3)
CO3 Action verb is greater than as PO1 verb. Therefore, the correlation is high (3)
PO2: Review (L3)
CO3 Action verb is same level PO2 verb. Therefore, the correlation is high (3)
PO4: Analyze (L4)
CO3 Action verb is less than PO4 verb by one level. Therefore, the correlation is moderate (2)
PO5: Apply(L3)
CO3 Action verb is same as PO5 verb. Therefore, the correlation is high (3)

PO12: Thumb rule
For some of Linear Data Structure applications, Linked lists concepts are used to write programs store the data. Therefore, the correlation is high (3)

**CO4: Apply** the concepts of structures, unions and linked list to manage heterogeneous data.
**Action Verb: Apply (L3)**
PO1: Apply (L3)
CO4 Action verb is greater than as PO1 verb. Therefore, the correlation is high (3)
PO2: Review (L3)
CO4 Action verb is same level PO2 verb. Therefore, the correlation is high (3)
PO4: Analyze (L4)
CO4 Action verb is less than PO4 verb by one level. Therefore, the correlation is moderate (2)
PO5: Apply(L3)
CO4 Action verb is same as PO5 verb. Therefore, the correlation is high (3)
PO12: Thumb rule
For some of Linear Data Structure applications, Linked lists concepts are used to write programs store the data. Therefore, the correlation is high (2)

**CO5: Create** the file applications for storing and accessing data.
**Action Verb: Create (L6)**
PO1: Apply (L3)
CO5 Action verb is greater than as PO1 verb. Therefore, the correlation is high (3)
PO2: Review (L3)
CO5 Action verb is same level PO2 verb. Therefore, the correlation is high (3)
PO4: Analyze (L4)
CO5 Action verb is same as PO4 verb. Therefore, the correlation is high (3)
PO5: Apply(L3)
CO5 Action verb is same as PO5 verb. Therefore, the correlation is high (3)
PO12: Thumb rule
For some of Linear Data Structure applications, Linked lists concepts are used to write programs store the data. Therefore, the correlation is high (3)

| | |
|---|---|
| | **ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI**<br>**(Autonomous)**<br>(Effective for the batches admitted from 2023-24) |

**Common to I SEM CSE/CIC/SCD/CSIT/EEE & II SEM ECE/AI&DS/AI&ML/CE/ME**

| **Course Code:** | **HEALTH AND WELLNESS, YOGA AND SPORTS** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| 23AHM9903 | | **0** | **0** | **1** | **0.5** |

**Course Objectives:**

The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

**Course Outcomes:** After completion of the course the student will be able to

CO1. **Understand** the health & fitness by diet
CO2. **Understand** the importance of yoga.
CO3. **Apply** The yoga practices including Surya Namaskar
CO4. **Understand** the importance of sports.
CO5. **Analyze** various activities that help enhance their health & Positive Personality

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| **1** | **Understand** | Health & fitness by diet | | | **L2** |
| **2** | **Understand** | Importance of yoga. | | | **L2** |
| **3** | **Apply** | yoga practices including Surya Namaskar | | | **L3** |
| **4** | **Understand** | Importance of sports | | | **L2** |
| **5** | **Analyze** | Various activities that help enhance their health & Positive Personality | | | **L4** |

**UNIT** I

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

**Activities:**

i) Organizing health awareness programmes in community
ii) Preparation of health profile
iii) Preparation of chart for balance diet for all age groups

**UNIT II**

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

**Activities:**

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

**UNIT III**

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

**Activities:**

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.
Practicing general and specific warm up, aerobics
ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

**Reference Books:**


1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning,2022
2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. HumanKinetics, Inc.2014


**General Guidelines:**

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

**Evaluation Guidelines:**

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity

shall be evaluated by the concerned teacher for 15 marks, totalingto 90 marks.

- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva in the subject

**Mapping of COs to POs and PSOs**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | 2 | 2 | | | | | | | |
| 2 | | | | | | 2 | 2 | | | | | | | |
| 3 | | | | | | 2 | 2 | | | | | | | |
| 4 | | | | | | 2 | 2 | | | | | | | |
| 5 | | | | | | 3 | 3 | | | | | | | |

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**CO-PO mapping justification:**

| **CO** | **Percentage of contact hours over the total planned contact hours** | | | | **CO** | | **Program Outcome (PO)** | **Level of Correlation (0-3)** |
|---|---|---|---|---|---|---|---|---|
| | **Register (Hrs)** | **Lesson Plan (Hrs)** | **%** | **corr** | **Verb** | **BTL** | | |
| **1** | | | | | **Understand** | **L2** | P06,P07 | 2 |
| **2** | | | | | **Understand** | **L2** | P06,P07 | 2 |
| **3** | | | | | **Apply** | **L3** | P06,P07 | 2 |
| **4** | | | | | **Understand** | **L2** | P06,P07 | 2 |
| **5** | | | | | **Analyze** | **L4** | P06,P07 | 3 |

**CO-PO mapping justification:**

**CO1:** Understand the health & fitness by diet

**Action Verb: Understand (L2)**

CO1 Action Verb is **Understand** of BTL 2.Using Thumb rule; L2 correlates PO6 and PO7 as a moderate (2)

**CO2:** Understand the Importance of yoga

**Action Verb: Understand (L2)**

CO2 Action Verb is **Understand** of BTL 2.Using Thumb rule; L2 correlates PO6 and PO7 as a moderate (2)

**CO3: APPLY**

yoga practices including Surya Namaskar

**Action Verb: APPLY (L3)**

CO3 Action Verb is APPLY of BTL 2.Using Thumb rule; L2 correlates PO6 and PO7 as a moderate (2)

**CO4:** .Understand Importance of sports

**Action Verb: Understand (L2)**

CO4 Action Verb is **Understand** of BTL 2.Using Thumb rule; L2 correlates PO6 and PO7 as a moderate (2)

**Action Verb: APPLY (L3)**

**CO5:** Analyze the Various activities that help enhance their health & Positive Personality

**Action Verb: Analyze (L4)**

CO5 Action Verb is Analyze of BTL 2.Using Thumb rule; L4 correlates PO6 and PO7 as a moderate (2)

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
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**Computer Science & Information Technology (CSIT)**
**(Effective for the batches admitted in 2023-24)**

**Semester II (First year)**

| Sl. No. | Category | Course Code | Course Title | Hours per week | | | Credits | CIE | SEE | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | | | |
| 1 | BS | 23ABS9903 | Engineering Physics | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2 | BS | 23ABS9905 | Differential Equations &Vector Calculus | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3 | ES | 23AES0201 | Basic Electrical & Electronics Engineering | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4 | ES | 23AES0301 | Engineering Graphics | 1 | 0 | 4 | 3 | 30 | 70 | 100 |
| 5 | ES | 23AES0503 | IT Workshop | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| 6 | PC | 23APC0501 | Data Structures | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 7 | BS | 23ABS9908 | Engineering Physics Lab | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| 8 | ES | 23AES0202 | Electrical & Electronics Engineering Workshop | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 9 | PC | 23APC0502 | Data Structures Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 10 | HM | 23AHM9904 | NSS/NCC/Scouts & Guides/Community Service | 0 | 0 | 1 | 0.5 | 50 | - | 50 |
| | | | **Total** | **13** | **0** | **15** | **20.5** | **320** | **630** | **950** |

**Annamacharya Institute of Technology & Sciences (Autonomous), Tirupati**

| Course Code | ENGINEERING PHYSICS | L | T | P | C |
|---|---|---|---|---|---|
| **23ABS9903** | | **3** | **0** | **0** | **3** |
| Regulation: **AK23** | **Common to I B.Tech ECE, AI&DS, AI&ML, ME,CE (Sem-1) & CSE,CIC,CSIT,CSD &EEE (Sem-2)** | | | | |

**Course Outcomes (CO):** At the end of the course students will be able to

CO1: **Understand** the intensity variation of light due to interference, diffraction, and polarization.
CO2: **Analyze** the fundamentals of crystallography and X-ray diffraction.
CO3: **Apply** the basic concepts of dielectric and magnetic materials for engineering applications.
CO4: **Analyze** the fundamentals of Quantum mechanics and interpret the nanomaterials for engineering problems.
CO5: **Analyze** the charge carrier dynamics in semiconductors by implementing the equations of state.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| 1 | **Understand** | The intensity variation of light due to interference, diffraction, and polarization. | | | L2 |
| 2 | **Analyze** | The fundamentals of crystallography and X-ray diffraction. | | | L4 |
| 3 | **Apply** | The basic concepts of dielectric and magnetic materials | | for engineering applications. | L3 |
| 4 | **Analyze** | The fundamentals of Quantum mechanics and interpret the nanomaterials | | for engineering problems. | L4 |
| 5 | **Analyze** | The charge carrier dynamics in semiconductors. | By implementing the equations of state. | | L4 |

**UNIT I Wave Optics** **10 Hrs**

Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Newton's Rings, Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit (Qualitative) – Diffraction Grating.

Polarization: Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

**UNIT II Crystallography and X-ray diffraction** **8 Hrs**

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.

X-ray diffraction: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods.

**UNIT III Dielectric and Magnetic Materials** **8 Hrs**

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - Frequency dependence of polarization-Applications of Dielectric materials.

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials - Applications of magnetic materials.

**UNIT IV Quantum Mechanics and Nanomaterials** **12 Hrs**

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Nanomaterials: Introduction to Nanomaterials–Significance of nanoscale - Physical, Mechanical, Magnetic, and optical properties of nanomaterials –Synthesis of nanomaterials: Ball Milling, Applications of Nanomaterials.

**UNIT V Semiconductors** **10 Hrs**

Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation – Hall effectand its applications – Applications of semiconductors.

**Textbooks:**

1. A Text book of Engineering Physics, M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy, S. Chand

Publications, 11th Edition 2019.
2. K.Thyagarajan "Engineering Physics",-Mc Graw Hill Publishing Company Ltd, 2016.
3. Engineering Physics - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)

**Reference Books:**

1. Engineering Physics - B.K. Pandey and S. Chaturvedi, Cengage Learning 2021.
2. Engineering Physics - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
3. Engineering Physics" - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.2010
4. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).

**Web Resources:** https://www.loc.gov/rr/scitech/selected-internet/physics.html

**Mapping of COs to POs and PSOs**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3 | | | | | | | | | | | | | |
| 2 | 3 | | | | | | | | | | | | | |
| 3 | 3 | | | 3 | | | | | | | | | | |
| 4 | 3 | | | | | | | | | | | | | |
| 5 | 3 | | | 3 | | | | | | | | | | |

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**CO-PO mapping justification:**

| **CO** | **Percentage of contact hours over the total planned contact hours** | | | **CO** | | **Program Outcome (PO)** | **PO(s): Action verb and BTL (for PO1 to PO5)** | **Level of Correlation (0-3)** |
|---|---|---|---|---|---|---|---|---|
| | **Lesson Plan (Hrs)** | **%** | **correlation** | **Verb** | **BTL** | | | |
| **1** | **15** | 22.3 | 3 | **Understand** | **L2** | PO1 | PO1: Apply (L3) | 2 |
| **2** | **11** | 16.4 | 2 | **Analyze** | **L4** | PO1 | PO1: Apply (L3) | 3 |
| **3** | **12** | 17.9 | 2 | **Apply** | **L3** | PO1, PO4 | PO1, PO4: Apply (L3) | 3 |
| **4** | **13** | 19.4 | 2 | **Analyze** | **L4** | PO1 | PO1: Apply (L3) | 3 |
| **5** | **16** | 23.8 | 3 | **Analyze** | **L4** | PO1, PO4 | PO1, PO4: Apply (L3) | 3 |
| | **67** | | | | | | | |

**CO1: The intensity variation of light due to interference, diffraction, and polarization.**
**Action Verb: Understand (L2)**
PO1 Verbs: Apply (L3)
CO1 Action Verb is lesser than PO1 verb by one level; Therefore, correlation is moderate (2).
**CO2: The fundamentals of crystallography.**
**Action Verb: Analyze (L4)**
PO1 Verbs: Apply (L3)
CO2 Action Verb is greater than PO1 verb; Therefore correlation is high (3).
**CO3: Apply the basic concepts of dielectric and magnetic materials for engineering applications.**
**Action Verb: Apply (L3)**
PO1 and PO4 Verbs: Apply (L3)
CO3 Action Verb level is equal to PO1 and PO4 verb; Therefore correlation is high (3).
**CO4: The fundamentals of Quantum mechanics and interpret the nanomaterials for engineering problems.**
**Action Verb: Analyze (L4)**
PO1 Verb: Apply (L3)
CO4 Action Verb is greater than PO1 verb by one level; Therefore, correlation is high (3).
**CO5: The charge carrier dynamics in semiconductors by implementing the equations of state.**
**Action Verb: Analyze (L4)**
PO1 and PO4 Verb: Apply (L3)
CO5 Action verb is greater than PO1 verb; therefore, the correlation is high (3).

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
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| Course Code | **Differential Equations & Vector Calculus** | L | T | P | C |
|---|---|---|---|---|---|
| **23ABS9905** | | **3** | **0** | **0** | **3** |
| Regulation: **AK23** | **Common to I B.Tech ECE, AI&DS, AI&ML, ME, CE (Sem-1) & CSE,CIC,CSIT, CSD &EEE (Sem-2)** | | | | |

**Course Outcomes (CO):** At the end of the course students will be able to
**CO1:** Apply the concepts of ordinary differential equations of first order and first degree.
**CO2:** Apply the methods of linear differential equations related to various engineering problems.
**CO3:** Analyze the solutions of partial differential equations.
**CO4:** Understand the different operators and identities in the vector calculus.
**CO5:** Evaluate the surface integral and volume integral in the vector calculus.

**Mapping of COs to POs**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3 | | | | | | | | | | | |
| 2 | 3 | | | | | | | | | | | |
| 3 | | 3 | | | | | | | | | | |
| 4 | 2 | | | | | | | | | | | |
| 5 | | 3 | | | | | | | | | | |

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**CO-PO mapping justification:**

| **CO** | **Percentage of contact hours over the total planned contact hours** | | | **CO** | | **Program Outcome (PO)** | **PO(s): Action verb and BTL (for PO1 to PO5)** | **Level of Correlation (0-3)** |
|---|---|---|---|---|---|---|---|---|
| | **Lesson Plan (Hrs)** | **%** | **correlation** | **Verb** | **BTL** | | | |
| 1 | 14 | 20.8 | 3 | Apply | L4 | PO1 | Apply | 3 |
| 2 | 15 | 22.3 | 3 | Apply | L3 | PO1 | Apply | 3 |
| 3 | 14 | 20.8 | 3 | Analyze | L4 | PO2 | Analyze | 3 |
| 4 | 9 | 13.4 | 2 | Understand | L2 | PO1 | Apply | 2 |
| 5 | 15 | 22.3 | 3 | Evaluate | L5 | PO2 | Analyze | 3 |

**UNIT I: Linear Differential Equations of first Order and first Degree** **9hrs**
Linear differential equations-Bernoulli's equations-Exat equations and equations reducible to exact form. Applications: Newton's Law of cooling-Law of natural growth and decay-Electrical circuits.

**UNIT II: Equations Reducible to Linear Differential Equations and Applications** **9 hrs**
Definitions, homogeneous and non-homogeneous , complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and simple Harmonic motion.

**UNIT III: Partial Differential Equations** **9 hrs**
Introduction and formation of partial differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.

**UNIT IV: Vector differentiation** **9 hrs**
Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities.

**UNIT V: Vector integration** **9 hrs**
Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and applications of these theorems.

**Text Books :**

1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2011.

**References:**

1. Dr.T.K.V.Iyengar, Engineering Mathematics-I,S.Chand publishers
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics,Laxmipublication,2008
4. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education.

**CO1:** Apply the concepts of ordinary differential equations of first order and first degree.
Action Verb: Apply(L3)
PO1 Verbs: Apply(L3)
CO1 Action Verb is equal to PO1 verb Therefore correlation is high (3).

**CO2:** Apply the methods of linear differential equations related to various engineering problems.
**Action Verb: Apply (L3)**
PO1 Verbs: Apply (L3)
CO2 Action Verb is equal to PO1 verb; Therefore correlation is high (3).

**CO3:** Analyze the solutions of partial differential equations.
**Action Verb: Analyze(L4)**
PO2 Verb: Analyze (L4)
CO3 Action Verb level is equal to PO2 verb; Therefore correlation is high (3).

**CO4:** Understand the different operators and identities in the vector calculus.
**Action Verb: Understand(L2)**
PO1 Verb: Apply(L3)
CO4 Action Verb is low level to PO1 to one level; Therefore correlation is moderate (2).

**CO5:** Evaluate the surface integral and volume integral in the vector calculus.
**Action Verb: Evaluate(L5)**
PO2 Verb: Analyze (L4)
CO5 Action verb is high level to PO2 verb; therefore the correlation is high (3).

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | Basic Electrical & Electronics Engineering | L | T | P | C |
|---|---|---|---|---|---|---|
| 23AES0201 | I-II | | 3 | 0 | 0 | 3 |

**Course Outcomes:**

After studying the course, student will be able to

CO1: **Understand** the fundamental laws of A. C circuits and D. C circuits.

CO2: **Understand** operating principles of motors, generators and measuring instruments.

CO3: **Understand** the fundamentals of power generation, costing and safety measures.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Bloom's level |
|---|---|---|---|---|---|
| 1 | Understand | The fundamentals laws of A. C circuits and D. C circuits. | | A. C circuits and D. C circuits | L2 |
| 2 | Understand | Operating principles of motors, generators and measuring instruments. | | | L2 |
| 3 | Understand | The fundamentals of Power generation, costing and safety measures. | | | L2 |

**PART-A**

**BASIC ELECTRICAL ENGINEERING**

**UNIT I: DC & AC Circuits**

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

**UNIT II: Machines and Measuring Instruments**

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone Bridge.

**UNIT III: Energy Resources, Electricity Bill & Safety Measures**

Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

Electricity bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

**TEXTBOOKS:**


1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition 2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013.
2. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition


**REFERENCE BOOKS:**


1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition.
2. Principles of Power Systems, V.K. Mehtha, S. Chand Technical Publishers, 2020.
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017.
4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.


**WEB RESOURCES:**

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

**PART-B**

**COURSE OUTCOMES:**

After completion of the course, students will be able to:

CO4: **Understand** the fundamental concepts of diodes, transistors and its applications.

CO5: **Analyze** the concepts of rectifiers, power supplies and amplifiers in electronics.

CO6: **Analyze** the concepts of Number Systems, Boolean Functions, Logic Gates and Digital Circuits.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Bloom's level |
|---|---|---|---|---|---|
| 4 | Understand | fundamental concepts of diodes, transistors and its applications | | | L2 |
| 5 | Analyze | concepts of rectifiers, power supplies and amplifiers in electronics | | | L4 |
| 6 | Analyze | concepts of Number Systems, Boolean Functions, Logic Gates and Digital Circuits | | | L4 |

**UNIT I: SEMICONDUCTOR DEVICES**

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

**UNIT II : BASIC ELECTRONIC CIRCUITS AND INSTRUMENTTAION**

Rectifiers and power supplies: Block diagram description of a DC power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple Zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

**UNIT III: DIGITAL ELECTRONICS**

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits– Half and Full Adder, Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

**Textbooks:**

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009

**Reference Books:**

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

**Mapping of course outcomes with program outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | | | | 1 | | | | | | | 2 | |
| **CO2** | 2 | 1 | | | | 1 | | | | | | | 1 | |
| **CO3** | 2 | 1 | | | | 2 | | | | | | | 1 | 2 |
| **CO4** | 2 | 3 | | | | | | | | | | | | |
| **CO5** | 3 | 3 | | | | | | | | | | | | |
| **CO6** | 3 | 3 | | | | | | | | | | | | |

**Justification Table:**

| CO | | CO | | | | | Program Outcome (PO) | PO(s): Action verb and BTL (for PO1 to PO5) | Level of Correlation (0-3) |
|---|---|---|---|---|---|---|---|---|---|
| | | Lesson Plan (Hrs) | % | corr | Verb | BTL | | | |
| 1 | | 08 | 30 | 3 | Understand | L2 | PO1, PO2, PO6 | PO1: Apply (L3)<br>PO2: Identify (L3)<br>PO6: Thumb Rule | 2<br>2<br>1 |
| 2 | | 08 | 30 | 3 | Understand | L2 | PO1, PO2, PO6 | PO1: Apply (L3)<br>PO2: Analyze(L4)<br>PO6: Thumb Rule | 2<br>1<br>1 |
| 3 | | 10 | 38 | 3 | Understand | L2 | PO1, PO2, PO6 | PO1: Apply (L3)<br>PO2: Analyze(L4)<br>PO6: Thumb Rule | 2<br>1<br>2 |
| 4 | | 08 | 30 | 3 | Understand | L2 | PO1, PO2 | PO1: Apply (L3)<br>PO2: Review (L2) | 2<br>3 |
| 5 | | 08 | 30 | 3 | Analyze | L4 | PO1, PO2 | PO1: Apply (L3)<br>PO2: Review (L2) | 3<br>3 |
| 6 | | 10 | 38 | 3 | Analyze | L4 | PO1, PO2 | PO1:Apply(L3)<br>PO2:Review (L2) | 3<br>3 |

**CO1: Understand the fundamental laws of AC and DC circuits.**
Action Verb: Understand (L2)
PO1: Apply (L3)
CO1 Action Verb is Less than PO1 verb by one level; Therefore, correlation is moderate (2).
PO2: Identify (L3)
CO1 Action Verb is Less than PO2 verb by one level; Therefore, correlation is moderate (2).
PO6: Using thumb rule, CO1 correlates PO6 as low (1).
**CO2: Understand operating principles of motors, generators, MC and MI instruments.**
Action Verb: Understand (L2)
PO1: Apply (L3)
CO2 Action Verb is Less than PO1 verb by one level; Therefore, correlation is moderate (2).
PO2: Analyze (L4)
CO2 Action Verb is Less than PO2 verb by two level; Therefore, correlation is low (1).
PO6: Using thumb rule, CO2 correlates PO6 as low (1).
**CO3: Understand the fundamentals of power generation, costing and safety measures.**
Action Verb: Understand (L2)
PO1: Apply (L3)
CO3 Action Verb is Less than PO1 verb by one level; Therefore, correlation is moderate (2).
PO2: Analyze (L4)
CO3 Action Verb is Less than PO2 verb by two level; Therefore, correlation is low (1).
PO6: Using thumb rule, CO3 correlates PO6 as medium (2).
**CO4: Understand the fundamental concepts of diodes, transistors and its applications**
Action Verb: Understand (L2)
PO1 Verbs: Apply (L3)
CO4 Action Verb is less than PO1 verb by one level; Therefore correlation is moderate (2).
PO2 Verbs: Review (L2)
CO4 Action Verb is equal to PO2 verb; Therefore correlation is high (3).
**CO5: Analyze the concepts of rectifiers, power supplies and amplifiers in electronics**.
Action Verb: Analyze (L4)
PO1 Verbs: Apply (L3)
CO5 Action Verb is greater than PO1 verb by one level; Therefore correlation is high (3).
PO2 Verbs: Review (L2)
CO5 Action Verb is equal to PO2 verb; Therefore correlation is high (3).

**CO6: Analyze the concepts of Number Systems, Boolean Functions, Logic Gates and Digital Circuits.**
Action Verb: Analyze (L4)
PO1 Verbs: Apply (L3)
CO6 Action Verb is greater than PO1 verb by one level; Therefore correlation is high (3).
PO2 Verbs: Review (L2)
CO6 Action Verb is equal to PO2 verb; Therefore correlation is high (3).

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | Engineering Graphics | L | T | P | C |
|---|---|---|---|---|---|---|
| 23AES0301 | I-II | | 1 | 0 | 4 | 3 |

**Course Outcomes:**

After studying the course, student will be able to

CO: 1 **Apply** the concepts of engineering curves and scales for technical drawing.

CO: 2 **Understand** the quadrant system to locate the position of points, lines and planes.

CO: 3 **Analyze** the projection of solids located in quadrant system.

CO: 4 **Analyze** the sectional views and development of surfaces of regular solids.

CO: 5 **Apply** orthographic and isometric projections concepts to construct the given object

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| **CO1** | Apply | the concepts of engineering curves and scales | for technical drawing | | L3 |
| **CO2** | Understand | the quadrant system to locate the position of points, lines and planes | | | L2 |
| **CO3** | Analyze | the projection of solids | located in quadrant system | | L4 |
| **CO4** | Analyze | the sectional views and development of surfaces | of regular solids | | L4 |
| **CO5** | Apply | orthographic and isometric projections concepts to construct the given object | | | L3 |

**Unit I: Introduction:** Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.
**Curves:** construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves.
**Scales:** Plain scales, diagonal scales and vernier scales.

**Unit II**
**Orthographic Projections:** Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.
**Projections of Straight Lines:** Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes
**Projections of Planes:** regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

**Unit III**
**Projections of Solids:** Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

**Unit IV**
**Sections of Solids:** Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.
**Development of Surfaces:** Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

**Unit V**
**Conversion of Views**: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views. **Computer graphics**: Creating 2D&3D drawings of objects including PCB and Transformationsusing Auto CAD (*Not for end examination*).

**Text Books:**


1. K. L. Narayana & P. Kannaiah, Engineering Drawing, 3/e, Scitech Publishers
2. N. D. Bhatt, Engineering Drawing, 53/e, Charotar Publishers

**Reference Books:**


1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
2. Engineering Drawing, M.B. Shah and B.C. Rana, Pearson Education Inc,2009.
3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, TataMcGraw Hill, 2017.


**Mapping of course outcomes with program outcomes**

| **COs** | **Programme Outcomes (POs) & Programme Specific Outcomes (PSOs)** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | | 3 | | | | | | | 3 | | | 2 | 2 |
| CO2 | 2 | | 2 | | | | | | | 3 | | | 2 | 2 |
| CO3 | 2 | | 2 | | | | | | | 3 | | | 2 | 2 |
| CO4 | 3 | | 3 | | | | | | | 3 | | | 2 | 2 |
| CO5 | 3 | | 3 | | | | | | | 3 | | | 2 | 2 |

**Correlation Matrix**

| CO | CO | | | | | Program Outcomes (PO) | PO(s): Action Verb and BTL (for PO1 to PO5) | Level of Correlation |
|---|---|---|---|---|---|---|---|---|
| | Lesson Plan (Hrs) | % | Correlation | Verb | BTL | | | |
| 1 | 18 | 24 | 3 | Apply | L3 | PO1<br>PO2<br>PO10 | Apply (L3)<br>Develop (L3)<br>Thumb Rule | 3<br>3<br>3 |
| 2 | 15 | 20 | 2 | Understand | L2 | PO1<br>PO2<br>PO10 | Apply (L3)<br>Develop (L3)<br>Thumb Rule | 2<br>2<br>3 |
| 3 | 15 | 20 | 2 | Analyze | L4 | PO1<br>PO2<br>PO10 | Apply (L3)<br>Develop (L3)<br>Thumb Rule | 3<br>3<br>3 |
| 4 | 15 | 20 | 2 | Analyze | L4 | PO1<br>PO2<br>PO10 | Apply (L3)<br>Develop (L3)<br>Thumb Rule | 3<br>3<br>3 |
| 5 | 12 | 16 | 2 | Apply | L3 | PO1<br>PO2<br>PO10 | Apply (L3)<br>Develop (L3)<br>Thumb Rule | 3<br>3<br>3 |

**Justification Statements:**

**CO1: Apply** the concepts of engineering curves and scales for technical drawing.
**Action Verb: Apply (L3)**
PO1 Verb: **Apply (L3)**
CO1 Action verb is same level as PO1 verb. Therefore, the correlation is high
(3)PO2 Verb: **Develop (L3)**
CO1 Action verb is same level as PO2 verb. Therefore, the correlation is high
(3)PO10 Verb: Thumb Rule (TR)
CO1: Engineering graphics involves creating visual representations and technical drawings to communicate design ideas,concepts and specifications. Therefore, the correlation is high (3)
**CO2: Understand** the quadrant system to locate the position of points, lines and planes.
**Action Verb: Understand (L2)**
PO1 Verb: **Apply (L3)**
CO2: Action verb is less than PO1 verb by one level. Therefore, the correlation is medium (2)PO2 Verb: **Develop (L3)**
CO2: Action verb is less than PO2 verb by one level. Therefore, the correlation is medium (2)
PO10 Verb: Thumb Rule (TR)
CO2: Engineering graphics involves creating visual representations and technical drawings to communicate design ideas,concepts and specifications. Therefore, the correlation is high (3)
**CO3: Analyze** the projection of solids located in quadrant system.
**Action Verb: Analyze (L4)**
PO1 Verb: **Apply (L3)**
CO3: Action verb is same level as PO1 verb. Therefore, the correlation is high
(3)PO2 Verb: **Develop (L3)**
CO3: Action verb is same level as PO2 verb. Therefore, the correlation is high
(3)PO10 Verb: Thumb Rule (TR)
CO3: Engineering graphics involves creating visual representations and technical drawings to communicate design ideas,concepts and specifications. Therefore, the correlation is high (3)

**CO4: Analyze** the sectional views and development of surfaces of regular solids
**Action Verb: Analyze (L4)**
PO1 Verb: **Apply (L3)**
CO4: Action verb is same level as PO1 verb. Therefore, the correlation is high
(3) PO2 Verb: **Develop (L3)**
CO4: Action verb is same level as PO2 verb. Therefore, the correlation is high
(3) PO10 Verb: Thumb Rule (TR)
CO4: Engineering graphics involves creating visual representations and technical drawings to communicate design ideas, concepts and specifications. Therefore, the correlation is high (3)
**CO5: Apply** orthographic and isometric projections concepts to construct the given object**.**
**Action Verb: Apply (L3)**
PO1 Verb: **Apply (L3)**
CO5: Action verb is same level as PO1 verb. Therefore, the correlation is high
(3) PO2 Verb: **Develop (L3)**
CO5: Action verb is same level as PO2 verb. Therefore, the correlation is high
(3) PO10 Verb: Thumb Rule (TR)
CO5: Engineering graphics involves creating visual representations and technical drawings to communicate design ideas, concepts and specifications. Therefore, the correlation is high (3)

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT))**

| Course Code | Year & Sem | IT workshop | L | T | P | C |
|---|---|---|---|---|---|---|
| 23AES0503 | I-II | (Common to CSE, CIC, CSE(DS), CSIT & EEE) | 0 | 0 | 2 | 1 |

**Course Outcomes:**

After studying the course, student will be able to

**CO1: Understand** The Process of Software Installation & Hardware troubleshooting.
**CO2: Analyze** the network configurations for customizing web pages and search engines.
**CO3: Apply** the basic editing function, formatting text & objects on a required content.
**CO4: Apply** the formulas, functions and visualizations to manage the data.
**CO5: Understand** the libraries and models of chatGPT to generate information.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| **CO1** | **Understand** | The Process of Software Installation & Hardware troubleshooting. | | | L2 |
| **CO2** | **Analyze** | the network configurations | | for customizing web pages and search engines | L4 |
| **CO3** | **Apply** | The basic editing function, formatting text & objects | | on a required content | L3 |
| **CO4** | **Apply** | the formulas, functions and visualizations | | to manage the data | L3 |
| **CO5** | **Understand** | The libraries and models of chatGPT | | to generate information | L2 |

**List of Experiments**

**PC Hardware & Software Installation**

**Task 1:** Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.[CO1]

**Task 2:** Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.[CO1]

**Task 3:** Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.[CO1]

**Task 4:** Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva.[CO1]

**Task 5:** Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva.[CO1]

**Internet & World Wide Web**

**Task1:** Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.[CO2]

**Task 2:** Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.[CO2]

**Task 3:** Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student. [CO2]

**Task 4:** Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms. [CO2]

**LaTeX and WORD**

**Task 1 –** Word Orientation: The mentor needs to give an overview of La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La TeXand word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word. [CO3]

**Task 2:** Using La TeX and Word to create a project certificate. Features to be covered:- Formatting Fonts

in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La TeX and Word. [CO3]

**Task 3:** Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes. [CO3]

**Task 4:** Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word. [CO3]

**EXCEL**

**Excel Orientation:** The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources. [CO4]

**Task 1:** Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text[CO4]

**Task 2:** Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, [CO4]

**LOOKUP/VLOOKUP**

**Task 3:** Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting[CO4]

**POWER POINT**

**Task 1:** Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint. [CO4]

**Task 2:** Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts. [CO4]

**Task 3:** Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides. [CO4]

**AI TOOLS – ChatGPT**

**Task 1:** Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them. [CO5]

• Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

**Task 2:** Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas[CO5]

• Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

**Task 3:** Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are. [CO5]

• Ex:Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

**Reference Books:**


1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition
4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
5. LaTeX Companion, Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3rd edition


**Mapping of course outcomes with program outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 3 | | | | | | | | | | | 1 | |
| **CO2** | 3 | 3 | 3 | 3 | 3 | | | | | | | | | |
| **CO3** | 3 | 3 | 3 | 2 | 3 | | | | | | | 3 | 2 | |
| **CO4** | 3 | 3 | 3 | 2 | 3 | | | | | | | 3 | | 2 |
| **CO5** | 2 | 2 | | | | | | | | | | | | 1 |

**Correlation matrix**

| Unit No. | Co's Action verb | BTL | Program Outcome (PO) | PO(s) : Action Verb and BTL (for PO1 to PO12) | Level of Correlation (0-3) |
|---|---|---|---|---|---|
| **1** | CO1: Understand | L2 | PO1<br>PO2 | PO1: Apply(L3)<br>PO2: Review(L2) | 2<br>3 |
| **2** | CO2: Analyze | L4 | PO1<br>PO2<br>PO3<br>PO4<br>PO5 | PO1: Apply(L3)<br>PO2: Identify (L3)<br>PO3: Develop(L3)<br>PO4: Analyze (L4)<br>PO5: Apply (L3) | 3<br>3<br>3<br>3<br>3 |
| **3** | CO3: Apply | L3 | PO1<br>PO2<br>PO3<br>PO4<br>PO5<br>PO12 | PO1: Apply(L3)<br>PO2: Review (L2)<br>PO3: Develop(L3)<br>PO4: Analyze (L4)<br>PO5: Apply (L3)<br>PO12: Thumb rule | 3<br>3<br>3<br>2<br>3<br>3 |
| **4** | CO4: Apply | L3 | PO1<br>PO2<br>PO3<br>PO4<br>PO5<br>PO12 | PO1: Apply(L3)<br>PO2: Review (L2)<br>PO3: Develop(L3)<br>PO4: Analyze (L4)<br>PO5: Apply (L3)<br>PO12: Thumb rule | 3<br>3<br>3<br>2<br>3<br>3 |
| **5** | CO5: Understand | L2 | PO1<br>PO2 | PO1: Apply(L3)<br>PO2: Identify (L3) | 2<br>2 |

**Justification Statements :**
**CO1: Understand** The Process of Software Installation & Hardware troubleshooting
**Action Verb: Understand (L2)**
**PO1 Verb: Apply (L3)**
CO1 Action verb is less than PO1 verb by one level. Therefore, the correlation is moderate (2)
**PO2 Verb: Review(L2)**
CO1 Action verb is same as PO2 verb. Therefore, the correlation is high (3)
**CO2: Analyze** the network configurations for customizing web pages and search engines
**Action Verb: Analyze (L4)**
**PO1: Apply (L3)**
CO2 Action verb is greater than as PO1 verb. Therefore, the correlation is high (3)
**PO2: idetify(L3)**
CO2 Action verb is greater than as PO2 verb. Therefore, the correlation is high (3)
**PO3: Develop (L3)**
CO2 Action verb is greater than as PO3 verb. Therefore, the correlation is high (3)
**PO4: Analyze (L4)**
CO2 Action verb is same as PO4 verb. Therefore, the correlation is high (3)
**PO5: Apply (L3)**
CO2 Action verb is greater than as PO5 verb. Therefore, the correlation is high (3)
**CO 3: Apply** The basic editing function, formatting text & objects on a required content.
**Action Verb: Apply (L3)**
**PO1: Apply (L3)**
CO3 Action verb is greater than as PO1 verb. Therefore, the correlation is high (3)
**PO2: Review(L2)**
CO3 Action verb is less than as PO2 verb. Therefore, the correlation is high(3)
**PO3: Develop(L3)**
CO3 Action verb is same as PO3 verb. Therefore, the correlation is high (3)
**PO4: Analyze (L4)**
CO3 Action verb is less than as PO4 verb. Therefore, the correlation is moderate (2)
**PO5: Apply (L3)**
CO3 Action verb is same as PO5 verb. Therefore, the correlation is high (3)
**PO12: Thumb rule**
Documentation and presentation are learning process to find the solution better manner the correlation is high (3)

**CO 4: Apply** the formulas, functions and visualizations to manage the data.
**Action Verb: Apply (L3)**
**PO1: Apply (L3)**
CO4 Action verb is greater than as PO1 verb. Therefore, the correlation is high (3)
**PO2: idetify(L3)**
CO4 Action verb is greater than as PO2 verb. Therefore, the correlation is high (3)
**PO3: Develop (L3)**
CO4 Action verb is same as PO3 verb. Therefore, the correlation is high (3)
**PO4: Analyze (L4)**
CO4 Action verb is less than as PO4 verb by one level. Therefore, the correlation is moderate (2)
**PO5: Apply (L3)**
CO4 Action verb is greater than as PO5 verb. Therefore, the correlation is high (3)
**PO12: Thumb rule**
Spread sheets in Excel is the trending approach in the current days Therefore, the correlation is high (3)
**CO 5: Understand** the libraries and models of chatGPT to generate information.
**Action Verb: Understand (L2)**
**PO1 Verb: Apply (L3)**
CO1 Action verb is less than PO1 verb by one level. Therefore, the correlation is moderate (2)
**PO2 Verb: Identify(L3)**
CO1 Action verb is same as PO2 verb. Therefore, the correlation is moderate (2)

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | Data Structures | L | T | P | C |
|---|---|---|---|---|---|---|
| 23APC0501 | I-II | **(Common to CSE, CIC, CSE(DS), AIML & AIDS)** | **3** | **0** | **0** | **3** |

**Course Outcomes:**

After studying the course, student will be able to

**CO 1: Understand** the concepts of Linear Data Structures to sort the data
**CO 2: Apply** the Linked list concepts to perform operations on data.
**CO 3: Apply** the stacks features to manage the memory
**CO 4: Analyse** various operations of queues, dequeues and their applications.
**CO 5: Understand** binary search trees and hash tables to facilitate indexed search

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| **CO1** | **Understand** | the concepts of Linear Data Structures | | to sort the data | L2 |
| **CO2** | **Apply** | The Linked list concepts | | to perform operations on data. | L3 |
| **CO3** | **Apply** | The stacks features | | to manage the memory | L3 |
| **CO4** | **Analyse** | various operations of queues, dequeues and their applications. | | | L4 |
| **CO5** | **Understand** | The Binary Search Trees and hash tables | | to facilitate indexed search | L2 |

| | | |
|---|---|---|
| **UNIT – I** | | 9 Hrs |
| **Introduction to Linear Data Structures:** Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures. Searching Techniques: Linear & Binary Search, Sorting Techniques: Bubble sort, Selection sort, Insertion Sort | | |
| **UNIT – II** | | 9 Hrs |
| **Linked Lists:** Singly linked lists: representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists | | |
| **UNIT – III** | | 9 Hrs |
| **Stacks:** Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, backtracking, reversing list etc. | | |
| **UNIT – IV** | | 9 Hrs |
| **Queues:** Introduction to queues: properties and operations, implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, etc. Deques: Introduction to deques (double-ended queues), Operations on deques and their applications**.** | | |
| **UNIT – V** | | 9 Hrs |
| **Trees**: Introduction to Trees, Binary Search Tree – Insertion, Deletion & Traversal<br>**Hashing**: Brief introduction to hashing and hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations, Applications of hashing in unique identifier generation, caching, etc | | |
| **Textbooks:** | | |
| 1.Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.<br>2.Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson- Freed, Silicon Press, 2008 | | |
| **Reference Books:** | | |
| 1.Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders<br>2.C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft<br>3.Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum<br>4.Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein<br>5.Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick | | |
| **Online Learning Resources:** | | |
| www.nptel.ac.in | | |

**Mapping of course outcomes with program outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | | | | | | | | | | | 2 | |
| CO2 | 3 | 3 | | 2 | | | | | | | | 1 | 2 | 1 |
| CO3 | 3 | 3 | | 3 | | | | | | | | 2 | 2 | 1 |
| CO4 | 3 | 3 | 3 | 3 | | | 2 | | | | | 2 | 2 | 2 |
| CO5 | 2 | 3 | 2 | 3 | | | | | | | | 2 | 2 | 2 |

**Correlation matrix**

| Unit No. | CO | | | | | Program Outcome (PO) | PO(s) : Action Verb and BTL (for PO1 to PO12) | Level of Correlation (0-3) |
|---|---|---|---|---|---|---|---|---|
| | Lesson plan(Hrs) | % | Correlation | Co's Action verb | BTL | | | |
| 1 | 18 | 24% | 3 | CO1: Understand | L2 | PO1<br>PO2 | PO1: Apply(L3)<br>PO2: Review(L2) | 2<br>3 |
| 2 | 14 | 19% | 2 | CO2: Apply | L3 | PO1<br>PO2<br>PO4<br>PO12 | PO1: Apply(L3)<br>PO2: Develop (L3)<br>PO4: Analysis (L4)<br>PO12: Thumb rule | 3<br>3<br>2<br>1 |
| 3 | 15 | 20% | 2 | CO3: Apply | L3 | PO1<br>PO2<br>PO4<br>PO12 | PO1: Apply(L3)<br>PO2: Develop (L3)<br>PO4: Analysis (L4)<br>PO12: Thumb rule | 3<br>3<br>2<br>2 |
| 4 | 13 | 18% | 2 | CO4: Analyse | L4 | PO1<br>PO2<br>PO3<br>PO4<br>PO7<br>PO12 | PO1: Apply(L3)<br>PO2: Review (L2)<br>PO3: Develop (L3)<br>PO4: Analysis(L4)<br>PO7: Thumb rule<br>PO12: Thumb rule | 3<br>3<br>3<br>3<br>2<br>2 |
| 5 | 14 | 19% | 2 | CO5: Understand | L2 | PO1<br>PO2<br>PO3<br>PO4<br>PO12 | PO1: Apply(L3)<br>PO2: review(L2)<br>PO3: develop(L3)<br>PO4: Interpret(L2)<br>PO12: Thumb rule | 2<br>3<br>2<br>3<br>2 |
| | 74 | 100 % | | | | | | |

**Justification Statements:**

**CO1: Understand the** concepts of Linear Data Structures to sort the data
**Action Verb: Understand (L2)**
PO1 Verb: Apply (L3)
CO1 Action verb is less than PO1 verb by one level. Therefore, the correlation is moderate (2)
PO2 Verb: Review (L2)
CO1 Action verb is same level as PO2. Therefore, the correlation is high (3)
**CO2: Apply** the Linked list concepts to perform operations on data.
**Action Verb: Apply (L3)**
PO1: Apply (L3)
CO2 Action verb is same level as PO1 verb. Therefore, the correlation is high (3)
PO2: Develop (L3)
CO2 Action verb is same level PO2 verb. Therefore, the correlation is high (3)

PO4: Analysis (L4)
CO2 Action verb is less than PO4 verb by one level. Therefore, the correlation is moderate (2)
PO12: Thumb rule
For some of Linear Data Structure applications, array and structure concepts are used to write programs store the data. Therefore, the correlation is low (1)**CO3: Apply the** stacks features to manage the memory
**Action Verb: Apply (L3)**
PO1: Apply (L3)
CO3 Action verb is same level as PO1 verb. Therefore, the correlation is high (3)
PO2: Develop (L3)
CO3 Action verb is same level PO2 verb. Therefore, the correlation is high (3)
PO4: Analysis (L4)
CO3 Action verb is less than PO4 verb by one level. Therefore, the correlation is moderate (2)
PO12: Thumb rule
For some of Data Structure applications, stacks concepts are used to write programs to manage programs. Therefore, the correlation is low (1)
**CO4: Analyse** various operations of queues, dequeues and their applications.
**Action Verb: Analyse (L4)**
PO1: Apply(L3)
CO4 Action verb is greater than PO1 verb by two levels. Therefore, the correlation is high (3)
PO2: Review (L2)
CO4 Action verb is greater than PO1 verb by two levels. Therefore, the correlation is high (3)
PO3: Develop (L3)
CO4 Action verb is greater than PO1 verb by two levels. Therefore, the correlation is high (3)
PO4: Analysis (L4)
CO4 Action verb is greater than PO4 verb by one level. Therefore, the correlation is high (3)
PO7: Thumb rule
For some of Real Time problems Data Structure applications, queues concept is indirectly used to sustainable environment development. Therefore, the correlation is moderate (2)
PO12: Thumb rule
For some of Real Time problems Data Structure applications, queues concepts are used to write programs and evaluation the memory operations. Therefore, the correlation is moderate (2)
**CO5: Understand** binary search trees and hash tables to facilitate indexed search
**Action Verb: Create (L6)**
PO1: Apply(L3)
CO5 Action verb is greater than PO1 verb by three levels. Therefore, the correlation is high (3)
PO2: Review (L6)
CO5 Action verb is same level as PO2 verb. Therefore, the correlation is high (3)
PO3: Develop (L3)
CO4 Action verb is same level as PO3 verb. Therefore, the correlation is high (3)
PO4: Interpret (L2)
CO5 Action verb is greater than PO4 verb by two levels. Therefore, the correlation is high (3)
PO12: Thumb rule
For some of data manipulations Sorting and File Organization methods are used to solve storage problems. Therefore, the correlation is low (3)

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY SCIENCES: TIRUPATI**
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**Computer Science & Information Technology (CSIT)**
**Common to I Sem ECE/ AI&DS/AI&ML/CE/ME & II Sem CSE/CIC/EEE/CSD/CSIT**

| Subject Code: 23ABS9908 | Subject Name: **Engineering Physics Lab** | L T P<br>0 0 2 | Credits: 1 |
|---|---|---|---|

**Course Outcomes**

CO1: **Analyze** the properties of light for engineering problems.
CO2: **Evaluate** the crystallite size using X-ray diffraction.
CO3: **Analyze** the basic properties of dielectric and magnetic behavior of the given material.
CO4: **Determine** the mechanical behavior of a given material.
CO5: **Evaluate** the basic parameters of a given semiconductor material.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| 1 | Analyze | The properties of light | | for engineering problems. | L4 |
| 2 | Evaluate | The crystallite size using X-ray diffraction. | | | L5 |
| 3 | Analyze | The basic properties of dielectric and magnetic behavior of the given material. | | | L4 |
| 4 | Determine | The mechanical behavior of a given material. | | | L5 |
| 5 | Evaluate | The basic parameters of a given semiconductor material. | | | L5 |

**List of Experiments:**

1. Determination of radius of curvature of a given Plano-convex lens by Newton's rings – CO1.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration – CO1.
3. Study the variation of B versus H by magnetizing the magnetic material (B-H curve) – CO3.
4. Determination of wavelength of Laser light using diffraction grating – CO1.
5. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method – CO3.
6. Determination of energy gap of a semiconductor using p-n junction diode – CO5.
7. Determination of the resistivity of semiconductors by four probe methods – CO5.
8. Determination of the crystallite size using X-Ray Diffraction spectra – CO2.
9. Determination of the numerical aperture of a given optical fiber and angle of acceptance – CO1.
10. Verification of Brewster's law – CO1.
11. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum – CO4.
12. Determination of rigidity modulus of the material of the given wire using Torsional pendulum – CO4.
13. Determination of temperature coefficients of a thermistor – CO5.
14. Determination of dielectric constant using charging and discharging method – CO3.
15. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect – CO5.
16. Sonometer: Verification of laws of stretched string – CO4.
17. Determination of magnetic susceptibility by Kundt's tube method – CO3.
18. Determination of Frequency of electrically maintained tuning fork by Melde's experiment – CO4.

**Note: Any TEN of the listed experiments are to be conducted. Out of which any TWO**

**Experiments may be conducted in virtual mode.**

**References:** A Textbook of Practical Physics - S. Balasubramanian, M. N. Srinivasan, S. Chand Publishers, 2017.

**URL**: www.vlab.co.in

**Mapping of COs to POs and PSOs**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3 | | | 3 | | | | | | | | | | |
| 2 | 3 | | | 3 | | | | | | | | | | |
| 3 | 3 | | | 3 | | | | | | | | | | |
| 4 | 3 | | | 3 | | | | | | | | | | |
| 5 | 3 | | | 3 | | | | | | | | | | |

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**CO-PO mapping justification:**

| **CO** | **Percentage of contact hours over the total planned contact hours** | | | **CO** | | **Program Outcome (PO)** | **PO(s): Action verb and BTL (for PO1 to PO5)** | **Level of Correlation (0-3)** |
|---|---|---|---|---|---|---|---|---|
| | **Lesson Plan (Hrs)** | **%** | **correlation** | **Verb** | **BTL** | | | |
| **1** | 9 | 25 | 3 | Analyze | **L4** | PO1, PO4 | PO1: Apply (L3), PO4: Analyze (L4) | 3 3 |
| **2** | 6 | 16 | 2 | Evaluate | **L5** | PO1, PO4 | PO1: Apply (L3), PO4: Analyze (L4) | 3 3 |
| **3** | 9 | 25 | 3 | Analyze | **L4** | PO1, PO4 | PO1: Apply (L3), PO4: Analyze (L4) | 3 3 |
| **4** | 6 | 16 | 2 | Determine | **L5** | PO1, PO4 | PO1: Apply (L3), PO4: Analyze (L4) | 3 3 |
| **5** | 6 | 16 | 2 | Evaluate | **L5** | PO1, PO4 | PO1: Apply (L3), PO4: Analyze (L4) | 3 3 |
| | 36 | | | | | | | |

**CO1: Analyze the properties of light for solving engineering problems.**
**Action Verb: Analyze (L4)**
PO1 Verbs: Apply (L3)
PO4 Verb: Analyze (L4)
CO1 Action Verb is greater than PO1 verb by one level; Therefore, correlation is high (3).
CO1 Action Verb is equal to PO4 verb; Therefore, correlation is high (3).

**CO2: Evaluate the crystallite size using X-ray diffraction.**
**Action Verb: Evaluate (L5)**
PO1 Verbs: Apply (L3)
PO4 Verb: Analyze (L4)

CO2 Action Verb is greater than PO1 verb by two levels; Therefore correlation is high (3).
CO2 Action Verb is greater than PO1 verb by one level; Therefore correlation is high (3).

**CO3: Analyze the basic properties of dielectric and magnetic behavior of the given material.**
**Action Verb: Analyze (L4)**
PO1 Verbs: Apply (L3)
PO4 Verb: Analyze (L4)
CO3 Action Verb level is greater than PO1 action verb by one level; Therefore correlation is high (3).
CO3 Action Verb level is equal to PO4 action verb; Therefore correlation is high (3).

**CO4: Determine the mechanical behavior of a given material using dynamic methods.**
**Action Verb: Determine (L5)**
PO1 Verbs: Apply (L3)
PO4 Verb: Analyze (L4)
CO4 Action Verb is greater than PO1 verb by two levels; Therefore correlation is high (3).
CO4 Action Verb is greater than PO4 verb by one level; Therefore correlation is high (3).

**CO5: Evaluate the basic parameters of a given semiconductor material.**
**Action Verb: Evaluate (L5)**
PO1 and PO4 Verb: Apply (L3)
CO5 Action Verb is greater than PO1 verb by two levels; Therefore correlation is high (3).
CO5 Action Verb is greater than PO1 verb by one level; Therefore correlation is high (3).

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | Electrical & Electronics Engineering Workshop | L | T | P | C |
|---|---|---|---|---|---|---|
| 23AES0202 | I-II | | 0 | 0 | 3 | 1.5 |

**Course Outcomes:**
After studying the course, student will be able to
CO1: **Understand** the Electrical circuit design, measurement of resistance, power, and power factor.
CO2: **Apply** suitable methods to measure Resistance, power, energy and power factor.
CO3: **Design** suitable methods for magnetization characteristics of D. C shunt generator.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Bloom's level |
|---|---|---|---|---|---|
| CO1 | Understand | Electrical circuit design; measurement of resistance, power, power factor | | | L2 |
| CO2 | Apply | Suitable methods to measure Resistance, power, energy and power factor. | | | L3 |
| CO3 | Design | Suitable methods for magnetization characteristics of D. C shunt generator. | | | L6 |

**SYLLABUS:**

**PART A**
**ELECTRICAL ENGINEERING LAB**

**List of experiments:**
1. Verification of Kirchhoff's current law and Voltage law-(CO1).
2. Verification of Superposition theorem-(CO1).
3. Measurement of Resistance using Wheat stone bridge-(CO1).
4. Measurement of Power and Power factor using Single-phase watt-meter-(CO2).
5. Measurement of Earth Resistance using Megger-(CO2).
6. Calculation of Electrical Energy for Domestic Premises-(CO2).
7. Magnetization Characteristics of DC shunt Generator-(CO3).

**Reference Books:**

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition


**Note:** Minimum Six Experiments to be performed.

**PART B**
**ELECTRONICS ENGINEERING LAB**

**COURSE OUTCOMES:**
After completion of the course, students will be able to:
CO4: **Understand** the V-I Characteristics of diodes and its applications.
CO5: **Analyze** the input and output characteristics of BJT and its applications.
CO6: **Analyze** the truth tables of all logic gates and f/f's using IC's.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Bloom's level |
|---|---|---|---|---|---|
| **CO4** | Understand | V-I Characteristics of diodes and its applications. | | | L2 |
| **CO5** | Analyze | input and output characteristics of BJT and its applications | | | L4 |
| **CO6** | Analyze | Truth tables of all logic gates and f/f's using IC's. | | | L4 |

**List of Experiments:**
1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias. (CO4)
2. Plot VI characteristics of Zener Diode and its application as voltage Regulator. (CO4)
3. Implementation of half wave and full wave rectifiers (CO4)
4. Plot Input & Output characteristics of BJT in CE and CB configurations (CO5)
5. Frequency response of CE amplifier. (CO5)
6. Simulation of RC coupled amplifier with the design supplied. (CO5)

7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs. (CO6)
8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs. (CO6)

**Tools Equipment Required:** DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROS, and all the required active devices.

**References:**

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, Introductory Electronic Devices & Circuits - Conventional Flow Version, Pearson Education, 2009.

**Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software.**

**Mapping of course outcomes with program outcomes**

| COs | Programme Outcomes (POs) & Programme Specific Outcomes (PSOs) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO 3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 2 | 1 | | 1 | | | | | 1 | | | | 2 | |
| CO2 | 3 | 2 | | 2 | | | | | 1 | | | | 2 | |
| CO3 | | 3 | | 3 | | | | | 1 | | | | 2 | 1 |
| CO4 | 2 | 3 | | | | | | | | | | | | |
| CO5 | 3 | 3 | | | | | | | | | | | | |
| CO6 | 3 | 3 | | | | | | | | | | | | |

**Justification Table:**

| CO | COs | | Program Outcome (PO) | PO(s): Action verb and BTL (for PO1 to PO5) | Level of Correlation (0-3) |
|---|---|---|---|---|---|
| | Verb | BTL | | | |
| 1 | Understand | L2 | PO1,<br>PO2,<br>PO4,<br>PO9 | PO1: Apply (L3)<br>PO2: Analyze (L4)<br>PO4: Analyze (L4)<br>PO9: Thumb Rule | 2<br>1<br>1<br>1 |
| 2 | Apply | L3 | PO1,<br>PO2,<br>PO4,<br>PO9 | PO1: Apply (L3)<br>PO2: Analyze(L4)<br>PO4: Analyze(L4)<br>PO9: Thumb Rule | 3<br>2<br>2<br>1 |
| 3 | Design | L6 | PO2,<br>PO4,<br>PO9 | PO2: Analyze(L4)<br>PO4: Design (L6)<br>PO9: Thumb Rule | 3<br>3<br>1 |
| 4 | Understand | L2 | PO1,<br>PO2 | PO1: Apply (L3)<br>PO2: Review (L2) | 2<br>3 |
| 5 | Analyze | L4 | PO1,<br>PO2 | PO1: Apply (L3)<br>PO2: Review (L2) | 3<br>3 |
| 6 | Analyze | L4 | PO1,<br>PO2 | PO1:Apply(L3)<br>PO2:Review (L2) | 3<br>3 |

**CO1: Understand the Electrical circuit design, measurement of resistance, power, and power factor.**
Action Verb: Understand (L2)
PO1: Apply (L3)
CO1 Action Verb is Less than PO1 verb by one level; Therefore, correlation is moderate (2).
PO2: Analyze (L4)
CO1 Action Verb is Less than PO2 verb by two level; Therefore, correlation is low (1).
PO4: Analyze (L4)
CO1 Action Verb is Less than PO4 verb by two level; Therefore, correlation is low (1).
PO9: Using Thumb Rule, CO1 correlates to PO9 as low (1).

**CO2: Apply suitable methods to measure Resistance, power, energy and power factor.**
Action Verb: Apply (L3)
PO1: Apply (L3)
CO2 Action Verb is same as PO1 verb; Therefore, correlation is high (3).
PO2: Analyze (L4)
CO2 Action Verb is Less than PO2 verb by one level; Therefore, correlation is moderate (2).
PO4: Analyze (L4)
CO2 Action Verb is Less than PO4 verb by one level; Therefore, correlation is moderate (2).
PO9: Using Thumb Rule, CO2 correlates to PO9 as low (1).

**CO3: Design suitable methods for magnetization characteristics of D. C shunt generator.**
Action Verb: Design (L6)
PO2: Analyze (L4)
CO3 Action Verb is greater than PO2 verb by two level; Therefore, correlation is high (3).
PO4: Design (L6)
CO3 Action Verb is same as PO4 verb; Therefore, correlation is high (3).
PO9: Using Thumb Rule, CO3 correlates to PO9 as low (1).

**CO4: Understand the V-I Characteristics of diodes and its applications.**
**Action Verb: Understand (L2)**
PO1 Verbs: Apply (L3)
CO4 Action Verb is less than PO1 verb by one level; Therefore correlation is moderate (2)
PO2 Verbs: Review (L2)
CO4 Action Verb is equal to PO2 verb; Therefore correlation is high (3).

**CO5: Analyze the input and output characteristics of BJT and its applications**.
**Action Verb: Analyze (L4)**
PO1 Verbs: Apply (L3)
CO5 Action Verb is greater than PO1 verb by one level; Therefore correlation is high (3).
PO2 Verbs: Review (L2)
CO5 Action Verb is equal to PO2 verb; Therefore correlation is high (3).

**CO6: Analyze the truth tables of all logic gates and f/f's using IC's.**
**Action Verb: Analyze (L4)**
PO1 Verbs: Apply (L3)
CO6 Action Verb is greater than PO1 verb by one level; Therefore correlation is high (3).
PO2 Verbs: Review (L2)
CO6 Action Verb is equal to PO2 verb; Therefore correlation is high (3).

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | Data Structures Lab | L | T | P | C |
|---|---|---|---|---|---|---|
| 23APC0502 | I-II | (Common to CSE, CIC, CSE(DS), CSIT, AIML & AIDS) | 0 | 0 | 3 | 1.5 |

**Course Outcomes:**

After studying the course, student will be able to

**CO 1: Apply** the sorting and searching techniques using Arrays
**CO 2: Develop** linked list operations for efficient access to data.
**CO 3: Develop** stacks and queues to solve real time applications.
**CO 4: Develop** binary search tree operations using linked list
**CO 5: Apply** the hashing techniques to organise the data in hash table.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| CO1 | Apply | sorting and searching algorithm | using arrays | | L3 |
| CO2 | Develop | linked list operations | | for efficient access to data. | L6 |
| CO3 | Develop | stacks and queues | | to solve real time applications. | L6 |
| CO4 | Develop | binary search tree operations | using linked list | | L6 |
| CO5 | Apply | the hashing techniques | | to organise the data in hash table. | L3 |

**List of Experiments:**

**Exercise 1: Array Manipulation[CO1]**

i) Write a program to reverse an array.
ii) C Programs to implement the Searching Techniques – Linear & Binary Search
iii) C Programs to implement Sorting Techniques – Bubble, Selection and Insertion Sort

**Exercise 2: Linked List Implementation[CO2]**

i) Implement a singly linked list and perform insertion and deletion operations.
ii) Develop a program to reverse a linked list iteratively and recursively.
iii) Solve problems involving linked list traversal and manipulation.

**Exercise 3: Linked List Applications[CO2]**

i) Create a program to detect and remove duplicates from a linked list.
ii) Implement a linked list to represent polynomials and perform addition.
iii) Implement a double-ended queue (deque) with essential operations.

**Exercise 4: Double Linked List Implementation[CO2]**

i) Implement a doubly linked list and perform various operations to understand its properties and applications.
ii) Implement a circular linked list and perform insertion, deletion, and traversal.

**Exercise 5: Stack Operations[CO3]**

i) Implement a stack using arrays and linked lists.
ii) Write a program to evaluate a postfix expression using a stack.
iii) Implement a program to check for balanced parentheses using a stack.

**Exercise 6: Queue Operations[CO3]**

i) Implement a queue using arrays and linked lists.
ii) Develop a program to simulate a simple printer queue system.
iii) Solve problems involving circular queues.

**Exercise 7: Stack and Queue Applications[CO3]**

i) Use a stack to evaluate an infix expression and convert it to postfix.
ii) Create a program to determine whether a given string is a palindrome or not.
iii) Implement a stack or queue to perform comparison and check for symmetry.

**Exercise 8: Binary Search Tree CO4]**

i) Implementing a BST using Linked List.
ii) Traversing of BST.

**Exercise 9: Hashing [CO5]**

i) Implement a hash table with collision resolution techniques.
ii) Write a program to implement a simple cache using hashing.

**Textbooks:**

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson- Freed, Silicon Press, 2008

**Reference Books:**

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms by Robert Sedgewick.

**Mapping of course outcomes with program outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | | | | | | | | | | | 2 | |
| CO2 | 3 | 3 | | 3 | | | | | | | | 3 | 2 | 1 |
| CO3 | 3 | 3 | | 3 | | | | | | | | 3 | 2 | 1 |
| CO4 | 3 | 3 | 3 | 3 | | | 3 | | | | | 3 | 2 | 2 |
| CO5 | 3 | 3 | | 2 | | | | | | | | 3 | 2 | 2 |

**Correlation matrix**

| Unit No. | Co's Action verb | BTL | Program Outcome (PO) | PO(s) : Action Verb and BTL (for PO1 to PO12) | Level of Correlation (0-3) |
|---|---|---|---|---|---|
| 1 | CO1: Apply | L3 | PO1<br>PO2 | PO1: Apply(L3)<br>PO2: Review(L2) | 3<br>3 |
| 2 | CO2: Develop | L6 | PO1<br>PO2<br>PO4<br>PO12 | PO1: Apply(L3)<br>PO2: Develop (L3)<br>PO4: Design (L6)<br>PO12: Thumb rule | 3<br>3<br>3<br>3 |
| 3 | CO3: Develop | L6 | PO1<br>PO2<br>PO4<br>PO12 | PO1: Apply(L3)<br>PO2: Develop (L3)<br>PO4: Design (L6)<br>PO12: Thumb rule | 3<br>3<br>3<br>3 |
| 4 | CO4: Develop | L6 | PO1<br>PO2<br>PO3<br>PO4<br>PO7<br>PO12 | PO1: Apply(L3)<br>PO2: Review (L2)<br>PO3: Design (L6)<br>PO4: Analysis(L4)<br>PO7: Thumb rule<br>PO12: Thumb rule | 3<br>3<br>3<br>3<br>3<br>3 |
| 5 | CO5: Apply | L3 | PO1<br>PO2<br>PO4<br>PO12 | PO1: Apply(L3)<br>PO2: Review(L2)<br>PO4: Analysis(L4)<br>PO12: Thumb rule | 3<br>3<br>2<br>3 |

**Justification Statements :**

**CO1: Apply** the sorting and searching techniques using Arrays

**Action Verb: Apply (L3)**

PO1 Verb: Apply (L3)

CO1 Action verb is same as PO1 verb. Therefore, the correlation is high (3)

PO2 Verb: Review(L2)

CO1 Action verb is greater than PO2 verb. Therefore, the correlation is high (3)

**CO2: Develop** linked list operations for efficient access to data.

**Action Verb: Develop (L6)**

PO1: Apply (L3)

CO2 Action verb is greater than as PO1 verb. Therefore, the correlation is high (3)

PO2: Develop (L6)

CO2 Action verb is same level PO2 verb. Therefore, the correlation is high (3)

PO4: Design (L6)

CO2 Action verb is same as PO4 verb. Therefore, the correlation is high (3)

PO12: Thumb rule

For some of Linear Data Structure applications, Linked lists concepts are used to write programs store the data. Therefore, the correlation is high (3)

**CO3: Develop** stacks and queues to solve real time applications

**Action Verb: Develop (L6)**

PO1: Apply (L3)

CO3 Action verb is greater than as PO1 verb. Therefore, the correlation is high (3)

PO2: Develop (L3)
CO3 Action verb is same level PO2 verb. Therefore, the correlation is high (3)
PO4: Design (L6)
CO3 Action verb is same as PO4 verb. Therefore, the correlation is high (3)
PO12: Thumb rule
For some of Data Structure applications, stacks concepts are used to manage data in the memory. Therefore, the correlation is high (3)

**CO4: Develop** binary search tree operations using linked list
**Action Verb: Develop (L6)**
PO1: Apply(L3)
CO4 Action verb is greater than PO1 verb by two levels. Therefore, the correlation is high (3)
PO2: Review (L2)
CO4 Action verb is greater than PO2 verb. Therefore, the correlation is high (3)
PO3: Design (L6)
CO4 Action verb is same as PO3 verb. Therefore, the correlation is high (3)
PO4: Analysis (L4)
CO4 Action verb is greater than PO4 verb by one level. Therefore, the correlation is high (3)
PO7: Thumb rule
For some of Real Time problems Data Structure applications, queues concept is indirectly used to sustainable environment development. Therefore, the correlation is high (3)
PO12: Thumb rule
For some of Real Time problems Data Structure applications, queues concepts are used to write programs and evaluation the memory operations. Therefore, the correlation is high (3)

**CO5: CO 5: Apply** the hashing techniques to organise the data in hash table.
**Action Verb: Apply (L3)**
PO1: Apply(L3)
CO5 Action verb is greater than PO1 verb. Therefore, the correlation is high (3)
PO2: Review (L2)
CO5 Action verb is same level as PO2 verb. Therefore, the correlation is high (3)
PO4: Analysis (L4)
CO5 Action verb less than PO4 verb by one level. Therefore, the correlation is moderate (2)
PO12: Thumb rule
For some of data manipulations tree and graphs concepts are used to solve data storage problems. Therefore, the correlation is high (3)

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | NSS/NCC/Scouts & Guides/Community Service | L | T | P | C |
|---|---|---|---|---|---|---|
| 23AHM9904 | I-II | | 0 | 0 | 1 | 0.5 |

**Course Outcomes**: After studying the course, students will be able to

**CO1:** Understand the importance of discipline, character and service motto of community.
**CO2:** Analyze the activities need to be done for nature protection
**CO3:** Analyze the social issues in a community and address it through the base camps.

| Course Outcomes | Action Verb | Knowledge Statement | Condition | Criteria | Blooms Level |
|---|---|---|---|---|---|
| CO1 | Understand | the importance of discipline, character and service motto | | of community | L1 |
| CO2 | Analyze | the activities need to be done for nature protection | | | L4 |
| CO3 | Analyze | the social issues in a community and address it through the base camps | | | L4 |

**UNIT-I**

**Orientation**

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, careerguidance.

**Activities:**

i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
ii) Conducting orientations programs for the students –future plans-activities-releasing road map etc.
iii) Displaying success stories-motivational biopics- award winning movies on societalissues etc.
iv) Conducting talent show in singing patriotic songs-paintings- any other contribution

**UNIT-II**

**Nature & Care**

**Activities:**

i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organizing Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

**UNIT-III**

**Community Service**

**Activities:**

i) Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities- experts-etc.
ii) Mental health, Spiritual Health, HIV/AIDS,
iii) Conducting consumer Awareness. Explaining various legal provisions etc.
iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and PopulationEducation.
v) Any other programmes in collaboration with local charities, NGOs etc.
vi) Conducting awareness programs on Health-related issues such as General Health,

**CORRELATION OF COS WITH THE POS & PSOS:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | | | | | | | | 2 | | | | 2 |
| CO2 | 3 | 3 | | | | | | | | 3 | | | | 2 |
| CO3 | 3 | 3 | | | | | | | | 3 | | | | 2 |

**CO-POMAPPING JUSTIFICATION:**

| **Unit No** | **Course Outcomes** | | **Program Outcome (PO)** | **PO(s):Action Verb and BTL(forPO1 to PO12)** | **Level of Correlation (0-3)** |
|---|---|---|---|---|---|
| | **CO's Action Verb** | **BTL** | | | |
| 1 | Understand | L2 | PO1<br>PO2<br>PO10 | Apply(L3)<br>Analyze(L4)<br>Thumb Rule | 2<br>2<br>2 |
| 2 | Analyze | L4 | PO1<br>PO2<br>PO10 | Apply(L3)<br>Analyze(L4)<br>Thumb Rule | 2<br>3<br>3 |
| 3 | Analyze | L4 | PO1<br>PO2<br>PO10 | Apply(L3)<br>Analyze(L4)<br>Thumb Rule | 2<br>3<br>3 |

**Justification Statements:**

**CO1: Understand the importance of discipline, character and service motto of community.**
**Action Verb: Understand (L2)**
CO1 Action Verb is less than PO1 verb by one level; Therefore correlation is moderate (2).
CO1 Action Verb is less than PO2 verb by one level; Therefore correlation is moderate (2).
CO1 Action Verb is of BTL 2. Using Thumb rule, L2 correlates PO10 as moderate (2).

**CO2: Analyze the activities need to be done for nature protection**
**Action Verb: Analyze (L4)**
CO2 Action Verb is greater than PO1 verb by one level; Therefore correlation is moderate (2).
CO2 Action Verb is same as PO2 verb, Therefore correlation is High (3)
CO2 Action Verb is of BTL 4. Using Thumb rule, L4 correlates PO10 as moderate (4).

**CO3: Analyze the social issues in a community and address it through the base camps**
**Action Verb: Analyze (L4)**
CO3 Action Verb is greater than PO1 verb by one level; Therefore correlation is moderate (2).
CO3 Action Verb is same as PO2 verb, Therefore correlation is High (3)
CO3 Action Verb is of BTL 4. Using Thumb rule, L4 correlates PO10 as moderate (4).

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
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**Computer Science & Information Technology (CSIT)**
**(Effective for the batches admitted in 2023-24)**

**Semester III (Second year)**

| Sl. No. | Category | Course Code | Course Title | Hours per week | | | Credits | CIE | SEE | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | | | |
| 1 | BS | 23ABS9913 | Discrete Mathematics & Graph Theory | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2 | HM | 23AHM9905 | Universal Human Values | 2 | 1 | 0 | 3 | 30 | 70 | 100 |
| 3 | PC | 23APC0503 | Digital Logic & Computer Organization | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4 | PC | 23APC0504 | Advanced Data Structures & Algorithms | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 5 | PC | 23APC0506 | Object-Oriented Programming Through JAVA | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 6 | PC | 23APC0505 | Advanced Data Structures and Algorithms Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 7 | PC | 23APC0507 | Object-Oriented Programming Through JAVA Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 8 | SC | 23ASC0501 | Python programming | 0 | 1 | 2 | 2 | 30 | 70 | 100 |
| 9 | MC | 23AMC9901 | Environmental Science | 2 | 0 | 0 | - | - | - | - |
| | | | Total | 16 | 2 | 8 | 20 | | | 800 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | Discrete Mathematics & Graph Theory | L | T | P | C |
|---|---|---|---|---|---|---|
| 23ABS9913 | II-I | (Common to CSE,CIC,CSD, CSIT, AI&DS, AI&ML) | 3 | 0 | 0 | 3 |

**Course Outcomes:**

After studying the course, student will be able to

CO1: **Apply** the concepts of mathematical logic in various engineering fields.
CO2: **Understand** the concepts related to set theory and algebraic structures.
CO3: **Analyze** the theory of elementary combinatorics by using binomial and multinomial theorems.
CO4: **Evaluate** the solutions of homogeneous and inhomogeneous recurrence relations.
CO5: **Apply** the graph theory in solving computer science problems and finite difference approximation**.**

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| **CO1** | Apply | the concepts of mathematical logic | in various engineering fields | | L3 |
| **CO2** | Understand | the concepts related to set theory and algebraic structures. | | | L2 |
| **CO3** | Analyze | the theory of elementary combinatorics | by using binomial and multinomial theorems | | L4 |
| **CO4** | Evaluate | The solutions of homogeneous and inhomogeneous recurrence relations. | | | L5 |
| **CO5** | Apply | The graph theory solving computer science problems. | | and finite difference approximation. | L3 |

| **UNIT – I: Mathematical Logic** | 9Hrs |
|---|---|
| Introduction, Statements and Notation, Connectives, Well-formed formulas, Tautology, Duality law, Equivalence, Implication, Normal Forms, Functionally complete set of connectives, Inference Theory of Statement Calculus, Predicate Calculus, Inference theory of Predicate Calculus | |
| **UNIT – II: Set theory** | 9Hrs |
| The Principle of Inclusion-Exclusion, Pigeon hole principle and its application, Functions : composition of functions, Inverse Functions, Recursive Functions, Lattices and its properties.<br>Algebraic structures: Algebraic systems-Examples and General Properties, Semi groups , Monoids, groups, sub groups, homomorphism, Isomorphism. | |
| **UNIT – III: Elementary Combinatorics** | 9Hrs |
| Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems. | |
| **UNIT – IV: Recurrence Relations** | 9Hrs |
| Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence relations, Solving Recurrence Relations by Substitution and Generating functions, The Method of Characteristic roots, Solutions of Inhomogeneous Recurrence Relations. | |
| **UNIT – V: Graphs** | 9Hrs |
| Basic Concepts, Isomorphism and Sub graphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multi graphs and Euler Circuits, Hamiltonian Graphs. | |
| **Textbooks** | |
| 1.J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 2002.<br>2.Kenneth H. Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, McGraw Hill Education (India) Private Limited | |
| | |

| **Reference Books** |
|---|
| 1.Joe L. Mott, Abraham Kandel and Theodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, 2nd Edition, Pearson Education.<br>2.Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science.<br>3.Dr.J.Rajendra Prasad,T.Rama Rao and A.Madana Mohan Rao, Mathematical Foundation of Computer Science |
| **Online Learning Resources:** |
| http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf |

**Mapping of COs to POs**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | | | | | | | | | | | |
| **CO2** | 2 | | | | | | | | | | | |
| **CO3** | | 3 | | | | | | | | | | |
| **CO4** | | 3 | | | | | | | | | | |
| **CO5** | 3 | | | | | | | | | | | |

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**CO-PO mapping justification:**

| CO | Percentage of contact hours over the total planned contact hours | | | CO | | Program Outcome (PO) | PO(s): Action verb and BTL (for PO1 to PO5) | Level of Correlation (0-3) |
|---|---|---|---|---|---|---|---|---|
| | Lesson Plan (Hrs) | % | correlation | Verb | BTL | | | |
| 1 | | | | Apply | L3 | PO1 | Apply (L3) | 3 |
| 2 | | | | Understand | L2 | PO1 | Apply (L3) | 2 |
| 3 | | | | Analyze | L4 | PO2 | Analyze (L4) | 3 |
| 4 | | | | Evaluate | L5 | PO2 | Analyze (L4) | 3 |
| 5 | | | | Apply | L3 | PO1 | Apply (L3) | 3 |

**CO1: .Apply the concepts of mathematical logic in various engineering fields**
**Action Verb: Apply (L3)**
PO1 Verbs: **Apply** (L3)
CO1 Action Verb is equal to PO1 verb . Therefore correlation is high (3).
**CO2: Understand the concepts related to set theory and algebraic structures**
**Action Verb: Understand (L2)**
PO1 Verbs: Apply (L3)
CO2 Action Verb is one level below to PO1 verb; Therefore correlation is moderate (2).
**CO3: .**Analyze the theory of elementary combinatorics by using binomial and multinomial theorems.
**Action Verb: Analyse (L4)**
PO2 Verb: **Analyse** (L4)
CO3 Action Verb level is equal to PO2 verb; Therefore correlation is high (3).
**CO4:** Evaluate the solutions of homogeneous and inhomogeneous recurrence relations.
**Action Verb: Evaluate (L5)**
PO2 Verb: Analyze (L4)
CO4 Action Verb is one level high to PO2 verb; Therefore correlation is high (3).
**CO5:** Apply the graph theory in solving computer science problems and finite difference approximation.
**Action Verb: Apply(L3)**
PO1 Verb: Apply (L3)
CO5 Action verb is equal to PO1 verb; therefore the correlation is high (3).

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
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**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | Universal Human Values | L | T | P | C |
|---|---|---|---|---|---|---|
| 23AHM9905 | II-I | | 2 | 1 | 0 | 3 |

**Course Outcomes:**

After studying the course, student will be able to

CO1:**Understand** the essentials of human values, self-exploration, happiness and prosperity for value added education.
CO2:**Analyze** the harmony in the human being as sentient 'I' and the material 'Body' in various aspects.
CO3:**Apply** the nine universal human values in relationships for harmony in the family and orderliness in the society.
CO4:**Evaluate** the interconnectedness of four orders of nature and holistic perception of harmony at all levels of existence.
CO5:**Apply** the holistic understanding of harmony on professional ethics through augmenting universal human order.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| **1** | Understand | the essentials of human values, self-exploration, happiness and prosperity for value added education. | | | **L2** |
| **2** | Analyze | the harmony in the human being as sentient 'I' and the material 'Body' in various aspects. | | | **L4** |
| **3** | Apply | the nine universal human values in relationships for harmony in the family and orderliness in the society. | | | **L3** |
| **4** | Evaluate | the interconnectedness of four orders of nature and holistic perception of harmony at all levels of existence. | | | **L5** |
| **5** | Apply | the holistic understanding of harmony on professional ethics through augmenting universal human order. | | | **L3** |

| **UNIT – I:** | 6 lectures and 3 tutorials for practice session |
|---|---|

Introduction to Value Education (6 lectures and 3 tutorials for practice session)
Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)
Lecture 2: Understanding Value Education
Tutorial 1: Practice Session PS1 Sharing about Oneself
Lecture 3: self-exploration as the Process for Value Education
Lecture4: Continuous Happiness and Prosperity – the Basic Human Aspirations
Tutorial 2: Practice Session PS2 Exploring Human Consciousness
Lecture 5: Happiness and Prosperity – Current Scenario
Lecture 6: Method to Fulfill the Basic Human Aspirations
Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

| **UNIT – II:** | 6 lectures and 3 tutorials for practice session |
|---|---|

Harmony in the Human Being (6 lectures and 3 tutorials for practice session)
Lecture 7: Understanding Human being as the Co-existence of the self and the body.
Lecture 8: Distinguishing between the Needs of the self and the body
Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.
Lecture 9: The body as an Instrument of the self
Lecture 10: Understanding Harmony in the self
Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self
Lecture 11: Harmony of the self with the body
Lecture 12: Programme to ensure self-regulation and Health
Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

| **UNIT – III:** | 6 lectures and 3 tutorials for practice session |
|---|---|

Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)
Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction
Lecture 14: 'Trust' – the Foundational Value in Relationship
Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust
Lecture 15: 'Respect' – as the Right Evaluation
Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect
Lecture 16: Other Feelings, Justice in Human-to-Human Relationship
Lecture 17: Understanding Harmony in the Society
Lecture 18: Vision for the Universal Human Order
Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

| **UNIT – IV:** | 4 lectures and 2 tutorials for practice session |
|---|---|

Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)
Lecture 19: Understanding Harmony in the Nature
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature
Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature
Lecture 21: Realizing Existence as Co-existence at All Levels
Lecture 22: The Holistic Perception of Harmony in Existence
Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

| **UNIT – V:** | 6 lectures and 3 tutorials for practice session |
|---|---|

Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)
Lecture 23: Natural Acceptance of Human Values
Lecture 24: Definitiveness of (Ethical) Human Conduct
Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct
Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
Lecture 26: Competence in Professional Ethics
Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education
Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Lecture 28: Strategies for Transition towards Value-based Life and Profession
Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

**Textbooks**

a. The Textbook
R R Gaur, R Asthana, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
b. The Teacher's Manual
R R Gaur, R Asthana, G P Bagaria,Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

**Reference Books**

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

**Online Learning Resources:**

1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf
5. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf
6. https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf
7. https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf
8. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385
9. https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

**Mapping of course outcomes with program outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | | | | | | | 2 | | | | 2 | | |
| CO2 | | | | | | | 3 | 3 | | | | | | |
| CO3 | | | | | | 2 | 2 | 2 | | | | | | |
| CO4 | | | | | | 3 | 3 | 3 | | | | 3 | | |
| CO5 | | | | | | 2 | 2 | 2 | | | | 2 | | |

**Correlation matrix**

| CO | CO | | | | | Program Outcomes (PO) | PO(s): Action Verb and BTL (for PO1 to PO5) | Level of Correlation |
|---|---|---|---|---|---|---|---|---|
| | Lesson Plan (Hrs) | % | Correlation | Verb | BTL | | | |
| 1 | 7 | 19.4 | 2 | Understand | 2 | PO8,PO12 | Thumb Rule | 2,2 |
| 2 | 8 | 22.2 | 3 | Analyze | 4 | PO7,PO8 | Thumb Rule | 3,3 |
| 3 | 7 | 19.4 | 2 | Apply | 3 | PO6,PO7,PO8 | Thumb Rule | 2,2,2 |
| 4 | 8 | 22.2 | 3 | Evaluate | 5 | PO6,PO7,PO8,PO12 | Thumb Rule | 3,3,3,3 |
| 5 | 7 | 19.4 | 2 | Apply | 3 | PO6,PO7,PO8,PO12 | Thumb Rule | 2,2,2,2 |

**Justification Statements:**

**CO1: Understand the essentials of human values, self-exploration, happiness and prosperity for value added education.**
**Action Verb: Understand (L2)**
CO1 Action Verb is Understand of BTL 2. Using Thumb rule, L2 correlates PO6 to PO12 as moderate (2).
**CO2: Analyze the harmony in the human being as sentient 'I' and the material 'Body' in various aspects.**
**Action Verb: Analyze (L4)**
CO2 Action Verb is Analyze of BTL 4. Using Thumb rule, L4 correlates PO6 to PO12 as high (3).
**CO3: Apply the nine universal human values in relationships for harmony in the family and orderliness in the society.**
**Action Verb: Apply (L3)**
CO3 Action Verb is Apply of BTL 3. Using Thumb rule, L3 correlates PO6 to PO12 as moderate (2)
**CO4: Evaluate the interconnectedness of four orders of nature and holistic perception of harmony at all levels of existence.**
**Action Verb:Evaluate (L5)**
CO4 Action Verb is Evaluate of BTL5. Using Thumb rule, L5 correlates PO6 to PO12 as high (3).
**CO5: Apply the holistic understanding of harmony on professional ethics through augmenting universal human order.**
**Action Verb: Apply (L3)**
CO5 Action Verb is Apply of BTL 3. Using Thumb rule, L3 correlates PO6 to PO12 as moderate (2).

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | DIGITAL LOGIC & COMPUTER ORGANIZATION (Common to CSE & CIC) | L | T | P | C |
|---|---|---|---|---|---|---|
| 23APC0503 | II-I | | 3 | 0 | 0 | 3 |

**Course Outcomes:**

After studying the course, student will be able to

**CO1: Understand** the number system concepts, number conversions, logic gates using binary numbers
**CO2: Understand** the sequential circuits, flip-flops, registers and computer fundamentals to store data.
**CO3: Evaluate** the Arithmetic operations for understanding execution process
**CO4: Analyze** the hardware requirements of primary and secondary memories to store the data.
**CO5: Apply** Input/Output devices and Interfaces to connect multiple devices.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| **CO1** | Understand | the number system concepts, number conversions, logic gates | | using binary numbers | L2 |
| **CO2** | Understand | the sequential circuits, flip-flops, registers and computer fundamentals | | | L2 |
| **CO3** | Evaluate | the Arithmetic operations | | for understanding execution process | L5 |
| **CO4** | Analyze | the hardware requirements of primary and secondary memories | | to store the data | L4 |
| **CO5** | Apply | Input/Output devices and Interfaces | | | L3 |

| **UNIT – I** | 9Hrs |
|---|---|
| **Data Representation:** Binary Numbers, Fixed Point Representation. Floating Point Representation. Number base conversions, Octal and Hexadecimal Numbers, components, Signed binary numbers, Character representation.<br>**Digital Logic Circuits-I:** Basic Logic Functions, Logic gates, universal logic gates, Minimization of Logic expressions. K-Map Simplification, Combinational Circuits, Decoders, Multiplexers, dumping. | |
| **UNIT – II** | 9Hrs |
| **Digital Logic Circuits-II**: Sequential Circuits, Flip-Flops, Binary counters, Registers, Shift Registers, Ripple counters<br>**Basic Structure of Computers:** Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers, Computer Generations, Addressing modes, subroutines. | |
| **UNIT – III** | 12Hrs |
| **Computer Arithmetic** : Addition and Subtraction of Signed Numbers, Ripple carry adder, Ripple carry multiplier, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations<br>**Processor Organization:** Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control and Multi programmed Control<br>**Pipelining:** Basic Concepts, Data Hazards, Instruction Hazards, Forms of Parallel Processing | |
| **UNIT – IV** | 9Hrs |
| **The Memory Organization:** Memory hierarchy, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Cache mappings, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage | |
| **UNIT – V** | 9Hrs |
| **Input /Output Organization:** Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Synchronous and Asynchronous bus, Interface Circuits, Standard I/O Interfaces | |
| **Textbooks** | |
| 1. Computer Organization, Carl Hamacher, ZvonkoVranesic, SafwatZaky, 6th edition, McGraw Hill, 2023.<br>2. Digital Design, 6th Edition, M. Morris Mano, Pearson Education, 2018.<br>3. Computer Organization and Architecture, William Stallings, 11thEdition, Pearson, 2022. | |
| **Reference Books** | |
| 1. Computer Systems Architecture, M.Moris Mano, 3rdEdition, Pearson, 2017.<br>2. Computer Organization and Design, David A. Paterson, John L. Hennessy, Elsevier, 2004. | |

3. Fundamentals of Logic Design, Roth, 5thEdition, Thomson, 2003.
4. Computer Organization & Architecture,William Stallings,11th Edition, Pearson, 2022

**Online Learning Resources:**

https://nptel.ac.in/courses/106/103/106103068/

**Mapping of course outcomes with program outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 2 | | | | | | | | | 1 | 1 | |
| CO2 | 2 | 3 | 2 | | | | | | | | | 1 | 1 | |
| CO3 | 3 | 3 | 2 | | | | | | 1 | | | 1 | | 2 |
| CO4 | 3 | 3 | 3 | 3 | | | | | | | | | | 2 |
| CO5 | 3 | | | 2 | 3 | | | | 2 | | | 2 | | 2 |

**Correlation matrix**

| Unit No. | CO | | | | | Program Outcome (PO) | PO(s) :Action Verb and BTL(for PO1 to PO12) | Level of Correlation (0-3) |
|---|---|---|---|---|---|---|---|---|
| | Lesson plan(Hrs) | % | Correlation | Co's Action verb | BTL | | | |
| **1** | 9 | 20 | 2 | CO1 : Understand | L2 | PO1<br>PO2<br>PO3<br>PO12 | PO1: Apply(L3)<br>PO2:Analyze(L4)<br>PO3: Develop(L3)<br>PO12: Thumb rule | 2<br>1<br>2<br>1 |
| **2** | 9 | 20 | 2 | CO2 : Understand | L2 | PO1<br>PO2<br>PO3<br>PO12 | PO1: Apply(L3)<br>PO2:Review(L2)<br>PO3: Develop (L3)<br>PO12: Thumb rule | 2<br>3<br>2<br>1 |
| **3** | 9 | 20 | 2 | CO3 : Evaluate | L5 | PO1<br>PO2<br>PO3<br>PO9<br>PO12 | PO1: Apply(L3)<br>PO2: Analyze (L4)<br>PO3: Design (L6)<br>PO9: Thumb rule<br>PO12: Thumb rule | 3<br>3<br>2<br>1<br>1 |
| **4** | 9 | 20 | 2 | CO4 : Analyze | L4 | PO1<br>PO2<br>PO3<br>PO4 | PO1: Apply(L3)<br>PO2: Analyze (L4)<br>PO3: Develop (L3)<br>PO4: Develop (L3) | 3<br>3<br>3<br>3 |
| **5** | 9 | 20 | 2 | CO5 : Apply | L3 | PO1<br>PO4<br>PO5<br>PO9<br>PO12 | PO1: Apply(L3)<br>PO4: Analyze (L4)<br>PO5: Apply (L3)<br>PO9: Thumb rule<br>PO12: Thumb rule | 3<br>2<br>3<br>2<br>2 |
| | 45 | 100 | | | | | | |

**Justification Statements:**

**CO1: Understand** the number system concepts, number conversions, logic gates using binary numbers
Action Verb: Understand(L2)
PO1 Verb: Apply(L3)
CO1 Action verb is less than PO1 verb by one level. Therefore, the correlation is moderate (2)
PO2 Verb: Analyze(L4)
CO1 Action verb is less than PO2 verb by two levels. Therefore, the correlation is low (1)
PO3: Develop (L3)
CO1 Action verb is less than PO3 verb . Therefore, the correlation is moderate (2)
PO12: Thumb rule
updating the logical circuits and combinational circuits. Therefore, the correlation is low (1)

**CO2: Understand** the sequential circuits, flip-flops, registers and computer fundamentals to store data.
Action Verb: Understand(L2)
PO1: Apply(L3)
CO2 Action verb is greater than level PO1 verb by one level. Therefore, the correlation is moderate (2)
PO2: Review(L2)
CO2 Action verb is less than PO2 verb by two level. Therefore, the correlation is high (3)
PO3: Develop (L3)
CO2 Action verb is less than PO3 verb . Therefore, the correlation is moderate (2)
PO12: Thumb rule

Update sequential circuits and registers. Therefore, the correlation is low (1)

**CO3: Evaluate** the Arithmetic operations for understanding execution process
Action Verb: Evaluate(L5)
PO1: Apply(L3)
CO3 Action verb is higher level than PO1 verb level by two level. Therefore, the correlation is high (3)
PO2: Analyze (L4)
CO3 Action verb is less than PO2 verb by one level. Therefore, the correlation is high (3)
PO3: Design (L6)
CO3 Action verb is less than PO3 verb by one level. Therefore, the correlation is moderate (2)
PO9: Thumb rule
Team work is required. Hence the correlation is low (1)
PO12: Thumb rule
Updating the Numbers and execution process. Therefore the correlation is low (1)

**CO4: Analyze** the hardware requirements of primary and secondary memories to store the data.
Action Verb: Analyze(L4)
PO1: Apply(L3)
CO4 Action verb is less than PO1 by one level. Therefore, the correlation is high (3)
PO2: Analyze (L4)
CO4 Action verb is same as PO2 verb. Therefore, the correlation is High (3)
PO3: Develop (L3)
CO4 Action verb is less than PO3 verb by two levels. Therefore, the correlation is High (3)
PO4: Develop (L3)
CO4 Action verb is less than PO4 verb by two levels. Therefore, the correlation is High (3)

**CO5: Apply** Input/Output devices and Interfaces to connect multiple devices
Action Verb: Apply (L3)
PO1: Apply(L3)
CO5 Action verb is same as PO1. Therefore, the correlation is high (3)
PO4: Analyze (L4)
CO5 Action verb is less than PO4 verb by one level. Therefore, the correlation is moderate (2)
PO5: Apply(L3)
CO5 Action verb is less than PO5 verb . Therefore, the correlation is high (3)
PO9 : Thumb rule
Team work is required to provide the solutions on different numbers. Hence the correlation is moderate (2)
PO12: Thumb rule
Updating the Numbers and execution process. Therefore, the correlation is moderate (2)

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | Advanced Data Structures and Algorithms Analysis (Common to CSE,CIC,CSE(DS),AIDS,CSIT & AIML) | L | T | P | C |
|---|---|---|---|---|---|---|
| 23APC0504 | II-I | | 3 | 0 | 0 | 3 |

**Course Outcomes:**

After studying the course, student will be able to

CO1: **Understand** the asymptotic notations and operations on AVL, B-Trees.
CO2: **Apply** the Trees, Graphs, Divide and conquer method to solve various problems.
CO3: **Apply** the greedy and dynamic programming methods to solve real time problems.
CO4: **Evaluate** the backtracking , branch and bound methods to solve minimization problems.
CO5: **Analyze** the P, NP, NP hard and NP complete problems for solving reduction problems.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| **CO1** | Understand | The asymptotic notations | operations on AVL,B-Trees | | L2 |
| **CO2** | Apply | The Trees, Graphs, Divide and conquer method | | to solve various problems | L3 |
| **CO3** | Apply | The greedy and dynamic programming methods | | to solve real time problems. | L3 |
| **CO4** | Evaluate | The backtracking , branch and bound methods | | to solve minimization problems | L5 |
| **CO5** | Analyze | The P, NP, NP hard , NP complete problems | | for solving reduction problems | L4 |

| **UNIT – I** | 9Hrs |
|---|---|
| Introduction to Algorithm Analysis, Space and Time Complexity analysis, Asymptotic Notations.<br>Review of Binary Search Trees: Binary Search Tree – Insertion, Deletion & Traversal<br>AVL Trees – Creation, Insertion, Deletion operations and Applications<br>B-Trees – Creation, Insertion, Deletion operations and Applications | |
| **UNIT – II** | 9 Hrs |
| Heap Trees (Priority Queues) – Min and Max Heaps, Operations and Applications Graphs – Terminology, Representations, Basic Search and Traversals, Connected Components and Biconnected Components, applications<br>Divide and Conquer: The General Method, Quick Sort, Merge Sort, Finding Minimum and Maximum, Strassen's matrix multiplication. | |
| **UNIT – III** | 9 Hrs |
| Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths<br>Dynamic Programming: General Method, Multi Stage graphs, All pairs shortest paths, Single Source Shortest Paths – General Weights (Bellman Ford Algorithm), Optimal Binary Search Trees, 0/1 Knapsack, Travelling Salesperson problem | |
| **UNIT – IV** | 8 Hrs |
| Backtracking: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem<br>Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem. | |
| **UNIT – V** | 10Hrs |
| NP Hard and NP Complete Problems: Basic Concepts, Cook's theorem<br>NP Hard Graph Problems: Clique Decision Problem (CDP), Chromatic Number Decision Problem (CNDP), Traveling Salesperson Decision Problem (TSP)<br>NP Hard Scheduling Problems: Scheduling Identical Processors, Job Shop Scheduling | |

**Textbooks:**

1. Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh 2nd Edition Universities Press.
2. Computer Algorithms/C++ Ellis Horowitz, SartajSahni, SanguthevarRajasekaran2nd Edition University Press

**Reference Books:**

1. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
2. An introduction to Data Structures with applications, Trembley & Sorenson, McGraw Hill
3. The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.
4. Data Structures using C & C++: Langsam, Augenstein&Tanenbaum, Pearson, 1995
5. Algorithms + Data Structures &Programs:,N.Wirth, PHI

6. Fundamentals of Data Structures in C++: Horowitz Sahni& Mehta, Galgottia Pub.
7. Data structures in Java:, Thomas Standish, Pearson Education Asia.

**Online Learning Resources:**

1. https://www.tutorialspoint.com/advanced_data_structures/index.asp
2. http://peterindia.net/Algorithms.html
3. Abdul Bari,1. Introduction to Algorithms (youtube.com)

**Mapping of course outcomes with program outcomes**

| CO | PO1 | PO2 | PO3 | PO 4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | | | | | | | | | | 2 | 3 | |
| CO2 | 3 | 2 | | 2 | | 2 | | | | | | 2 | 2 | |
| CO3 | 3 | 2 | 3 | 2 | | 2 | | | | | | 2 | 2 | |
| CO4 | 3 | 3 | 3 | 3 | | 2 | | | | | | 2 | 2 | |
| CO5 | 2 | 3 | 3 | 3 | 3 | | | | | | | 2 | 2 | |

**Correlation matrix**

| Unit No. | CO | | | | | Program Outcome (PO) | PO(s) :Action Verb and BTL(for PO1 to PO12) | Level of Correlation (0-3) |
|---|---|---|---|---|---|---|---|---|
| | Lesson plan(Hrs) | % | Correlation | Co's Action verb | BTL | | | |
| 1 | 9 | 20 | 2 | CO1: Understand | L2 | PO1<br>PO2<br>PO12 | PO1: Apply(L3)<br>PO2: Analyze(L4)<br>PO12: Thumb rule | 2<br>1<br>2 |
| 2 | 9 | 20 | 2 | CO2: Apply | L3 | PO1<br>PO2<br>PO4<br>PO6<br>PO12 | PO1: Apply(L3)<br>PO2: Analyze(L4)<br>PO4: Analyze(L4)<br>PO6: Thumb rule<br>PO12: Thumb rule | 3<br>2<br>2<br>2<br>2 |
| 3 | 9 | 20 | 2 | CO3: Apply | L3 | PO1<br>PO2<br>PO3<br>PO4<br>PO6<br>PO12 | PO1: Apply(L3)<br>PO2: Analyze(L4)<br>PO3: Develop (L3)<br>PO4: Analyze (L4)<br>PO6: Thumb rule<br>PO12: Thumb rule | 3<br>2<br>3<br>2<br>2<br>2 |
| 4 | 9 | 20 | 2 | CO4: Evaluate | L5 | PO1<br>PO2<br>PO3<br>PO4<br>PO6<br>PO12 | PO1: Apply(L3)<br>PO2: Analyze(L4)<br>PO3: Develop (L3)<br>PO4: Analyze (L4)<br>PO6: Thumb rule<br>PO12: Thumb rule | 3<br>3<br>3<br>3<br>2<br>2 |
| 5 | 9 | 20 | 2 | CO5: Analyze | L4 | PO1<br>PO2<br>PO3<br>PO4<br>PO5<br>PO12 | PO1: Apply(L3)<br>PO2: Analyze (L4)<br>PO3: Develop (L3)<br>PO4: Analyze (L4)<br>PO5: Apply(L3)<br>PO12: Thumb rule | 2<br>3<br>3<br>3<br>3<br>2 |
| | 45 | 100 | | | | | | |

**Justification Statements:**

**CO1: Understand** the asymptotic notations and operations on AVL, B-Trees.

**Action Verb: Understand (L2)**

**PO1 Verb: Apply(L3)**

CO1 Action verb is less than PO1 verb by one level. Therefore, the correlation is moderate (2)

**PO2 Verb: Analyze (L4)**

CO1 Action verb is less than PO2 verb by two level. Therefore, the correlation is low (1)

**PO12: Thumb rule**

The asymptotic performance of algorithms, To Analyze the behavior of algorithms as their input increases. Therefore the correlation is moderate (2)

**CO2: Apply** the Trees, Graphs, Divide and conquer method to solve various problems.

**Action Verb: Apply (L3)**

**PO1: Apply(L3)**

CO2 Action verb is same level as PO1 verb. Therefore, the correlation is high (3)

**PO2: Analyze (L4)**

CO2 Action verb is less than PO2 verb by one level. Therefore, the correlation is moderate (2)

**PO4: Analyze (L4)**

CO2 Action verb is lesser than PO4 verb by one level. Therefore, the correlation is moderate (2)

**PO6: Thumb rule**

Greedy and dynamic programming concepts were applied to solve traffic problems and finding best route to
the destination. Therefore, the correlation is moderate (2)

**PO12: Thumb rule**

Finding optimal solution to a real-world problem is a continuous activity. Therefore, the correlation is moderate (2)

**CO3: Apply** the greedy and dynamic programming methods to solve real time problems.

**Action Verb: Apply (L3)**

**PO1: Apply(L3)**

CO3 Action verb is same level of PO1 verb. Therefore, the correlation is High (3)

**PO2: Analyze (L4)**

CO3 Action verb is less than of PO2 verb by one level. Therefore, the correlation is moderate (2)

**PO3: Develop (L3)**

CO3 Action verb is same as PO3 verb. Therefore, the correlation is high (3)

**PO4: Analyze (L4)**

CO3 Action verb is less than PO4 verb by one level. Therefore, the correlation is moderate (2))

**PO6 : Thumb rule**

backtracking and searching techniques were applied for GPS. Therefore, the correlation is moderate (2)

**PO12: Thumb rule**

backtracking and searching techniques will give optimal solutions to various problems. Therefore, the correlation is moderate (2)

**CO4: Evaluate the** backtracking, branch and bound methods to solve minimization problems.

**Action Verb: Evaluate (L5)**

**PO1: Apply(L3)**

CO3 Action verb is greater than of PO1 verb . Therefore, the correlation is High (3)

**PO2: Analyze (L4)**

CO3 Action verb is greater than of PO2 verb. Therefore, the correlation is high (3)

**PO3: Develop (L3)**

CO3 Action verb is greater than of PO3 verb. Therefore the correlation is high(3)

**PO4: Analyze (L4)**

CO3 Action verb is greater than of PO4 verb. Therefore the correlation is high(3)

**PO6 : Thumb rule**

Backtracking and searching techniques were applied for GPS. Therefore, the correlation is moderate (2)

**PO12: Thumb rule**

Backtracking and searching techniques will give optimal solutions to various problems. Therefore, the correlation is moderate (2)

**CO5: Analyze** the P, NP, NP hard and NP complete problems for solving reduction problems.

**Action Verb : Analyze (L4)**

**PO1: Apply(L3)**

CO5 Action verb is less than of PO1 verb by one level. Therefore, the correlation is moderate (2)

**PO2: Analyze (L4)**

CO5 Action verb is same level of PO2 verb. Therefore, the correlation is high (3)

**PO3: Develop (L3)**

CO5 Action verb is greater than PO3 verb. Therefore, the correlation is high (3)

**PO4: Analyze (L4)**

CO5 Action verb is same as PO4 verb. Therefore, the correlation is high (3)

**PO5: Apply(L3)**

CO5 Action verb is greater than PO5 verb. Therefore, the correlation is high (3)

**PO12: Thumb rule**

In research-oriented purpose P, NP concepts can be applied. Therefore, the correlation is moderate (2)

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | Object-Oriented Programming Through JAVA (common to CSE, CIC, CSE(DS), AIDS,CSIT & AIML) | L | T | P | C |
|---|---|---|---|---|---|---|
| 23APC0506 | II-I | | 3 | 0 | 0 | 3 |

**Course Outcomes:**

After studying the course, student will be able to

**CO1: Understand** the Java language components and how to apply in applications

**CO2: Apply** the concepts of OOP's fundamentals like classes, Methods and class libraries to develop applications

**CO3: Analyze** the concepts of arrays, inheritance and interfaces to develop efficient java applications.

**CO4: Evaluate** the concepts of packages, file I/O, by using access control, and exception handling mechanisms to solve real world scenarios

**CO5: Create** the GUI applications by using concepts like multi-threading, Java FX, JDBC

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms Level |
|---|---|---|---|---|---|
| **CO1** | Understand | the Java language components | | How to apply in applications | L2 |
| **CO2** | Apply | the concepts of OOP's fundamentals | like classes, methods and class libraries | to develop applications | L3 |
| **CO3** | Analyze | the concepts of arrays, inheritance and interfaces | | to develop efficient java applications | L4 |
| **CO4** | Evaluate | the concepts of packages , file I/O | by using access control, and exception handling mechanisms | to solve real world scenarios | L5 |
| **CO5** | Create | The GUI applications, JDBC applications | by using concepts like multi-threading, Java FX, JDBC | | L6 |

| **UNIT – I** | **7 Hrs** |
|---|---|
| **Object Oriented Programming:** Basic concepts, Principles, Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.<br>**Data Types,** Variables, and Operators: Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator ( = ), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.<br>**Control Statements:** Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary<br>Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement. | |
| **UNIT – II** | **12 Hrs** |
| **Classes and Objects:** Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.<br>**Methods:** Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static. | |
| **UNIT – III** | **19 Hrs** |
| **Arrays:** Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.<br>**Inheritance:** Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.<br>**Interfaces:** Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in | |

| | | |
|---|---|---|
| Interface, Functional Interfaces, Annotations. | | |
| **UNIT – IV** | | **19 Hrs** |
| **Packages and Java Library:** Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.<br>**Exception Handling:** Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions.<br>**Java I/O and File:** Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java(Text Book 2) | | |
| **UNIT – V** | | **19 Hrs** |
| **String Handling in Java:** Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.<br>**Multithreaded Programming:** Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread-Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.<br>**Java Database Connectivity:** Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface<br>**Java FX GUI:** Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3) | | |
| **Textbooks:** | | |
| 1. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.<br>2. Joy with JAVA, Fundamentals of Object Oriented Programming, DebasisSamanta, MonalisaSarma, Cambridge, 2023.<br>3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson. | | |
| **Reference Books:** | | |
| 1. The complete Reference Java, 11thedition, Herbert Schildt,TMH<br>2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson | | |
| **Online Resources:** | | |
| 1. https://nptel.ac.in/courses/106/105/106105191/<br>2.https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview | | |

**Mapping of course outcomes with program outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | | | | | | | | | | | 1 | 1 |
| CO2 | | 3 | 3 | 2 | 3 | | | | | | 2 | 2 | 1 | 1 |
| CO3 | 3 | 3 | 1 | 2 | 2 | | | | | | | | 1 | 1 |
| CO4 | 3 | 3 | | 3 | 3 | | 3 | | | | | | 1 | 1 |
| CO5 | | 3 | 3 | | 3 | | | | | | 3 | 3 | 1 | 1 |

**Correlation matrix**

| Unit No. | CO | | | | | Program Outcome (PO) | PO(s) :Action Verb and BTL(for PO1 to PO12) | Level of Correlation (0-3) |
|---|---|---|---|---|---|---|---|---|
| | Lesson plan(Hrs) | % | Correlation | Co's Action verb | BTL | | | |
| 1 | 12 | 13.63% | 2 | CO1: Understand | L2 | PO1<br>PO2 | PO1: Apply(L3)<br>PO2: Analyze(L4) | 2<br>1 |
| 2 | 13 | 14.77% | 2 | CO2: Apply | L3 | PO2<br>PO3<br>PO4<br>PO5<br>PO11<br>PO12 | PO2: Review (L2)<br>PO3: Develop (L3)<br>PO4: Analyze(L4)<br>PO5: Apply(L3)<br>PO11: Thumb Rule<br>PO12: Thumb Rule | 3<br>3<br>2<br>3<br>2<br>2 |
| 3 | 23 | 26.13% | 3 | CO3: Analyze | L4 | PO1<br>PO2<br>PO3<br>PO4<br>PO5 | PO1: Apply(L3)<br>PO2: Analyze(L4)<br>PO3: Design(L6)<br>PO4: Interpret(L5)<br>PO5: Select(L5) | 3<br>3<br>1<br>2<br>2 |
| 4 | 20 | 22.72% | 3 | CO4: Evaluate | L5 | PO1<br>PO2<br>PO4<br>PO5<br>PO7 | PO1: Apply(L3)<br>PO2: Analyze (L4)<br>PO4: Analyze(L4)<br>PO5: Select(L3)<br>PO7: Thumb Rule | 3<br>3<br>3<br>3<br>3 |
| 5 | 20 | 22.72% | 3 | CO5: Create | L6 | PO2<br>PO3<br>PO5<br>PO11<br>PO12 | PO2: Formulate (L6)<br>PO3: Design (L6)<br>PO5: Create(L6)<br>PO11: Thumb Rule<br>PO12: Thumb rule | 3<br>3<br>3<br>3<br>3 |
| | 88 | 100 % | | | | | | |

**Justification Statements:**

**CO1: Understand the Java language components and how to apply in applications.**

**Action Verb: Understand(L2)**

PO1 Verb: Apply(L3)

CO1 Action verb is less than PO1 verb by one level. Therefore, the correlation is medium (2)

PO2 Verb: Analyze(L4)

CO1 Action verb is less than PO2 verb by two levels. Therefore, the correlation is low (1)

**CO2: Apply the concepts of OOP's fundamentals like classes, Methods and class libraries to develop applications**

**Action Verb: Apply (L3)**

PO2: Review (L2)

CO2 Action verb is same level as PO1 verb. Therefore, the correlation is High (3)

PO3: Develop (L3)

CO2 Action verb is same level as PO3 verb. Therefore, the correlation is High (3)

PO4: Analyze(L4)

CO2 Action verb is less than PO4 verb by one level. Therefore, the correlation is moderate (2)

PO5: Apply(L3)

CO2 Action verb is less than PO5 verb by three level. Therefore, the correlation is High (3)

PO11: Thumb Rule

Create some Java programs to solve real world problems. Therefore, the correlation is moderate (2)

PO12: Thumb Rule

Learn java programs to solve. Therefore, the correlation is moderate (2)

**CO3: Analyze the concepts of arrays, inheritance and interfaces to develop efficient java applications.**

**Action Verb: Analyze(L4)**

PO1: Apply (L3)

CO3 Action verb is Greater than PO1. Therefore, the correlation is high (3)

PO2: Analyze (L4)

CO3 Action verb is same level as PO2. Therefore, the correlation is high (3)

PO3: Design (L6)

CO3 Action verb is less than PO3 verb by two level. Therefore, the correlation is low (1)

PO4: Interpret (L5)

CO3 Action verb is less than PO4 verb by one level. Therefore, the correlation is medium (2)

PO5: Select (L5)

CO3 Action verb is less than PO4 verb by one level. Therefore, the correlation is medium (2)

**CO4: Evaluate the concepts of packages, access control, file I/O, and exception handling mechanisms to solve real world scenarios**

**Action Verb: Evaluate(L5)**

PO1: Apply(L3)

CO4 Action verb is Greater than PO1. Therefore, the correlation is high (3)

PO2: Analyze (L4)

CO4 Action verb is Greater than PO2. Therefore, the correlation is high (3)

PO4: Analyze (L4)

CO4 Action verb is Greater than PO4. Therefore, the correlation is high (3)

PO5: Select (L3)

CO4 Action verb is Greater than PO5. Therefore, the correlation is high (3)

PO7: Thumb Rule

To solve some problems, we use multithreading and collection frame works. Therefore, the correlation is medium (3)

**CO5: Create GUI applications by using concepts like multi-threading, Java FX, JDBC**

**Action Verb: Create (L6)**

PO2: Formulate (L6)

CO5 Action verb is same level as PO2. Therefore, the correlation is high (3)

PO3: Design (L6)

CO5 Action verb is same level as PO3. Therefore, the correlation is high (3)

PO5: Create (L6)

CO5 Action verb is same level as PO5. Therefore, the correlation is high (3)

PO11: Thumb Rule

Java is used to design simple and enterprise applications so need for project management. Therefore, the correlation is high (3)

PO12: Thumb Rule

It is a programming language so new version available so we need to learn. Therefore, the correlation is high (3)

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | Advanced Data Structures and Algorithms Analysis Lab (Common to CSE,CIC,CSIT, AIDS & AIML) | L | T | P | C |
|---|---|---|---|---|---|---|
| 23APC0505 | II-I | | 0 | 0 | 3 | 1.5 |

**Course Outcomes:**

After studying the course, student will be able to

**CO1: Understand** the operations on AVL Trees, B-Trees and graph traversals.

**CO2: Create** the Min, Max Heap using arrays and find BFT, DFT for the graphs.

**CO3: Create** the sorting techniques for finding the time complexities and use greedy method to find single source shortest path.

**CO4: Apply** backtracking strategy for finding the N-Queens ,0/1 knapsack problem.

**CO5: Apply** greedy strategy for job sequencing and using dynamic programming to find 0/1 knapsack problem.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| CO1 | Understand | the operations | on AVL Trees, B-Trees and graph traversals | | L2 |
| CO2 | Create | the Min, Max Heap using arrays and find BFT, DFT | | for the graphs | L6 |
| CO3 | Create | the sorting techniques | | for finding the time complexities | L6 |
| CO4 | Apply | backtracking strategy | | for finding the N-Queens ,0/1 knapsack problem | L3 |
| CO5 | Apply | greedy strategy | | for job sequencing | L3 |

**List of Experiments:**

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.**(CO1)**
2. Construct B-Tree an order of 5 with a set of 100 random elements stored in array.Implement searching, insertion and deletion operations.**(CO1)**
3. Construct Min and Max Heap using arrays, delete any element and display the content of the Heap.**(CO2)**
4. Implement BFT and DFT for given graph, when graph is represented by a) Adjacency Matrix b) Adjacency Lists. **(CO2)**
5. Write a program for finding the bi-connected components in a given graph.**(CO2)**
6. Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).**(CO2)**
7. Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists.**(CO3)**
8. Implement Job sequencing with deadlines using Greedy strategy.**(CO5)**
9. Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.**(CO4)**
10. Implement N-Queens Problem Using Backtracking.**(CO4)**
11. Use Backtracking strategy to solve 0/1 Knapsack problem.**(CO4)**
12. Implement Travelling Sales Person problem using Branch and Bound approach.**(CO5)**

**Reference Books:**


1. Fundamentals of Data Structures in C++, Horowitz Ellis, SahniSartaj, Mehta, Dinesh, 2ndEdition, Universities Press
2. Computer Algorithms/C++ Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, 2ndEdition, University Press
3. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
4. An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill


**Online Learning Resources:**

1. http://cse01-iiith.vlabs.ac.in/
2. http://peterindia.net/Algorithms.html

**Mapping of course outcomes with program outcomes**

| CO | PO 1 | PO2 | PO 3 | PO4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 2 | 1 | | | | | | | 1 | | | 2 | 1 | |
| CO 2 | 3 | 3 | | | 3 | | | | | | | 2 | | |
| CO 3 | 3 | 3 | 2 | 2 | | | | | 1 | | | 1 | | |
| CO 4 | 3 | 2 | | | | | | | 2 | | | 2 | | 2 |
| CO 5 | 3 | 2 | 3 | 3 | | | | | 1 | | | 2 | | 2 |

**Correlation matrix**

| Unit No. | Co's Action verb | BTL | Program Outcome (PO) | PO(s) :Action Verb and BTL(for PO1 to PO12) | Level of Correlation (0-3) |
|---|---|---|---|---|---|
| 1 | **CO1 : Understand** | **L2** | PO1<br>PO2<br>PO9<br>PO12 | PO1: Apply(L3)<br>PO2: Analyze(L4)<br>PO9: Thumb rule<br>PO12: Thumb rule | 2<br>1<br>1<br>2 |
| 2 | **CO2 : Create** | **L6** | PO1<br>PO2<br>PO5<br>PO12 | PO1: Apply(L3)<br>PO2: Analyze (L4)<br>PO5: Develop (L6)<br>PO12: Thumb rule | 3<br>3<br>3<br>2 |
| 3 | **CO3 : Create** | **L6** | PO1<br>PO2<br>PO3<br>PO4<br>PO9<br>PO12 | PO1: Apply(L3)<br>PO2: Analyze (L4)<br>PO3: Design (L6)<br>PO4: Design (L6)<br>PO9: Thumb rule<br>PO12: Thumb rule | 3<br>3<br>3<br>3<br>1<br>1 |
| 4 | **CO4 : Apply** | **L3** | PO1<br>PO2<br>PO9<br>PO12 | PO1: Apply(L3)<br>PO2: Analyze (L4)<br>PO9: Thumb rule<br>PO12: Thumb rule | 3<br>2<br>2<br>2 |
| 5 | **CO5 : Apply** | **L3** | PO1<br>PO2<br>PO3<br>PO4<br>PO9<br>PO12 | PO1: Apply(L3)<br>PO2: Analyze (L4)<br>PO3: Develop (L3)<br>PO4: Develop (L3)<br>PO9: Thumb rule<br>PO12: Thumb rule | 3<br>2<br>3<br>3<br>1<br>2 |

**Justification Statements :**

**CO1: Understand** the operations on AVL Trees, B-Trees and graph traversals.

**Action Verb : Understand (L2)**

PO1 Verb : Apply(L3)

CO1 Action verb is less than PO1 verb by one level. Therefore the correlation is moderate (2)

PO2 Verb : Analyze(L4)

CO1 Action verb is less than PO2 verb by two levels. Therefore the correlation is low (1)

PO9 : Thumb rule

Perform operations on AVL trees and B-trees are individual. There fore the correlation is low(1)

PO12 : Thumb rule

Apply different values of operations on AVL Trees, B-Trees and graph traversals is life long. Therefore the correlation is moderate (2)

**CO2: Create** the Min, Max Heap using arrays and find BFT, DFT for the graphs

**Action Verb : Create (L6)**

PO1 Verb : Apply(L3)

CO2 Action verb is greater than PO1 verb. Therefore the correlation is high (3)

PO2 Verb : Analyze(L4)

CO2 Action verb is greater than PO2 verb. Therefore the correlation is high (3)

PO5: Develop(L6)

CO2 Action verb is less than PO5 verb by one level. Therefore the correlation is high (3)

PO12: Thumb rule

To Apply the min and max heap on arrays and finding traversals on graphs is lifelong learning. Therefore the correlation is moderate (2)

**CO3: Create** the sorting techniques for finding the time complexities and use greedy method to find single source shortest path.
Action Verb : Create (L6)
PO1: Apply(L3)
CO3 Action verb is greater than PO1 verb. Therefore the correlation is high (3)
PO2:Analyze (L4)
CO3 Action verb is greater than PO1 verb. Therefore the correlation is high (3)
PO3: Design (L6)
CO3 Action verb is less than PO3 verb by one level. Therefore the correlation is moderate (2)
PO4: Develop (L6)
CO3 Action verb is less than PO4 verb by one level. Therefore the correlation is moderate (2)
PO9 : Thumb rule
Team work or individual work is required to analyze sorting techniques time complexities. Hence the correlation is low (1)
PO12: Thumb rule
To Develop sorting techniques and single source shortest path as life long learning. Therefore the correlation is low (1)
**CO4: Apply** backtracking strategy for finding the N-Queens ,0/1 knapsack problem
Action Verb : Apply (L3)
PO1: Apply(L3)
CO4 Action verb is same level as PO1 verb. Therefore the correlation is high (3)
PO2: Analyze (L4)
CO4 Action verb is less than PO2 verb by one level. Therefore the correlation is medium (2)
PO9 : Thumb rule
Team work/ individual work is required find the N-Queens and 0/1 Knapsack trough backtracking. Hence the correlation is medium (2)
PO12: Thumb rule
To Develop back tracking in N-Queens problem is life long learning. Therefore the correlation is medium (2)
**CO5 : Apply** greedy strategy for job sequencing and using dynamic programming to find 0/1 knapsack problem.
Action Verb : Apply (L3)
PO1: Apply (L3)
CO5 Action verb is same level as PO1 verb. Therefore the correlation is high (3)
PO2: Analyze (L4)
CO5 Action verb is less than PO2 verb by one level. Therefore the correlation is medium (2)
PO3: Design (L3)
CO5 Action verb is less than PO3 verb. Therefore the correlation is high (3)
PO4: Design (L3)
CO5 Action verb is less than PO4 verb. Therefore the correlation is high (3)
PO9 : Thumb rule
Team work / individual work is required applying greedy strategy on job sequencing. Hence the correlation is low (1)
PO12: Thumb rule
To apply dynamic programming for 0/1 knapsack is life long learning. Therefore the correlation is medium (2)

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | Object-Oriented Programming Through Java Lab (common to CSE, CSIT,CIC, CSE(DS), AIDS & AIML) | L | T | P | C |
|---|---|---|---|---|---|---|
| 23APC0507 | II-I | | 0 | 0 | 3 | 1.5 |

**Course Outcomes:**

After studying the course, student will be able to

**CO1: Understand** the Java syntax, data types, control structures and OOPs principles.
**CO2: Apply** the problem-solving skills and algorithmic thinking by using OOP concepts
**CO3: Apply** the fundamental OOP principles to solve programming problems effectively.
**CO4: Analyze** the Java libraries to implement thread Applications.
**CO5: Create** graphical user interface (GUI) applications using JavaFX

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| CO1 | Understand | The Java syntax, data types, control structures and OOPs principles | | | L2 |
| CO2 | Apply | The problem-solving skills and algorithmic thinking | by using OOP concepts | | L3 |
| CO3 | Apply | The fundamental OOP principles | | to solve programming problems effectively | L3 |
| CO4 | Analyze | The Java libraries | | to implement thread Applications. | L4 |
| CO5 | Create | graphical user interface (GUI) applications | using JavaFX | | L6 |

**List of Experiments:**

**Exercise – 1**

a) Write a JAVA program to display default value of all primitive data type of JAVA **(CO1)**
b) Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root. **(CO2)**

**Exercise - 2**

a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism. b) Write a JAVA program to sort for an element in a given list of elements using bubble sort. **(CO2)**
c) Write a JAVA program using StringBuffer to delete, remove character. **(CO2)**

**Exercise - 3**

a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method. **(CO2)**
b) Write a JAVA program implement method overloading. **(CO3)**
c) Write a JAVA program to implement constructor**. (CO3)**
d) Write a JAVA program to implement constructor overloading. **(CO3)**

**Exercise - 4**

a) Write a JAVA program to implement Single Inheritance **(CO3)**
b) Write a JAVA program to implement multi level Inheritance **(CO3)**
c) Write a JAVA program for abstract class to find areas of different shapes **(CO3)**

**Exercise - 5**

a) Write a JAVA program give example for "super" keyword. **(CO3)**
b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved? **(CO3)**
c) Write a JAVA program that implements Runtime polymorphism **(CO3)**

**Exercise - 6**

a) Write a JAVA program that describes exception handling mechanism **(CO4)**
b) Write a JAVA program Illustrating Multiple catch clauses **(CO4)**
c) Write a JAVA program for creation of Java Built-in Exceptions **(CO4)**
d) Write a JAVA program for creation of User Defined Exception **(CO4)**

**Exercise - 7**

a) Write a JAVA program that creates threads by extending Thread class. First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds, (Repeat the same by implementing Runnable) **(CO4)**
b) Write a program illustrating is Alive and join () **(CO4)**

c) Write a Program illustrating Daemon Threads. **(CO4)**
d) Write a JAVA program Producer Consumer Problem **(CO4)**

**Exercise – 8**

a) Write a JAVA program that import and use the user defined packages **(CO4)**
b) Without writing any code, build a GUI that display text in label and image in an ImageView (use JavaFX) **(CO5)**
c) Build a Tip Calculator app using several JavaFX components and learn how to respond to user interactions with the GUI **(CO5)**

**Exercise – 9**

a) Write a java program that connects to a database using JDBC **(CO5)**
b) Write a java program to connect to a database using JDBC and insert values into it. **(CO5)**
c) Write a java program to connect to a database using JDBC and delete values from it. **(CO5)**

**Textbooks:**

1. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2. Joy with JAVA, Fundamentals of Object Oriented Programming, DebasisSamanta, MonalisaSarma, Cambridge, 2023.
3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

**Reference Books:**

1. The complete Reference Java, 11th edition, Herbert Schildt,TMH
2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

**Online Resources:**

1. https://nptel.ac.in/courses/106/105/106105191/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview

**Mapping of course outcomes with program outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | 3 | | | 2 | | | | | | | | 3 | |
| CO2 | | 3 | 3 | 2 | 3 | | | | | | | | 2 | |
| CO3 | | | 3 | 2 | 3 | | | | | | | | 2 | 2 |
| CO4 | | 3 | 3 | 3 | 3 | | | | 3 | | 3 | 3 | 2 | 2 |
| CO5 | | | 3 | | 3 | | | | 3 | | 3 | 3 | 2 | |

**Correlation matrix**

| Unit No. | Co's Action verb | BTL | Program Outcome (PO) | PO(s) :Action Verb and BTL(for PO1 to PO12) | Level of Correlation (0-3) |
|---|---|---|---|---|---|
| 1 | CO1 :Understand | L2 | PO2<br>PO5 | PO2: Review(L2)<br>PO5: Apply(L3) | 3<br>2 |
| 2 | CO2 :Apply | L3 | PO2<br>PO3<br>PO4<br>PO5 | PO2: Review(L2)<br>PO3: Develop (L3)<br>PO4: Analyze(L4)<br>PO5: Apply(L3) | 3<br>3<br>2<br>3 |
| 3 | CO3: Apply | L3 | PO3<br>PO4<br>PO5 | PO3: Develop(L3)<br>PO4: Analyze(L4)<br>PO5: Apply(L3) | 3<br>2<br>3 |
| 4 | CO4: Analyze | L4 | PO2<br>PO3<br>PO4<br>PO5<br>PO9<br>PO11<br>PO12 | PO2: Analyze (L4)<br>PO3: Develop(L3)<br>PO4: Analyze(L4)<br>PO5: Apply(L3)<br>PO9: Thumb Rule<br>PO11: Thumb Rule<br>PO12: Thumb Rule | 3<br>3<br>3<br>3<br>3<br>3<br>3 |
| 5 | CO5 :Create | L6 | PO3<br>PO5<br>PO9<br>PO11<br>PO12 | PO3: Design (L6)<br>PO5: Create(L6)<br>PO9: Thumb Rule<br>PO11: Thumb Rule<br>PO12: Thumb Rule | 3<br>3<br>3<br>3<br>3 |

**Justification Statements :**

**CO1: Understand Java syntax thoroughly, encompassing data types and control structures.**

**Action Verb : Understand(L2)**

PO2: Review(L2)

CO1 Action verb is same PO2 verb. Therefore the correlation is High(3)

PO5: Apply(L3)

CO1 Action verb is less than PO5 verb by one level. Therefore the correlation is moderate (2)

**CO2: Develop problem-solving skills and algorithmic thinking, applying OOP concepts to design efficient solutions to various programming challenges.**

**Action Verb : Apply (L3)**

PO2: Review(L2)

CO2 Action verb is greater than PO2 verb. Therefore the correlation is High(3)

PO3: Develop (L3)

CO2 Action verb is same level as PO3 verb. Therefore the correlation is high (3)

PO4: Analyze (L4)

CO2 Action verb is less than PO4 verb by one levels. Therefore the correlation is moderate (2)

PO5: Apply (L3)

CO2 Action verb is same level as PO5 verb. Therefore the correlation is high (3)

**CO3: Apply fundamental OOP principles such as encapsulation, inheritance, polymorphism, and abstraction to solve programming problems effectively.**

**Action Verb : Apply(L3)**

PO3: Develop (L3)

CO3 Action verb is same level as PO3 verb. Therefore the correlation is high (3)

PO4: Analyze (L4)

CO3 Action verb is less than PO4 verb by one level. Therefore the correlation is moderate(2)

PO5: Apply (L3)

CO3 Action verb is same as PO5 verb. Therefore the correlation is high(3)

**CO4: Analyze the concepts of multithreading and collection frameworks for solving complex programs.**

**Action Verb :Analyze (L4)**

PO2: Analyze (L4)

CO4 Action verb is same PO2 verb. Therefore the correlation is high (3)

PO3: Develop (L3)

CO4 Action verb is greater than PO3 verb. Therefore the correlation is high (3)

PO4: Analyze (L4)

CO4 Action verb is same as PO4 verb. Therefore the correlation is high (3)

PO5: Apply (L3)

CO4 Action verb is greater than PO5 verb. Therefore the correlation is high (3)

PO9: Thumb Rule

It is a programming language we need to collaborate with team. Therefore the correlation is high (3)

PO11: Thumb Rule

By using java to manage enterprise projects in multi-disciplinary environments . Therefore the correlation is high (3)

PO12: Thumb Rule

It is a programming language we need to learn lifelong because new concepts arise. Therefore the correlation is high (3)

**CO5: Create GUI based applications using Java FX.**

**Action Verb : Create (L6)**

PO3: Design (L6)

CO5 Action verb is same level as PO3 verb. Therefore the correlation is high (3)

PO5: Create(L6)

CO5 Action verb is same as PO5 verb. Therefore the correlation is high (3)

PO9: Thumb Rule

It is a programming language we need to collaborate with team. Therefore the correlation is high (3)

PO11: Thumb Rule

By using java to manage enterprise and web based projects in multi-disciplinary environments. Therefore the correlation is high (3)

PO12: Thumb Rule

It is a programming language we need to learn lifelong because new concepts arise. Therefore the correlation is high (3)

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | PYTHON PROGRAMMING (SKILL ENHANCEMENT COURSE) (Common to CSE,CIC,CSE(DS),CSIT, AIDS & AIML) | L | T | P | C |
|---|---|---|---|---|---|---|
| 23ASC0501 | II-I | | 0 | 1 | 2 | 2 |

**Course Outcomes:**
After studying the course, student will be able to
**CO1: Understand** the Basic concepts of python programming to build scripts in IDLE.
**CO2: Apply** the modularity techniques to invoke user defined functions**.**
**CO3: Apply** the concept of Dictionaries, Tuples and sets to perform operations on data.
**CO4: Analyze** the file concepts and oops paradigms to manage data.
**CO5: Apply** the concepts of JSON and XML for data processing.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| **CO1** | **Understand** | Basic concepts of python programming | | to build scripts in IDLE | L2 |
| **CO2** | **Apply** | the modularity techniques | | to invoke user defined functions | L3 |
| **CO3** | **Apply** | the concept of Dictionaries, Tuples and sets | | to perform operations on data. | L3 |
| **CO4** | **Analyze** | the file concepts and oops paradigms. | | to manage data | L4 |
| **CO5** | **Apply** | the concepts of JSON and XML | | for data processing | L3 |

**UNIT – I** 9Hrs

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter 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** 9 Hrs

**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:**

7. Write a program to define a function with multiple return values.
8. Write a program to define a function using default arguments.
9. Write a program to find the length of the string without using any library functions.
10. Write a program to check if the substring is present in a given string or not.
11. Write a program to perform the given operations on a list:
    i.Addition ii. Insertion iii. slicing
12. Write a program to perform any 5 built-in functions by taking any list.

**UNIT – III** 9 Hrs

**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:**

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

**UNIT – IV** 9 Hrs

**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:**

18. 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.
19. Python program to print each line of a file in reverse order.
20. Python program to compute the number of characters, words and lines in a file.
21. Write a program to create, display, append, insert and reverse the order of the items in the array.
22. Write a program to add, transpose and multiply two matrices.
23. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

**UNIT – V** 9Hrs

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

**Sample Experiments:**

24. Python program to check whether a JSON string contains complex object or not.
25. Python Program to demonstrate NumPy arrays creation using array () function.
26. Python program to demonstrate use of ndim, shape, size, dtype.
27. Python program to demonstrate basic slicing, integer and Boolean indexing.
28. Python program to find min, max, sum, cumulative sum of array
29. 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
30. 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

**Reference Books:**


1. Gowrishankar S, Veena A., Introduction to Python Programming, CRC Press.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson, 2024
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.


**Online Learning Resources/Virtual Labs**

1. https://www.coursera.org/learn/python-for-applied-data-science-ai
2. https://www.coursera.org/learn/python?specialization=python#syllabus

**Mapping of course outcomes with program outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 2 | | 2 | | | | | | | | 1 | |
| CO2 | 3 | 3 | 3 | 2 | 3 | | | | | | | | | 2 |
| CO3 | 3 | 3 | 3 | 2 | 3 | | | | | | | | | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | | | | | | | 2 | | |
| CO5 | 3 | 3 | 3 | 2 | 3 | | | | | | | | | 2 |

**Correlation matrix**

| Unit No. | CO | | | | | Program Outcome (PO) | PO(s) :Action Verb and BTL(for PO1 to PO12) | Level of Correlation (0-3) |
|---|---|---|---|---|---|---|---|---|
| | Lesson plan(Hrs) | % | Correlation | Co's Action verb | BTL | | | |
| 1 | 9 | 20 | 2 | CO1 : Understand | L2 | PO1<br>PO2<br>PO3<br>PO5 | PO1: Apply(L3)<br>PO2: Review(L2)<br>PO3: Develop (L3)<br>PO5: Apply (L3) | 2<br>3<br>2<br>2 |
| 2 | 9 | 20 | 2 | CO2 : Apply | L3 | PO1<br>PO2<br>PO3<br>PO4<br>PO5 | PO1: Apply(L3)<br>PO2: Review(L2)<br>PO3: Develop (L3)<br>PO4: Analyze(L4)<br>PO5: Apply (L3) | 3<br>3<br>3<br>2<br>3 |
| 3 | 9 | 20 | 2 | CO3 : Apply | L3 | PO1<br>PO2<br>PO3<br>PO4<br>PO5 | PO1: Apply(L3)<br>PO2: Review(L2)<br>PO3: Develop (L3)<br>PO4: Analyze(L4)<br>PO5: Apply (L3) | 3<br>3<br>3<br>2<br>3 |
| 4 | 9 | 20 | 2 | CO4 : Analyze | L4 | PO1<br>PO2<br>PO3<br>PO4<br>PO5<br>PO12 | PO1: Apply(L3)<br>PO2: Review(L2)<br>PO3: Develop (L3)<br>PO4: Analyze(L4)<br>PO5: Apply (L3)<br>Thumb Rule | 3<br>3<br>3<br>3<br>3<br>2 |
| 5 | 9 | 20 | 2 | CO5 : Apply | L3 | PO1<br>PO2<br>PO3<br>PO4<br>PO5 | PO1: Apply(L3)<br>PO2: Review(L2)<br>PO3: Develop (L3)<br>PO4: Analyze(L4)<br>PO5: Apply (L3) | 3<br>3<br>3<br>2<br>3 |
| | 53 | 100 % | | | | | | |

**Justification Statements:**

**CO1: Understand** the Basic concepts of python programming to build scripts in IDLE.

**Action Verb : Understand(L2)**

**PO1 Verb : Apply(L3)**

CO1 Action verb is less than PO1 verb by one level. Therefore the correlation is moderate (2)

**PO2 Verb : Review(L2)**

CO1 Action verb is same as PO2 verb. Therefore the correlation is high (3)

**PO3 Verb : Develop(L3)**

CO1 Action verb is less than PO3 verb by one level. Therefore the correlation is moderate (2)

**PO5 Verb : Apply(L3)**

CO1 Action verb is less than PO5 verb by one level. Therefore the correlation is moderate (2)

**CO2: Apply** the modularity techniques to invoke user defined functions**.**

**Action Verb : Apply (L3)**

**PO1: Apply(L3)**

CO2 Action verb is same as PO1 verb. Therefore the correlation is high (3)

**PO2 Verb : Review(L2)**

CO2 Action verb is greater than PO2 verb. Therefore the correlation high (3)

**PO3 Verb : Develop (L3)**

CO2 Action verb same as PO3 verb. Therefore the correlation high (3)

**PO4 Verb : Analyze(L4)**

CO2 Action verb is less than PO4 verb by one level. Therefore the correlation is moderate (2)

**PO5 Verb : Apply(L3)**

CO2 Action verb is same as PO5 verb. Therefore the correlation is high (3)

**CO3: Apply** the concept of Dictionaries, Tuples and sets to perform operations on data.

**Action Verb : Apply(L3)**

**PO1: Apply(L3)**

CO3 Action verb is same as PO1 verb. Therefore the correlation is high (3)

**PO2 Verb : Review(L2)**

CO3 Action verb is greater than PO2 verb. Therefore the correlation high (3)

**PO3 Verb : Develop (L3)**

CO3 Action verb same as PO3 verb. Therefore the correlation high (3)

**PO4 Verb : Analyze(L4)**

CO3 Action verb is less than PO4 verb by one level. Therefore the correlation is moderate (2)

**PO5 Verb : Apply(L3)**

CO3 Action verb is same as PO5 verb. Therefore the correlation is high (3)

**CO4: Analyze** the file concepts and oops paradigms to manage data.

**Action Verb: Analyze(L4)**

**PO1: Apply(L3)**

CO3 Action verb is greater than PO1 verb. Therefore the correlation is high (3)

**PO2 Verb : Review(L2)**

CO3 Action verb is greater than PO2 verb. Therefore the correlation high (3)

**PO3 Verb : Develop (L3)**

CO3 Action verb is greater than PO3 verb. Therefore the correlation high (3)

**PO4 Verb : Analyze(L4)**

CO3 Action verb is same as PO4 verb. Therefore the correlation is high (3)

**PO5 Verb : Apply(L3)**

CO3 Action verb is greater than PO5 verb. Therefore the correlation is high (3)

**PO12: Thumb rule**

To solve the real time problems oops and file concepts are necessary for data security. Therefore the correlation is medium(2)

**CO5: Apply** the concepts of JSON and XML for data processing.

**Action Verb : Apply(L3)**

**PO1: Apply(L3)**

CO3 Action verb is same as PO1 verb. Therefore the correlation is high (3)

**PO2 Verb : Review(L2)**

CO3 Action verb is greater than PO2 verb. Therefore the correlation high (3)

**PO3 Verb : Develop (L3)**

CO3 Action verb same as PO3 verb. Therefore the correlation high (3)

**PO4 Verb : Analyze(L4)**

CO3 Action verb is less than PO4 verb by one level. Therefore the correlation is moderate (2)

**PO5 Verb : Apply(L3)**

CO3 Action verb is same as PO5 verb. Therefore the correlation is high (3)

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
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**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | Environmental Science | L | T | P | C |
|---|---|---|---|---|---|---|
| 23AMC9901 | II-I | **(common to CSE, CIC, CSD, CSIT & EEE)** | **2** | **0** | **0** | **0** |

**Course Outcomes:**

After studying the course, student will be able to

**CO1**: **Understand** the multidisciplinary nature of environmental studies, various renewable and nonrenewable resources.

**CO2**: **Understand** the ecosystem and biodiversity to solve complex environmental problems

**CO3**: **Apply** the various types of pollution, solid waste management, and related preventive measures

**CO4**: **Apply** the rainwater harvesting, watershed management, ozone layer depletion, and wasteland reclamation.

**CO5**: **Analyze** the population explosion and impact of environmental health issues on human being.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| **1** | Understand | the multidisciplinary nature of environmental studies, various renewable and nonrenewable resources. | | | **L2** |
| **2** | Understand | the ecosystem and biodiversity | to solve complex environmental problems | | **L2** |
| **3** | Apply | the various types of pollution, solid waste management, and related preventive measures | | | **L3** |
| **4** | Apply | the rainwater harvesting, watershed management, ozone layer depletion, and wasteland reclamation | | | **L3** |
| **5** | Analyze | the population explosion and impact of environmental health issues on human being. | | | **L4** |

**UNIT – I**

**Multidisciplinary Nature of Environmental Studies:** Introduction  Multidisciplinary Nature of Environmental Studies  Definition, Scope and Importance – Need for Public Awareness.

**Natural Resources**: Renewable and non-renewable energy 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 overutilization of surface and sub-surface – 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-pesticides problems, water logging, salinity, case studies.

**Energy resources**: Renewable and non-renewable energy resources.

**UNIT – II**

**Ecosystems**: Concept of an ecosystem. – Structure and functions 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: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

**Biodiversity And Its Conservation** : Introduction- Definition:genetic, species and ecosystem diversity – 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-sports of biodiversity – Threats to biodiversity:

habitat loss, poaching of wildlife, man - wildlife conflicts  Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

**UNIT – III**

**Environmental Pollution:** Definition, Causes, effects and its controlmeasures of: Air Pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, and Thermal pollution and 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: earthquakes, cyclones, tsunamis, and landslides.

| **UNIT – IV** | | |
|---|---|---|
| **Social Issues and the Environment:** From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, Rainwater harvesting and Watershed Management – Resettlement and rehabilitation of people – Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies– Wasteland 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 – Public awareness. | | |
| **UNIT – V** | | |
| **Human Population and the Environment:** Population growth, variation among nations. Population explosion – Family Welfare Programs. – 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.. | | |
| **Textbooks:** | | |
| 1.Textbook of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.<br>2. Palaniswamy, "Environmental Studies", Pearson education<br>3. S.Azeem Unnisa, "Environmental Studies" Academic Publishing Company<br>4. K.Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", Scitech Publications (India), Pvt. Ltd. | | |
| **Reference Books:** | | |
| 1.Deeksha Dave and E.Sai Baba Reddy, "Textbook of Environmental Science", Cengage Publications.<br>2. M.Anji Reddy, "Text book of Environmental Sciences and Technology", BS Publication.<br>3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.<br>4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Prentice hall of India Private limited<br>5. G.R.Chatwal, "A Text Book of Environmental Studies" Himalaya Publishing House<br>6. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice hall of India Private limited. | | |

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | | | | | | 2 | 2 | | | | | | | |
| **CO 2** | | | | | | | 2 | | | | | | | |
| **CO 3** | | | | | | 2 | 2 | | | | | | | |
| **CO 4** | | | | | | 2 | 2 | | | | | | | |
| **CO 5** | | | | | | | 2 | | | | | | | |

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**CO-PO mapping justification:**

| CO | Percentage of contact hours over the total planned contact hours | | | | CO | | Program Outcome (PO) | PO(s): Action verb and BTL (for PO1 to PO5) | Level of Correlation (0-3) |
|---|---|---|---|---|---|---|---|---|---|
| | Register (Hrs) | Lesson Plan (Hrs) | % | corr | Verb | BTL | | | |
| 1 | 10 | 12 | 23 | 3 | Understand | L2 | PO6, PO7 | Thumb Rule Thumb Rule | 2, 2 |
| 2 | 15 | 15 | 28 | 3 | Understand | L2 | PO7 | Thumb Rule | 2 |
| 3 | 8 | 8 | 15 | 2 | Apply | L3 | PO6 PO7 | Thumb Rule Thumb Rule | 2, 2 |
| 4 | 9 | 10 | 19 | 2 | Apply | L3 | PO6, PO7 | Thumb Rule Thumb Rule | 2, 2 |
| 5 | 8 | 8 | 15 | 2 | Analyze | L4 | PO7 | Thumb Rule | 2 |
| | 50 | 53 | 100 | | | | | | |

**Justification Statements**

**CO1:** Understand the multidisciplinary nature of environmental studies, various renewable and nonrenewable resources.
**Action Verb: Understand (L2)**
Using Thumb rule,CO1correlatesPO6 and PO7 as a moderate (2)
**CO2:** Understand the ecosystem and biodiversity to solve complex environmental problems
**Action Verb: Understand (L2)**
Using Thumb rule, CO2 correlates PO7 as a moderate (2)
**CO3:** Apply the various types of pollution, solid waste management, and related preventive measures
**Action Verb: APPLY (L3)**
Using Thumb rule,CO3 correlates PO6 and PO7 as a moderate (2)
**CO4:** Apply the rainwater harvesting, watershed management, ozone layer depletion, and wasteland reclamation.
**Action Verb: APPLY (L3)**
Using Thumb rule,CO4 correlates PO6 and PO7 as a moderate (2)
**CO5: Analyze** the population explosion and impact of environmental health issues on human being
**Action Verb: Analyze (L4)**
Using Thumb rule,CO5 correlates PO7 as a moderate (2)

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**
**(Effective for the batches admitted in 2023-24)**

**Semester IV (Second year)**

| Sl. No. | Category | Course Code | Course Title | Hours per week | | | Credits | CIE | SEE | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | | | |
| 1 | HM | 23AES0305 | Optimization Techniques | 2 | 0 | 0 | 2 | 30 | 70 | 100 |
| 2 | BS | 23ABS9916 | Probability & Statistics | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3 | PC | 23APC0510 | Operating Systems | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4 | PC | 23APC0508 | Database Management Systems | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 5 | PC | 23APC0519 | Software Engineering | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 6 | PC | | Operating Systems & Software Engineering Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 7 | PC | 23APC0509 | Database Management Systems Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 8 | SC | | Python with DJango | 0 | 1 | 2 | 2 | 30 | 70 | 100 |
| 9 | ES | 23AES0304 | Design Thinking & Innovation | 1 | 0 | 2 | 2 | 30 | 70 | 100 |
| | | | **Total** | **15** | **1** | **10** | **21** | | | **900** |
| **Mandatory Community Service Project Internship of 08 weeks duration during summer vacation** | | | | | | | | | | |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | Optimization Techniques | L | T | P | C |
|---|---|---|---|---|---|---|
| 23AES0305 | II-II | | 2 | 0 | 0 | 2 |

**Course Outcomes:**

After studying the course, student will be able to

CO1:Apply the mathematical procedure for solving the LPP and transportation models
CO2:Apply the algorithms in solving the Transportation and Assignment Problems
CO3:Understand the job scheduling and implement sequencing procedure to solve problems related to the n Jobs on m Machines
CO4:Apply the decision-making strategies in game theories for managerial applications
CO5:Understand the concepts of project planning, scheduling and controlling to execute complex projects using PERT and CPM techniques

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| **CO1** | Apply | the mathematical procedure for solving the LPP and transportation models | | in industries | L3 |
| **CO2** | Apply | the algorithms in solving the Transportation and Assignment Problems | | in logistic related fields | L3 |
| **CO3** | Understand | the job scheduling and implement sequencing procedure to solve problems related to the n Jobs on m Machines | | in industries | L2 |
| **CO4** | Apply | the decision making strategies in game theories for managerial applications | | in industries | L3 |
| **CO5** | Understand | the concepts of project planning, scheduling and controlling to execute complex projects using PERT and CPM techniques | | in industries | L2 |

**Unit I:**

Introduction: Meaning, Nature, Scope & Significance of Optimization - Typical applications. The Linear Programming Problem – Introduction, Formulation of Linear Programming problem, Limitations of L.P.P, Graphical method, Simplex method: Maximization and Minimization model(exclude Duality problems), Big-M method and Two Phase method.

**Unit II**

Transportation Problem: Introduction, Transportation Model, finding initial basic feasible solutions, Moving towards optimality, Unbalanced Transportation problems, Transportation problems with maximization, Degeneracy. Assignment Problem – Introduction, Mathematical formulation of the problem, Solution of an Assignment problem, Hungarian Algorithm, Multiple Solution, Unbalanced Assignment problems, Maximization in Assignment Model.

**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 III**

Sequencing – Job sequencing, Johnsons Algorithm for n Jobs and Two machines, n Jobs and Three Machines, n jobs through m machines, Two jobs and m Machines Problems.

**Unit IV**

Game Theory: Concepts, Definitions and Terminology, Two Person Zero Sum Games, Pure Strategy Games (with Saddle Point), Principal of Dominance, Mixed Strategy Games (Game without Saddle Point), Significance of Game Theory in Managerial Application.

**Unit V**

Project Management: Network Analysis – Definition –objectives -Rules for constructing network diagram- Determining Critical Path – Earliest & Latest Times – Floats - Application of CPM and PERT techniques in Project Planning and Control – PERT Vs CPM. (exclude Project Crashing).

**Text Books:**


1. Operations Research / R. Panneerselvam, PHI Publications.
2. Operations Research / S.D. Sharma-Kedarnath
3. Operations Research /A.M. Natarajan, P. Balasubramani, A. Tamilarasi/Pearson Education.
4. Engineering Optimization: Theory and practice / S.S. Rao, New Age International (P) Limited.

**Mapping of COs to POs**

| COs | Programme Outcomes (POs) & Programme Specific Outcomes (PSOs) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | | 3 | | | | | | | | | | 2 | 2 |
| CO2 | 3 | | 3 | | 3 | | | | | | | | 2 | 2 |
| CO3 | 2 | 2 | | | | | | | | | | | 3 | 2 |
| CO4 | 3 | | 3 | | 3 | | | | | | | | 2 | 2 |
| CO5 | 2 | 2 | | | | | | | | | | | 3 | 2 |

**Correlation matrix**

| Unit No. | CO | | | | | Program Outcome (PO) | PO(s) :Action Verb and BTL(for PO1 to PO12) | Level of Correlation (0-3) |
|---|---|---|---|---|---|---|---|---|
| | Lesson plan(Hrs) | % | Correlation | Co's Action verb | BTL | | | |
| 1 | | | | Apply | L3 | PO1<br>PO3<br>PSO1<br>PSO2 | Apply (L3)<br>Develop (L3)<br>Thumb Rule<br>Thumb Rule | 3<br>3<br>2<br>2 |
| 2 | | | | Apply | L3 | PO1<br>PO3<br>PO5<br>PSO1<br>PSO2 | Apply (L3)<br>Develop (L3)<br>Apply (L3)<br>Thumb Rule<br>Thumb Rule | 3<br>3<br>3<br>2<br>2 |
| 3 | | | | Understand | L2 | PO1<br>PO2<br>PSO1<br>PSO2 | Apply (L3)<br>Identify (L3)<br>Thumb Rule<br>Thumb Rule | 2<br>2<br>3<br>2 |
| 4 | | | | Apply | L3 | PO1<br>PO3<br>PO5<br>PSO1<br>PSO2 | Apply (L3)<br>Develop (L3)<br>Apply (L3)<br>Thumb Rule<br>Thumb Rule | 3<br>3<br>3<br>2<br>2 |
| 5 | | | | Understand | L2 | PO1<br>PO2<br>PSO1<br>PSO2 | Apply (L3)<br>Identify (L3)<br>Thumb Rule<br>Thumb Rule | 2<br>2<br>3<br>2 |

**Justification Statements:**

**CO1: Apply the mathematical procedure for solving the LPP and transportation models.**
Action Verb: Apply (L3)
PO1 Verb: Apply (L3)
CO1 Action verb is same level as PO1 verb. Therefore, the correlation is high (3).
PO3 Verb: Develop (L3)
CO1: Action verb is same level as PO3 verb. Therefore, the correlation is high (3).

**CO2: Apply the algorithms in solving the Transportation and Assignment Problems.**
Action Verb: Apply (L3)
PO1 Verb: Apply (L3)
CO2: Action verb is same level as PO1 verb. Therefore, the correlation is high (3).
PO3 Verb: Develop (L3)
CO2: Action verb is same level as PO3 verb. Therefore, the correlation is high (3).
PO5 Verb: Apply (L3)
CO2: Action verb is same level as PO5 verb. Therefore, the correlation is high (3).

**CO3: Understand the job scheduling and implement sequencing procedure to solve problems related to the n Jobs on m Machines.**
Action Verb: Understand (L2)
PO1 Verb: Apply (L3)
CO1 Action verb is same (lower) level as PO1 verb. Therefore, the correlation is low (2).
PO2 Verb: Identify (L3)
CO1: Action verb is same (lower) level as PO2 verb. Therefore, the correlation is low (2).

**CO4: Apply the decision making strategies in game theories for managerial applications.**
Action Verb: Understand (L2)

PO1 Verb: Apply (L3)
CO2: Action verb is same (lower) level as PO1 verb. Therefore, the correlation is low (2).
PO3 Verb: Develop (L3)
CO2: Action verb is same (lower) level as PO3 verb. Therefore, the correlation is low (2).
PO5 Verb: Apply (L3)
CO2: Action verb is same (lower) level as PO5 verb. Therefore, the correlation is low (2).

**CO5: Understand the concepts of project planning, scheduling and controlling to execute complex projects using PERT and CPM techniques.**
Action Verb: Understand (L2)
PO1 Verb: Apply (L3)
CO1 Action verb is same (lower) level as PO1 verb. Therefore, the correlation is low (2).
PO2 Verb: Identify (L3)
CO1: Action verb is same (lower) level as PO2 verb. Therefore, the correlation is low (2).

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | Probability & Statistics | L | T | P | C |
|---|---|---|---|---|---|---|
| 23ABS9916 | II-II | | 3 | 0 | 0 | 3 |

**Course Outcomes:**

After studying the course, student will be able to

CO1:**Understand** the discrete and continuous data through various statistical methods.
CO2:**Apply** the concepts of probability, Baye's theorem and its applications.
CO3:**Apply** the discrete and continuous probability distributions for random data.
CO4:**Analyze** the techniques for testing of hypothesis for large samples.
CO5:**Analyze** the techniques for testing of hypothesis for small samples.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| **1** | Understand | the discrete and continuous data | through statistical methods. | | **L2** |
| **2** | Apply | The concepts of probability and its applications | | | **L3** |
| **3** | Apply | The discrete and continuous probability distributions | for random data. | | **L3** |
| **4** | Analyze | The techniques for testing of hypothesis | for large samples | | **L4** |
| **5** | Analyze | The techniques for testing of hypothesis | for small samples | | **L4** |

| | | |
|---|---|---|
| **UNIT - I** | **Descriptive statistics** | 10 Hrs |
| Statistics Introduction, Population vs Sample, Collection of data, primary and secondary data, Measures of Central tendency, Measures of Variability (dispersion), Skewness, Kurtosis. Correlation and Regression: Correlation coefficient, rank correlation, regression coefficients, method of least squares, regression lines | | |
| **UNIT - II** | **Probability** | 8Hrs |
| Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation. | | |
| **UNIT - III** | **Probability distributions** | 8Hrs |
| Probability distributions: Binomial, Poisson and Normal-their properties (Chebyshev`s inequality).Approximation of the binomial distribution to normal distribution. | | |
| **UNIT - IV** | **Estimation and Testing of hypothesis, large sample tests** | 8 Hrs |
| Estimation-parameters, statistics, sampling distribution, point estimation, maximum likelihood estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems. | | |
| **UNIT - V** | **Small sample tests** | 8Hrs |
| Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), x2 - test for goodness of fit, x2 - test for independent of attributes. | | |

**Textbooks:**


1. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012


**Reference Books:**


1. S. Ross, a First Course in Probability, Pearson Education India, 2002
2. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968
3. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education.
4. S.Chand ,Probability and Statistics, Dr.T.K.V.Iyengar, Dr.B.Krishna Gandhi, S.Ranganatham, Dr.M.V.S.S.N.Prasad

**Mapping of COs to POs**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | | | | | | | | | | | |
| **CO2** | 3 | | | | | | | | | | | |
| **CO3** | 3 | | | | | | | | | | | |
| **CO4** | | 3 | | | | | | | | | | |
| **CO5** | | 3 | | | | | | | | | | |

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**CO-PO mapping justification:**

| CO | Percentage of contact hours over the total planned contact hours | | | CO | | Program Outcome (PO) | PO(s): Action verb and BTL (for PO1 to PO5) | Level of Correlation (0-3) |
|---|---|---|---|---|---|---|---|---|
| | Lesson Plan (Hrs) | % | correlation | Verb | BTL | | | |
| **1** | | | | **Understand** | **L2** | PO1 | **Apply (L3)** | 2 |
| **2** | | | | **Apply** | **L3** | PO1 | **Apply (L3)** | 3 |
| **3** | | | | **Apply** | **L3** | PO1 | **Apply (L3)** | 3 |
| **4** | | | | **Analyze** | **L4** | PO2 | **Analyze (L4)** | 3 |
| **5** | | | | **Analyze** | **L4** | PO2 | **Analyze (L4)** | 3 |

**Justification Statements**

**CO1:** Understand the discrete and continuous data through various statistical methods.
**Action Verb: Understand (L2)**
PO1 Verbs: Apply(L3)
CO1 Action Verb is low level to PO1 verb by one level; Therefore correlation is moderate (2).

**CO2:** Apply the concepts of probability, Baye's theorem and its applications.
**Action Verb: Apply (L3)**
PO1 Verbs: Apply(L3)
CO2 Action Verb is equal to PO1 verb; Therefore correlation is high (3).

**CO3:** Apply the discrete and continuous probability distributions for random data.
**Action Verb: Apply (L3)**
PO1 Verb: Apply (L3)
CO3 Action Verb level is equal to PO1 verb; Therefore correlation is high (3).

**CO4:** Analyze the techniques for testing of hypothesis for large samples.
**Action Verb: Analyze(L4)**
PO2 Verb: Analyze(L4)
CO4 Action Verb level is equal to PO2 verb; Therefore correlation is high (3).

**CO5:** Analyze the techniques for testing of hypothesis for small samples.
**Action Verb: Analyze(L4)**
PO2 Verb: Analyze (L4)
CO5 Action verb is equal to PO2 verb; therefore the correlation is high (3).

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT))**

| Course Code | Year & Sem | Operating Systems (common to CSE, CSIT & CIC) | L | T | P | C |
|---|---|---|---|---|---|---|
| 23APC0510 | II-II | | 3 | 0 | 0 | 3 |

**Course Outcomes:**

After studying the course, student will be able to

CO1: **Understand** the basic concepts of Operating Systems and its services.
CO2: **Apply** the concepts of process synchronization and CPU scheduling by drawing Gantt chart
CO3: **Analyze** the methods to handle deadlock and memory management
CO4: **Evaluate** the various disk scheduling algorithms
CO5: **Understand** the issues and goals of File System protection

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| **CO1** | Understand | the basic concepts of Operating Systems and its services | | | L2 |
| **CO2** | Apply | the concepts of process synchronization & CPU scheduling | by drawing Gantt chart | | L3 |
| **CO3** | Analyze | the methods to handle deadlock and memory management | | | L4 |
| **CO4** | Evaluate | the various disk scheduling algorithms | | | L5 |
| **CO5** | Understand | the issues and goals of File System protection | | | L2 |

| **UNIT - I** | | 9 Hrs |
|---|---|---|
| **Operating Systems Overview**: Introduction, Operating system functions, Operating systems operations, Computing environments, Free and Open-Source Operating Systems **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 | | |
| **UNIT - II** | | 10Hrs |
| **Processes:** Process Concept, Process scheduling, Operations on processes, Inter-process communication. **Threads and Concurrency:** Multithreading models, Thread libraries, Threading issues. **CPU Scheduling**: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling | | |
| **UNIT - III** | | 8Hrs |
| **Synchronization Tools**: The Critical Section Problem, Peterson's Solution, Mutex Locks, Semaphores, Monitors, Classic problems of Synchronization. **Deadlocks:** system Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock. | | |
| **UNIT - IV** | | 9Hrs |
| **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 - V** | | 8Hrs |
| **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.Operating System Concepts, Silberschatz A, Galvin P B, Gagne G, 10th Edition, Wiley, 2018.
2. Modern Operating Systems, Tanenbaum A S, 4th Edition, Pearson , 2016

**Reference Books:**

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

**Online Learning Resources:**

1. https://nptel.ac.in/courses/106/106/106106144/
2. http://peterindia.net/OperatingSystems.html

**Mapping of course outcomes with program outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | | | | | | | | | | 2 | 1 | 1 |
| CO2 | 3 | 3 | | | | 2 | | | | | | 3 | 1 | 1 |
| CO3 | 3 | 3 | 3 | 3 | 3 | | | | | | | | 2 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 2 | | 3 | | | | 2 | 2 | 2 |
| CO5 | 2 | 3 | | | | | | 3 | | | | 2 | 2 | 2 |

**Correlation matrix**

| Unit No. | CO | | | | | Program Outcome (PO) | PO(s) :Action Verb and BTL(for PO1 to PO12) | Level of Correlation(0-3) |
|---|---|---|---|---|---|---|---|---|
| | Lesson plan(Hrs) | % | Correlation | Co's Action verb | BTL | | | |
| 1 | 9 | 20 | 2 | CO1 : Understand | L2 | PO1<br>PO2<br>PO12 | PO1: Apply(L3)<br>PO2: Review(L2)<br>PO12: Thumb rule | 2<br>3<br>2 |
| 2 | 9 | 20 | 2 | CO2 :Apply | L3 | PO1<br>PO2<br>PO6<br>PO12 | PO1: Apply(L3)<br>PO2: Review(L2)<br>PO6: Thumb rule<br>PO12: Thumb rule | 3<br>3<br>2<br>3 |
| 3 | 9 | 20 | 2 | CO3 : Analyze | L4 | PO1<br>PO2<br>PO3<br>PO4<br>PO5 | PO1: Apply(L3)<br>PO2: Review(L2)<br>PO3: Develop (L3)<br>PO4: Analyze (L4)<br>PO5: Apply(L3) | 3<br>3<br>3<br>3<br>3 |
| 4 | 9 | 20 | 2 | CO4 : Evaluate | L5 | PO1<br>PO2<br>PO3<br>PO4<br>PO5<br>PO6<br>PO8<br>PO12 | PO1: Apply(L3)<br>PO2: Review(L2)<br>PO3: Develop (L3)<br>PO4: Analyze (L4)<br>PO5: Apply(L3)<br>PO6: Thumb rule<br>PO8: Thumb rule<br>PO12: Thumb rule | 3<br>3<br>3<br>3<br>3<br>2<br>3<br>2 |
| 5 | 9 | 20 | 2 | CO5 : Understand | L2 | PO1<br>PO2<br>PO8<br>PO12 | PO1: Apply(L3)<br>PO2: Review(L2)<br>PO8: Thumb rule<br>PO12: Thumb rule | 2<br>3<br>3<br>2 |
| | **45** | **100** | | | | | | |

**Justification Statements :**

**CO1: Understand the basic concepts of Operating Systems and its services. Action Verb : Understand(L2)**

**PO1 Verb : Apply(L3)**

CO1 Action verb is less than PO1 verb by one level. Therefore the correlation is moderate(2)

**PO2 Verb : Review(L2)**

CO1 Action verb is same as PO2 verb. Therefore the correlation is high(3)

**PO12: Thumb rule**

In today's world operating system services are updating, those services needs to understand.Therefore the correlation is moderate (2)

CO2: Apply the concepts of process synchronization & CPU scheduling by drawing gantt chart Action Verb : Apply (L3)

PO1: Apply(L3)

CO2 Action verb is same level as PO1 verb. Therefore the correlation is high (3)

PO2 Verb : Review(L2)

CO1 Action verb is greater than PO2 verb by one level. Therefore the correlation is high (3)

PO6: Thumb rule

Most of the scheduling algorithm were used to solve some of the societal problems like forming Queue line. Therefore the correlation is Moderate (2)

PO12: Thumb rule

Scheduling is the one of the daily activity done in many sectors. Therefore the correlation is High(3)

CO3: Analyze the methods to handle deadlock and memory management Action Verb : Analyze (L4)

PO1: Apply(L3)

CO3 Action verb is greater level as PO1 verb. Therefore the correlation is high (3)

PO2: Review (L2)

CO3 Action verb is greater than PO2 verb. Therefore the correlation is high (3)
PO3: Develop (L3)
CO3 Action verb is greater than PO3 verb by one level. Therefore the correlation is high(3)
PO4: Analyze (L4)
CO3 Action verb is same as PO4 verb. Therefore the correlation is high(3)
PO5: Apply(L3)
CO3 Action verb is greater than PO5 verb by one level. Therefore the correlation is high(3)

CO4: Evaluate the various disk scheduling algorithms
Action Verb : Evaluate (L5)
PO1: Apply(L3)
CO4 Action verb is greater level as PO1 verb. Therefore the correlation is high (3)
PO2: Review (L2)
CO4 Action verb is greater level as PO2 verb. Therefore the correlation is high (3)
PO3: Develop (L3)
CO4 Action verb is greater than PO3 verb. Therefore the correlation is high(3)
PO4: Analyze (L4)
CO4 Action verb is greater than PO4 verb by one level. Therefore the correlation is high(3)
PO5: Apply(L3)
CO4 Action verb is greater than PO5 verb. Therefore the correlation is high(3)
PO6: Thumb rule
Disk scheduling and file system interfaces are applied to provide solutions for E-Commerce database access . Therefore the correlation is moderate (2)
PO8: Thumb rule
Since ethical principles shall be followed in file manipulations and data storage. Therefore the correlation is high(3)
PO12: Thumb rule
File manipulation of data and storage of data is playing major role in current scenario. Therefore, the correlation is moderate (2)

CO5: Understand the issues and goals of File System protection
Action Verb : Understand (L2)
PO1: Apply(L3)
CO5 Action verb is less than PO1 verb by one level. Therefore, the correlation is moderate (2)
PO2: Review (L2)
CO5 Action verb is same asPO2 verb. Therefore, the correlation is high(3)
PO8 : Thumb rule
Ethical principles should be followed for various security issues. Therefore the correlation is high(3)
PO12: Thumb rule
Security services and principles are keep on updating in the today‘s world. Therefore, the correlation is moderate (2)

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT))**

| Course Code | Year & Sem | Database Management Systems Common to CSE, AIML, CSE(DS), CSIT & CIC | L | T | P | C |
|---|---|---|---|---|---|---|
| 23APC0508 | II-II | | 3 | 0 | 0 | 3 |

**Course Outcomes:**

After studying the course, student will be able to

**CO1: Understand** the fundamentals of databases to design relational models.
**CO2: Apply** the E-R model for database design of real-world applications.
**CO3: Apply** the SQL and PL/SQL concepts to formulate queries.
**CO4: Analyze** normalization methods to enhance database structures
**CO5: Analyze** the concurrent transactions and recover systems to prevent data loss in system crash.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| **CO1** | Understand | The fundamentals of databases | | To design relational models. | L2 |
| **CO2** | Apply | the E-R model | | for database design of real world applications | L3 |
| **CO3** | Apply | the SQL and PL/SQL concepts | | To formulate queries. | L3 |
| **CO4** | Analyze | normalization methods | | to enhance database structures | L4 |
| **CO5** | Analyze | the concurrent transactions and recover systems | | to prevent data loss in system crash. | L4 |

| **UNIT - I** | | 9 Hrs |
|---|---|---|
| **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.<br>**Entity Relationship Model:** Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams. | | |
| **UNIT - II** | | 9Hrs |
| **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 Calculus. BASIC SQL:Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update). | | |
| **UNIT - III** | | 9 Hrs |
| **SQL**: 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.<br>**NoSQL:**Introduction and Properties of NoSQL, Different NoSQL Systems, Columnar families, Schema-Less Databases, Materialized Views, Distribution Models, Sharding | | |
| **UNIT – IV** | | 9 Hrs |
| **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 – V** | | 9 Hrs |
| **Transaction Concept:** Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.<br>**Introduction to Indexing Techniques**: B+ Trees, operations on B+Trees, Hash Based Indexing: | | |

**Textbooks:**

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

**Reference Books:**

1. Introduction to Database Systems, 8thedition, C J Date, Pearson.
2. Database Management System, 6th edition, RamezElmasri, Shamkant B. Navathe, Pearson
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

**Online Learning Resources:**

1. https://nptel.ac.in/courses/106/105/106105175/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0127580666728202 2456_shared/overview

**Mapping of course outcomes with program outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | | | | | | | | | | | 1 | |
| CO2 | 3 | 3 | | | | | | | | | | 2 | | 2 |
| CO3 | 3 | 3 | 3 | 2 | 3 | | | 2 | 2 | | | 2 | | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | | | 3 | | | | | | |
| CO5 | | 3 | 3 | 3 | 3 | | | 2 | 2 | | | 2 | | 2 |

**Correlation matrix**

| Unit No. | CO | | | | BTL | Program Outcome (PO) | PO(s) :Action Verb and BTL(for PO1 to PO12) | Level of Correlation (0-3) |
|---|---|---|---|---|---|---|---|---|
| | Lesson plan(Hrs) | % | Correlation | Co"s Action verb | | | | |
| 1 | 9 | 20 | 2 | CO1 :Understand | L2 | PO1<br>PO2 | PO1: Apply(L3)<br>PO2: Review(L2) | 2<br>3 |
| 2 | 9 | 20 | 2 | CO2 :Apply | L3 | PO1<br>PO2<br>PO12 | PO1: Apply(L3)<br>PO2: Review(L2)<br>PO12: Thumb rule | 3<br>3<br>2 |
| 3 | 9 | 20 | 2 | CO3 :Apply | L3 | PO1<br>PO2<br>PO3<br>PO4<br>PO5<br>PO8<br>PO9<br>PO12 | PO1: Apply(L3)<br>PO2: Review(L2)<br>PO3: Develop (L3)<br>PO4: Analyze (L4)<br>PO5: Apply(L3)<br>PO8: Thumb rule<br>PO9: Thumb rule<br>PO12: Thumb rule | 3<br>3<br>3<br>2<br>3<br>2<br>2<br>2 |
| 4 | 9 | 20 | 2 | CO4 :Analyze | L4 | PO1<br>PO2<br>PO3<br>PO4<br>PO5<br>PO8 | PO1: Apply(L3)<br>PO2: Analyze(L4)<br>PO3: Develop (L3)<br>PO4: Analyze (L4)<br>PO5: Apply(L3)<br>PO8: Thumb rule | 3<br>3<br>3<br>3<br>3<br>3 |
| 5 | 9 | 20 | 2 | CO5 :Analyze | L4 | PO2<br>PO3<br>PO4<br>PO5<br>PO8<br>PO9<br>PO12 | PO2: Analyze(L4)<br>PO3: Develop (L3)<br>PO4: Analyze (L4)<br>PO5: Apply(L3)<br>PO8: Thumb rule<br>PO9: Thumb rule<br>PO12: Thumb rule | 3<br>3<br>3<br>3<br>2<br>2<br>2 |
| | 45 | 100% | | | | | | |

**Justification Statements:**

**CO1: Understand the fundamentals of databases to design relational models.**

Action Verb: Understand(L2) PO1 Verb : Apply(L3)

CO1 Action verb is less than PO1 verb by one level. Therefore the correlation is moderate (2)

PO2 Verb: Review(L2)

CO1 Action verb is same level as PO2 verb. Therefore the correlation is high (3)

**CO2: Apply the E-R model for database design of real world applications.**
Action Verb: Apply (L3)
PO1: Apply(L3)
CO2 Action verb is same level as PO1 verb. Therefore the correlation is high (3)
PO2: Review (L2)
CO2 Action verb is greater than PO2 verb. Therefore the correlation is high (3)
PO12: Thumb rule
For some of DB applications, PL/SQL concepts are used to formulate queries. Therefore the correlation is moderate (2)
**CO3: Apply the SQL and PL/SQL concepts to formulate queries.**
Action Verb: Apply(L3)
PO1: Apply(L3)
CO3 Action verb is same level as PO1 verb. Therefore the correlation is high (3)
PO2: Review (L2)
CO3 Action verb is higher level as PO2 verb. Therefore the correlation is high (3)
PO3: Develop (L3)
CO3 Action verb is same level as PO3 verb. Therefore the correlation is high (3)
PO4: Analyze(L4)
CO3 Action verb is less than PO4 verb by one level. Therefore the correlation is moderate (2)
PO5: Apply(L3)
CO3 Action verb is same level as PO5 verb. Therefore the correlation is high (3)
PO8: Thumb rule
Since ethical principles should be followed to create a database. Therefore the correlation is moderate(2)
PO9 : Thumb rule
Team work is required between DBA and Database designer to create a database. Hence the correlation is moderate (2)
PO12: Thumb rule
For some of DB applications, ER model concepts are used to create designs. Therefore the correlation is moderate(2)
**CO4: Analyze normalization methods to enhance database structures**
Action Verb: Analyze(L4) PO1: Apply(L3)
CO4 Action verb is greater than PO1 verb . Therefore the correlation is high (3)
PO2: Analyze (L4)
CO4 Action verb is same level as PO2 verb. Therefore the correlation is high (3)
PO3: Develop (L3)
CO4 Action verb is greater than PO3 verb. Therefore the correlation is high (3)
PO4: Analyze (L4)
CO4 Action verb is same as PO4 verb. Therefore the correlation is high (3)
PO5: Apply(L3)
CO4 Action verb is greater than PO5 verb. Therefore the correlation is high (3)
PO8: Thumb rule
Since ethical principles shall be followed in data manipulation. Therefore the correlation is high(3)
**CO5: Analyze the concurrent transactions and recover systems to prevent data loss in system crash.**
Action Verb: Analyze (L4) PO2: Analyze (L4)
CO5 Action verb is same level as PO2 verb. Therefore the correlation is high (3)
PO3: Develop (L3)
CO5 Action verb is greater than PO3 verb. Therefore the correlation is high (3)
PO4: Analyze (L4)
CO5 Action verb is same level as PO4 verb. Therefore the correlation is high (3)
PO5: Apply(L3)
CO5 Action verb is greater than PO5 verb. Therefore the correlation is high (3)
PO8 : Thumb rule
Since ethical principles should be followed for transaction management. Therefore the correlation is moderate(2)
PO9: Thumb rule
Team work is required for transaction management and recovery of failure transactions. Hence the correlation is moderate (2)
PO12: Thumb rule
In real time transaction management is continuously updating. Therefore the correlation is moderate (2)

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | Software Engineering | L | T | P | C |
|---|---|---|---|---|---|---|
| 23APC0512 | II-II | | 3 | 0 | 0 | 3 |

**Course Outcomes:**
After studying the course, student will be able to
**CO1: Understand** the different Software Engineering Models
**CO2: Analyze** the Parameters and prerequisites of software project management.
**CO3: Analyze** the Design Methodologies of Software Project
**CO4: Apply** the Coding and Testing Methods for Quality Assurance of the Software project
**CO5: Analyze** the Software Quality Management Systems (standards) for reliability

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| **CO1** | Understand | The different Software Engineering Models | | | L2 |
| **CO2** | Analyze | The Parameters and prerequisites of SPM | | | L4 |
| **CO3** | Analyze | The Design Methodologies of Software Project | | | L4 |
| **CO4** | Apply | The Coding and Testing Methods | | for Quality Assurance of the Software project | L3 |
| **CO5** | Analyze | The Software Quality Management Systems (standards) | | for reliability | L4 |

| **UNIT – I** | | 9 Hrs |
|---|---|---|
| **Introduction:** Evolution, Software development projects, Exploratory style of software developments, Emergence of software engineering, Notable changes in software development practices, Computer system engineering.<br>**Software Life Cycle Models:** Basic concepts, Waterfall model and its extensions, Rapid application development, Agile development model, Spiral model. | | |
| **UNIT – II** | | 9Hrs |
| **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.<br>**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** | | 9 Hrs |
| **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.<br>**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)<br>**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.<br>**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. | | |
| **UNIT – IV** | | 9 Hrs |
| **Coding And Testing:** Coding, Code review, Software documentation, Testing, Black-box testing, White-Box testing, Regression Testing ,Debugging, Program analysis tools, Integration testing, Testing object-oriented programs, Smoke testing, and Some general issues associated with testing.<br>**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. | | |
| **UNIT – V** | | 9 Hrs |
| **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. Fundamentals of Software Engineering, Rajib Mall, 5th Edition, PHI.
2. Software Engineering A practitioner's Approach, Roger S. Pressman, 9th Edition, McGraw Hill International Edition.

**Reference Books:**

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

**Online Learning Resources:**

1) https://nptel.ac.in/courses/106/105/106105182/
2) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012605895063871 48827_shared/overview
3) https:://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013382690411003 904735_shared/overview

**Mapping of course outcomes with program outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | | | | | | | | | | | | | |
| CO2 | 3 | | | 3 | 3 | | | | | | | | 3 | |
| CO3 | 3 | | 3 | | | | | | | | | | 3 | |
| CO4 | 3 | | 3 | 2 | | | | | | | | | 2 | 2 |
| CO5 | 3 | | 3 | 3 | 3 | 2 | 2 | | | 2 | 2 | | 2 | 2 |

**Correlation matrix**

| Unit No. | CO | | | | | Program Outcome (PO) | PO(s) :Action Verb and BTL(for PO1 to PO12) | Level of Correlation (0-3) |
|---|---|---|---|---|---|---|---|---|
| | Lesson plan(Hrs) | % | Correlation | Co"s Action verb | BTL | | | |
| 1 | 9 | 20% | 2 | CO1 :Understand | L2 | PO1 | PO1:Apply(L3) | 2 |
| 2 | 9 | 20% | 2 | CO2 : Analyze | L4 | PO1<br>PO4<br>PO5 | PO1:Apply(L3)<br>PO4: Analyze (L4)<br>PO5:Apply(L3) | 3<br>3<br>3 |
| 3 | 9 | 20% | 2 | CO3 : Analyze | L4 | PO1<br>PO3 | PO1:Apply(L3)<br>PO3: Develo(L3) | 3<br>3 |
| 4 | 9 | 20% | 2 | CO4 :Apply | L3 | PO1<br>PO3<br>PO4 | PO1:Apply(L3)<br>PO3: Develop (L3)<br>PO4:Analyze (L4) | 3<br>3<br>2 |
| 5 | 9 | 20% | 2 | CO5 : Analyze | L4 | PO1<br>PO3<br>PO4<br>PO5<br>PO6<br>PO7<br>PO10<br>PO11 | PO1:Apply(L3)<br>PO3: Develop (L3)<br>PO4: Analyze (L4)<br>PO5:Apply(L3)<br>PO6:Thumb rule<br>PO7:Thumb rule<br>PO10: Thumbrule<br>PO11: Thumbrule | 3<br>3<br>3<br>3<br>2<br>2<br>2<br>2 |
| | 45 | 100% | | | | | | |

**Justification Statements:**

CO1: Understand the different Software Engineering Models
Action Verb: Understand(L2)
PO1: Apply(L3)
CO1 Action verb is less than PO1 verb by one level. Therefore the correlation is moderate (2)
CO2: Analyze the Parameters and prerequisites of Software project management Action Verb: Analyze(L4)

PO1: Apply(L3)
CO2 Action verb is greater than PO1 verb. Therefore the correlation is high (3)
PO4: Analyze (L4)
CO2 Action verb is same level as PO4 verb. Therefore the correlation is high (3)
PO5: Apply(L3)
CO2 Action verb is greater than PO5 verb. Therefore the correlation is high (3)

CO3: Analyze the Design Methodologies of Software Project
Action Verb: Analyze(L4)
PO1: Apply(L3)
CO3. Action verb is greater than PO1 verb. Therefore the correlation is high (3)
PO3: Develop (L3)
CO3 Action verb is greater than PO3 verb. Therefore the correlation is high (3)

CO4: Apply the Coding and Testing Methods for Quality Assurance of the Software project
Action Verb: Apply(L3)
PO1: Apply(L3)
CO4 Action verb is same level as PO1 verb. Therefore the correlation is high (3)
PO3: Develop (L3)
CO4 Action verb is same level as PO3 verb. Therefore the correlation is high (3)
PO4: Analyze (L4)
CO4 Action verb is less than PO4 verb by one level. Therefore the correlation is moderate(2)

CO5: Analyze the Software Quality Management Systems (standards) for reliability
Action Verb: Analyze (L4)
PO1: Apply(L3)
CO5 Action verb is greater than PO1 verb. Therefore the correlation is high (3)
PO3: Develop (L3)
CO5 Action verb is greater than PO2 verb. Therefore the correlation is high (3)
PO4: Analyze (L4)
CO5 Action verb is same level as PO4 verb. Therefore the correlation is high (3)
PO5: Apply(L3)
CO5 Action verb is greater than PO5 verb. Therefore the correlation is high (3)
PO6: Thumb rule
For some software projects ,Various projects are evaluated for understanding ,therefore the correlation is moderate(2)
PO9: Thumb rule
Team work is required for software project, therefore the correlation is moderate(2)
PO11: Thumb rule
Demonstrate knowledge and understanding of the engineering and management principles And apply these to one‘s own work, therefore the correlation is moderate(2)

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | Operating Systems and Software Engineering Lab | L | T | P | C |
|---|---|---|---|---|---|---|
| | II-II | | 0 | 0 | 3 | 1.5 |

**Course Outcomes:**

After studying the course, student will be able to

**CO 1: Understand** the basic commands in UNIX operating systems.
**CO 2: Apply** the concepts of CPU scheduling algorithms to solve real time problems.
**CO 3: Apply** the concepts of process synchronization, memory management and deadlocks for various solutions, file system interface
**CO 5: Design** the E-R diagrams for DFD & CFD and structured charts for the project.
**CO 6: Develop** the UML diagrams for real time mobile applications and e-commerce projects.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| **CO1** | **Understand** | the basic commands in UNIX operating system | | | L2 |
| **CO2** | **Apply** | the concepts of CPU scheduling algorithms | | to solve real time problems | L3 |
| **CO3** | **Apply** | the concepts of process synchronization methods | | | L3 |
| **CO4** | **Create** | the E-R diagrams | | for DFD & CFD | L6 |
| **CO5** | **Develop** | UML diagrams | | for real time mobile applications and e-commerce projects. | L3 |

Sample Experiments in Operating Systems:

1. Practicing of Basic UNIX Commands. **(CO1)**
2. Write programs using the following UNIX operating system calls fork, exec, getpid, exit, wait, close, stat, opendir and readdir. **(CO1)**
3. Simulate UNIX commands like cp, ls, grep, etc., **(CO1)**
4. Simulate the following CPU scheduling algorithms
   a) FCFS b) SJF c) Priority d) Round Robin. **(CO2)**
5. Control the number of ports opened by the operating system with
   a) Semaphore b) Monitors. **(CO2)**
6. Write a program to illustrate concurrent execution of threads using pthreads library. **(CO2)**
7. Write a program to solve producer-consumer problem using Semaphores. **(CO2)**
8. Implement the following memory allocation methods for fixed partition
   a) First fit b) Worst fit c) Best fit **(CO3)**
9. Simulate the following page replacement algorithms **(CO3)**
   a) FIFO b) LRU c) LFU
10. Simulate Paging Technique of memory management. **(CO3)**
11. Implement Bankers Algorithm for Dead Lock avoidance and prevention **(CO3)**
12. Simulate the following file allocation strategies **(CO3)**
    a) Sequential b) Indexed c) Linked

**Sample Experiments in Software Engineering:**

1) Perform the following, for the following experiments: **(CO4)**
   i. Do the Requirement Analysis and Prepare SRS
   ii. Draw E-R diagrams, DFD, CFD and structured charts for the project.
   a. Course Registration System
   b. Students Marks Analyzing System
   c. Online Ticket Reservation System
   d. Stock Maintenance
2) Consider any application, using COCOMO model, estimate the effort. **(CO4)**
3) Consider any application, Calculate effort using FP oriented estimation model. **(CO4)**
4) Draw the UML Diagrams for the problem a, b, c, d. **(CO4)**
5) Design the test cases for e-Commerce application (Flipcart, Amazon) **(CO5)**
6) Design the test cases for a Mobile Application (Consider any example from Appstore). **(CO5)**
7) Design and Implement ATM system through UML Diagrams. **(CO5)**
8) Perform the following, for the following experiments: **(CO5)**
   i. Do the Requirement Analysis and Prepare SRS
   ii. Draw E-R diagrams, DFD, CFD and structured charts for the project.
   e. Course Registration System
   f. Students Marks Analyzing System
   g. Online Ticket Reservation System
   h. Stock Maintenance
9) Consider any application, using COCOMO model, estimate the effort. (**CO5)**
10) Consider any application, Calculate effort using FP oriented estimation model. **(CO6)**

| **Course Title** | **COs** | **Programme Outcomes (POs) & Programme Specific Outcomes (PSOs)** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO 11 | PO1 2 | PSO1 | PSO2 |
| Design Thinking & Innovation | CO1 | 2 | 3 | | 2 | | 2 | | | | | | | | 2 |
| | CO2 | 3 | 3 | 2 | 2 | | | | | | | | | | 2 |
| | CO3 | 3 | 3 | | 2 | | 2 | | | | | | | | 2 |
| | CO4 | 3 | 3 | 3 | 3 | | | | | | | | | | 2 |
| | CO5 | 3 | 3 | 2 | 2 | 3 | 2 | | | | | | | | 2 |

| **References:** |
|---|
| 1.Operating System Concepts, Silberschatz A, Galvin P B, Gagne G, 10th Edition, Wiley, 2018.<br>2.Modern Operating Systems, Tanenbaum A S, 4th Edition, Pearson, 2016<br>3. Operating Systems -Internals and Design Principles, Stallings W, 9th edition, Pearson, 2018<br>4. Operating Systems: A Concept Based Approach, D.M Dhamdhere, 3rd Edition, McGraw- Hill, 2013 |
| **Online Learning Resources/Virtual Labs:**<br>1. https://www.cse.iitb.ac.in/~mythili/os/<br>2. http://peterindia.net/OperatingSystems.html |

**Correlation matrix**

| Unit No. | Co's Action verb | BTL | Program Outcome (PO) | PO(s) : Action Verb and BTL (for PO1 to PO12) | Level of Correlation (0-3) |
|---|---|---|---|---|---|
| 1 | Understand | L2 | PO1<br>PO2<br>PO4<br>PO12 | Apply (L3)<br>Review (L2)<br>Analize (L4)<br>Thumb Rule | 2<br>3<br>2<br>2 |
| 2 | Apply | L3 | PO1<br>PO2<br>PO3<br>PO4 | Apply (L3)<br>Review (L2)<br>Develop (L3)<br>Analize (L4) | 3<br>3<br>3<br>2 |
| 3 | Apply | L3 | PO1<br>PO2<br>PO4 | Apply (L3)<br>Review (L2)<br>Analize (L4) | 3<br>3<br>2 |
| 4 | Create | L6 | PO1<br>PO2<br>PO3<br>PO4 | Apply (L3)<br>Review (L2)<br>Design (L6)<br>Analize (L4) | 3<br>3<br>3<br>3 |
| 5 | Develop | L3 | PO1<br>PO2<br>PO3<br>PO4<br>PO5<br>PO12 | Apply (L3)<br>Review (L2)<br>Design (L6)<br>Analize (L4)<br>Apply (L3)<br>Thumb Rule | 3<br>3<br>2<br>2<br>3<br>2 |

**Justification Statements:**
**CO1: Understand** the basic commands in UNIX operating systems.
Action Verb: Understand (L2)
PO1Verb: **Apply (L3)**
CO1 Action verb is lower than PO1 verb. Therefore, the correlation is medium (2)
PO2Verb: **Review(L2)**
CO1 Action verb is same level as PO2 verb. Therefore, the correlation is high (3)
PO4 Verb: **Analize (L4)**
CO1 Action verb is lower than PO4 verb. Therefore, the correlation is medium (2)
PO12 Verb: **Thumb Rule**
Basic commands are required to solve any engineering site therefore the correlation is medium (2)

**CO2: Apply** the concepts of CPU scheduling algorithms to solve real time problems.
Action **Verb: Apply (L3)**
PO1Verb: **Apply (L3)**
CO2 Action verb is same level as PO1 verb. Therefore, the correlation is high (3)
PO2Verb: **Review (L2)**
CO2 Action verb is same level as PO2 verb. Therefore, the correlation is high (3)
PO3 Verb: **Develop (L3)**
CO2 Action verb is same level as PO3 verb. Therefore, the correlation is high 3)
PO4 Verb: **Analize (L4)**
CO2 Action verb is lower than PO4 verb. Therefore, the correlation is medium (2)

**CO3: Apply** the concepts of process synchronization, memory management and deadlocks for various solutions.
Action Verb: **Apply (L3)**
PO1 Verb: **Apply (L3)**
CO3 Action verb is same level (greater) as PO1 verb. Therefore, the correlation is high (3)
PO2 Verb: **Review (L2)**
CO3 Action verb is same level (greater) as PO2 verb. Therefore, the correlation is high (3)
PO4 Verb: **Analize (L4)**
CO3 Action verb is lower than PO4 verb. Therefore, the correlation is medium (2)

**CO4: Design** the E-R diagrams for DFD & CFD and structured charts for the project.
**Action Verb: Create (L3)**
PO1 Verb: **Apply (L3)**
CO4 Action verb is same level as PO1 verb. Therefore, the correlation is high (3)
PO2 Verb: **Review (L2)**
CO4 Action verb is same level as PO2 verb. Therefore, the correlation is high (3)
PO3 Verb: **Design (L6)**
CO4 Action verb is same level as PO3 verb. Therefore, the correlation is high (3)
PO4 Verb: **Analize (L4)**
As per thumb rule CO4 co-relates slightly with PO6 verb. Therefore, the correlation is high (3)

**CO5 : Develop** the UML diagrams for real time mobile applications and e-commerce projects.
**Action Verb: Design (L6)**
CO5 Action verb is same level (greater) as PO3 verb. Therefore, the correlation is low (3)
PO1 Verb: **Apply (L3)**
CO5 Action verb is same level (greater) as PO4 verb. Therefore, the correlation is low (3)
PO2 Verb: **Review (L2)**
PO3 Verb: **Design (L6)**
CO5 Action verb is same level (greater) as PO4 verb. Therefore, the correlation is low (2)
PO4 Verb: **Analize (L4)**
CO5 Action verb is same level (greater) as PO5 verb. Therefore, the correlation is low (2)
PO5 Verb: **Apply (L3)**
CO5 Action verb is same level (greater) as PO5 verb. Therefore, the correlation is low (3)
PO12 Verb: **Thumb Rule**
Documentation and control flow of the project using UML concept required in long life therefore the correlation is high (2)

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | Database Management Systems Lab | L | T | P | C |
|---|---|---|---|---|---|---|
| 23APC0509 | II-II | (Common to CSE,CIC,CSE(DS),CSI & AIML) | 0 | 0 | 3 | 1.5 |

**Course Outcomes:**

After studying the course, student will be able to

**CO1: Apply** the DDL, DML&DCL Commands for manipulating the data**.**

**CO2: Create** queries to manipulate and retrieve data from databases.

**CO3: Analyze** application programs using PL/SQL

**CO4**: **Analyze** Procedures, Functions, Cursors, and Triggers to automate tasks and optimize database functionality

**CO5: Analyze** JDBC concepts for Database connectivity.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| CO1 | Apply | the DDL, DML&DCL Commands | | for manipulating the data. | L3 |
| CO2 | Create | queries | | to manipulate and retrieve data from databases. | L6 |
| CO3 | Analyze | application programs | using PL/SQL | | L4 |
| CO4 | Analyze | Procedures, Functions, Cursors, and Triggers | | to automate tasks and optimize database functionality | L4 |
| CO5 | Analyze | JDBC concepts | | for Database connectivity | L4 |

**List of Experiments:**

1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command. **(CO1)**
2. Queries (along with subQueries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example: Select the roll number and name of the student who secured fourth rank in the class. **(CO1)**
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views. **(CO1)**
4. 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) **(CO2)**
5. 
   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) **(CO2)**
   ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block **(CO2)**
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions. **(CO2)**
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE APPLICATION ERROR. **(CO3)**
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES. **(CO3)**
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions. **(CO3)**
10. Develop programs using features parameters in a CURSOR, FOR UPDATECURSOR, WHERE CURRENT of clause and CURSOR variables. **(CO4)**
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers **(CO4)**
12. Create a table and perform the search operation on table using indexing and non

indexing techniques. **(CO4)**

13. Write a Java program that connects to a database using JDBC **(CO5)**
14. Write a Java program to connect to a database using JDBC and insert values into it **(CO5)**
15. Write a Java program to connect to a database using JDBC and delete values from it **(CO5)**

**References:**


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", Fourth Edition, Pearson Education, 2007


**Mapping of course outcomes with program outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | | 3 | | | | | | | | | 2 |
| CO2 | | 3 | | | 3 | | | | | | | | | 2 |
| CO3 | 2 | 1 | | 3 | 3 | | | | | | | | | 2 |
| CO4 | 2 | 1 | | 3 | 3 | | | | | | | | 1 | |
| CO5 | | | 3 | | 3 | | | | | | | 2 | 1 | |

**Correlation matrix**

| Unit No. | Co's Action verb | BTL | Program Outcome (PO) | PO(s) : Action Verb and BTL (for PO1 to PO12) | Level of Correlation (0-3) |
|---|---|---|---|---|---|
| 1 | Apply | L3 | PO1<br>PO2<br>PO3<br>PO5 | PO1: Apply(L3)<br>PO2: Review(L2)<br>PO3: Develop(L3)<br>PO5: Apply(L3) | 3<br>2<br>3<br>3 |
| 2 | Create | L6 | PO2<br>PO5 | PO3:Formulate(L6)<br>PO5:Create(L6) | 3<br>3 |
| 3 | Analyze | L4 | PO1<br>PO2<br>PO4<br>PO5 | PO1:Apply(L3)<br>PO2:Review(L2)<br>PO4:Design(L6)<br>PO5:Create(L6) | 2<br>1<br>3<br>3 |
| 4 | Analyze | L4 | PO1<br>PO2<br>PO4<br>PO5 | PO1:Apply(L3)<br>PO2:Review(L2)<br>PO4:Design(L6)<br>PO5:Create(L6) | 2<br>1<br>3<br>3 |
| 5 | Analyze | L4 | PO3<br>PO5<br>PO12 | PO3:Design(L6)<br>PO5:Create(L6)<br>PO12:Thumb rule | 3<br>3<br>2 |

**Justification Statements:**

**CO1: Apply the DDL, DML&DCL Commands for manipulating the data.**

**Action Verb: Apply(L3)**

**PO1 Verb: Apply(L3)**

CO1 Action verb is same as PO1 verb. Therefore, the correlation is high (3)

**PO2 Verb: Review(L2)**

CO1 Action verb is less than PO2 verb by one level. Therefore, the correlation is moderate (2)

**PO3 Verb: Develop(L3)**

CO1 Action verb is same as PO3 verb. Therefore, the correlation is high (3)

**PO5 Verb: Apply(L3)**

CO1 Action verb is same as PO5 verb. Therefore, the correlation is high (3)

**CO2: Create** queries to manipulate and retrieve data from databases.

**Action Verb: Create (L6)**

**PO2 Verb : Formulate(L6)**

CO2 Action verb is same as PO2 verb. Therefore, the correlation is high (3)

**PO5 Verb: Create(L6)**

CO2 Action verb is same as PO5 verb. Therefore, the correlation is high (3)

**CO3: Analyze** application programs using PL/SQL

**Action Verb: Analyze(L4)**

**PO1 Verb: Apply (L3)**

CO3 Action verb is less than PO1 verb. Therefore, the correlation is moderate(2)

**PO2 Verb: Review(L2)**

CO3 Action verb is less than PO2 verb by two levels. Therefore, the correlation is low(1)

**PO4 Verb: Design (L6)**

CO3 Action verb is greater than as PO4 verb. Therefore, the correlation is high (3)

**PO5 Verb: Create (L6)**

CO3 Action verb is greater than as PO5 verb. Therefore, the correlation is high (3)

**CO4: Analyze Procedures,Functions, Cursors, and Triggers to automate tasks and optimize database functionality**

**Action Verb: Analyze(L3) PO1 Verb: Apply (L3)**

CO4 Action verb is less than PO1 verb. Therefore, the correlation is moderate(2)

**PO2 Verb: Review(L2)**

CO4 Action verb is less than PO2 verb by two levels. Therefore, the correlation is low(1)

**PO4 Verb: Design (L6)**

CO4 Action verb is greater than as PO4 verb. Therefore, the correlation is high (3)

**PO5 Verb: Create (L6)**

CO4 Action verb is greater than as PO5 verb. Therefore, the correlation is high (3)

**CO5: Analyze** JDBC concepts for Database connectivity.

**Action Verb: Analyze (L3) PO3 Verb: Design (L6)**

CO5 Action verb is greater than as PO3 verb. Therefore, the correlation is high (3)

**PO5 Verb: Create (L6)**

CO5 Action verb is greater than as PO5 verb. Therefore, the correlation is high (3)

**PO12: Verb:Thumb rule**

Database connection is a continuous learning activity for the user, the correlation is moderate(2)

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | Python with DJango (SKILL ENHANCEMENT COURSE) (Common to CSE,CIC,CSE(DS),AIDS & AIML) | L | T | P | C |
|---|---|---|---|---|---|---|
| | II-I | | 0 | 1 | 2 | 2 |

**Course Outcomes:**
After studying the course, student will be able to
**CO1: Understand** the HTTP request procedure for creating web scraping.
**CO2: Apply** the Django Template for creating model site & converting the model into a table.
**CO3: Apply** the Django Authentication procedures for to solve security issues with Django.
**CO4: Analyze** the Database Migrations techniques for Fetching Data from the Database
**CO5: Apply** the functional website in Django for registering on Heroku and GitHub depository.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| CO1 | Understand | the HTTP request procedure in DJango | | for creating web scraping | L2 |
| CO2 | Apply | the Django Template | | for Creating model site & converting the model | L3 |
| CO3 | Apply | the Django Authentication | | for to solve security issues with Django | L3 |
| CO4 | Analyze | Database Migrations techniques | | for Fetching Data from the Database | L4 |
| CO5 | Apply | functional website | | for registering on Heroku and GitHub | L3 |

| **UNIT – I** | Python libraries for web development | 9Hrs |
|---|---|---|

UNIT-I : Python libraries for web development :
Collections-Container datatypes, Tkinter-GUI applications, Requests-HTTP requests, BeautifulSoup4-web scraping, Scrapy, Zappa, Dash, CherryPy, Turbo Gears, Flask, Web2Py, Bottle, Falcon, Cubic Web, Quixote, Pyramid.

**Sample Experiments:**

1. Write a Python GUI program to import Tkinter package and create a window. Set its title and add a label to the window.
2. Write a Python program that designs a simple login form with labels and Entry widgets, arranging them in a grid using the Grid geometry manager.
3. Write a program using BeautifulSoup4 library for web scraping for a given URL.
4. Develop a sample Hello World page using Flask framework **(**
5. Develop a sample web page using CherryPy / Web2Py / Bottle Framework

| **UNIT – II** | **Introduction to Django Framework** | 9 Hrs |
|---|---|---|

Understanding Django environment, Features of Django and Django architecture, MVC and MTV, Urls and Views, Mapping the views to URLs, Django Template, Template inheritance Django Models, Creating model for site, Converting the model into a table, Fields in Models, Integrating Bootstrap into Django, Creating tables, Creating grids, Creating carousels.

**Sample Experiments:**

1. Create a Sample “Hello World” Application using Django.
2. Create a Login and Registration Page using MVC architecture in Django Framework.
3. Create a sample page in Django by integrating BootStrap.
4. Create an application with Tables, grids in Django.**)**
5. Create a Django App with Carousels feature.

| **UNIT – III** | **Integrating Accounts & Authentication on Django** | 9 Hrs |
|---|---|---|

Introduction to Django Authentication System, Security Problem & Solution with Django Creating Registration Form using Django, Adding Email Field in Forms,

Configuring email settings, Sending emails with Django, Adding Grid Layout On Registration Page, Adding Page Restrictions, Login Functionality Test and Logout.

**Sample Experiments:**

6. Create a registration page using Authentication System.
7. Create an application in Django to send emails using email settings and Grid Layout.
8. Create an application in Django using page restriction / authentication with Login and Logout Functionality
9. Create a sample form using Django Forms

31.

| **UNIT – IV** | **Connecting SQLite with Django** | **9 Hrs** |
|---|---|---|

Database Migrations, Fetch Data From Database, Displaying Data On Templates, Adding Condition On Data, Sending data from url to view, Sending data from view to template, Saving objects into database, Sorting objects, Filtering objects, Deleting objects, Difference between session and cookie, Creating sessions and cookies in Django.

**Sample Experiments:**

10. Create an app in Django which fetches data from database and show as list and also save objects in database
11. Create an app in Django for performing CRUD operations on records in a database
12. Create an app in Django which uses session management and cookies to store and manage user sessions.

| **UNIT – V** | **Deploying Django Web Application on Cloud** | **9Hrs** |
|---|---|---|

Creating a functional website in Django, Four Important Pillars to Deploy, registering on Heroku and GitHub, Push project from Local System to GitHub, working with Django Heroku, Working with Static Root, Handling WSGI with gunicorn, setting up Database & adding users.

**Sample Experiments:**

13. Create a website in Django with login, and registration page.
14. Register on GitHub, and Heroku and deploy the website on Heroku with all the functionalities developed.
15. Configure Django to handle static files.

**Reference Books:**


1. Martin C.Brown, "Python: The Complete Reference Paper back", 4th Edition 2018, McGraw Hill Education.
2. Reema Thareja, "Python Programming: Using Problem Solving Approach", 3rd Edition 2017,Oxford.
3. Daniel Rubio, Apress, "Beginning Django Web Application Development and Deployment with Python", 2nd Edition 2017, Apress.
4. Tom Aratyn, "Building Django 2.0 Web Applications: Create enterprise-grade, scalable Python web applications easily with Django 2.0", 2nd Edition 2018, Packt Publishing.
5. Harry Percival, "Test-Driven Development with Python: Obey the Testing Goat: Using Django, Selenium and JavaScript",2nd Edition 2019, Kindle Edition.


**Online Learning Resources/Virtual Labs**

1. https://www.coursera.org/learn/python-for-applied-data-science-ai
2. https://www.coursera.org/learn/python?specialization=python#syllabus

**Mapping of course outcomes with program outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 2 | | 2 | | | | | | | | 1 | |
| CO2 | 3 | 3 | 3 | 2 | 3 | | | | | | | | | 2 |
| CO3 | 3 | 3 | 3 | 2 | 3 | | | | | | | | | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | | | | | | | 2 | | |
| CO5 | 3 | 3 | 3 | 2 | 3 | | | | | | | | | 2 |

**Correlation matrix**

| Unit No. | CO | | | | | Program Outcome (PO) | PO(s) :Action Verb and BTL(for PO1 to PO12) | Level of Correlation (0-3) |
|---|---|---|---|---|---|---|---|---|
| | Lesson plan(Hrs) | % | Correlation | Co's Action verb | BTL | | | |
| 1 | 9 | 20 | 2 | CO1 : Understand | L2 | PO1<br>PO2<br>PO3<br>PO5 | PO1: Apply(L3)<br>PO2: Review(L2)<br>PO3: Develop (L3)<br>PO5: Apply (L3) | 2<br>3<br>2<br>2 |
| 2 | 9 | 20 | 2 | CO2 : Apply | L3 | PO1<br>PO2<br>PO3<br>PO4<br>PO5 | PO1: Apply(L3)<br>PO2: Review(L2)<br>PO3: Develop (L3)<br>PO4: Analyze(L4)<br>PO5: Apply (L3) | 3<br>3<br>3<br>2<br>3 |
| 3 | 9 | 20 | 2 | CO3 : Apply | L3 | PO1<br>PO2<br>PO3<br>PO4<br>PO5 | PO1: Apply(L3)<br>PO2: Review(L2)<br>PO3: Develop (L3)<br>PO4: Analyze(L4)<br>PO5: Apply (L3) | 3<br>3<br>3<br>2<br>3 |
| 4 | 9 | 20 | 2 | CO4 : Analyze | L4 | PO1<br>PO2<br>PO3<br>PO4<br>PO5<br>PO12 | PO1: Apply(L3)<br>PO2: Review(L2)<br>PO3: Develop (L3)<br>PO4: Analyze(L4)<br>PO5: Apply (L3)<br>Thumb Rule | 3<br>3<br>3<br>3<br>3<br>2 |
| 5 | 9 | 20 | 2 | CO5 : Apply | L3 | PO1<br>PO2<br>PO3<br>PO4<br>PO5 | PO1: Apply(L3)<br>PO2: Review(L2)<br>PO3: Develop (L3)<br>PO4: Analyze(L4)<br>PO5: Apply (L3) | 3<br>3<br>3<br>2<br>3 |
| | 53 | 100 % | | | | | | |

**Justification Statements:**

**CO1: Understand** the HTTP request procedure for creating web scraping.

**Action Verb : Understand(L2)**

**PO1 Verb : Apply(L3)**

CO1 Action verb is less than PO1 verb by one level. Therefore the correlation is moderate (2)

**PO2 Verb : Review(L2)**

CO1 Action verb is same as PO2 verb. Therefore the correlation is high (3)

**PO3 Verb : Develop(L3)**

CO1 Action verb is less than PO3 verb by one level. Therefore the correlation is moderate (2)

**PO5 Verb : Apply(L3)**

CO1 Action verb is less than PO5 verb by one level. Therefore the correlation is moderate (2)

**CO2: Apply** the Django Template for Creating model site & converting the model into a table.

**Action Verb : Apply (L3)**

**PO1: Apply(L3)**

CO2 Action verb is same as PO1 verb. Therefore the correlation is high (3)

**PO2 Verb : Review(L2)**

CO2 Action verb is greater than PO2 verb. Therefore the correlation high (3)

**PO3 Verb : Develop (L3)**

CO2 Action verb same as PO3 verb. Therefore the correlation high (3)

**PO4 Verb : Analyze(L4)**

CO2 Action verb is less than PO4 verb by one level. Therefore the correlation is moderate (2)

**PO5 Verb : Apply(L3)**

CO2 Action verb is same as PO5 verb. Therefore the correlation is high (3)

**CO3: Apply** the Django Authentication procedures for to solve security issues with Django.

**Action Verb : Apply(L3)**

**PO1: Apply(L3)**

CO3 Action verb is same as PO1 verb. Therefore the correlation is high (3)

**PO2 Verb : Review(L2)**

CO3 Action verb is greater than PO2 verb. Therefore the correlation high (3)

**PO3 Verb : Develop (L3)**

CO3 Action verb same as PO3 verb. Therefore the correlation high (3)

**PO4 Verb : Analyze(L4)**

CO3 Action verb is less than PO4 verb by one level. Therefore the correlation is moderate (2)
**PO5 Verb : Apply(L3)**
CO3 Action verb is same as PO5 verb. Therefore the correlation is high (3)
**CO4: Analyze** the Database Migrations techniques for Fetching Data from the Database
**Action Verb: Analyze(L4)**
**PO1: Apply(L3)**
CO4 Action verb is greater than PO1 verb. Therefore the correlation is high (3)
**PO2 Verb : Review(L2)**
CO4 Action verb is greater than PO2 verb. Therefore the correlation high (3)
**PO3 Verb : Develop (L3)**
CO4 Action verb is greater than PO3 verb. Therefore the correlation high (3)
**PO4 Verb : Analyze(L4)**
CO4 Action verb is same as PO4 verb. Therefore the correlation is high (3)
**PO5 Verb : Apply(L3)**
CO4 Action verb is greater than PO5 verb. Therefore the correlation is high (3)
**PO12: Thumb rule**
To Develop application for resolve the real time problems Database and updating
Data from the DB. Therefore the correlation is medium(2)

**CO5: Apply** the functional website in Django for registering on Heroku and GitHub depository.
**Action Verb : Apply(L3)**
**PO1: Apply(L3)**
CO5 Action verb is same as PO1 verb. Therefore the correlation is high (3)
**PO2 Verb : Review(L2)**
CO5 Action verb is greater than PO2 verb. Therefore the correlation high (3)
**PO3 Verb : Develop (L3)**
CO5 Action verb same as PO3 verb. Therefore the correlation high (3)
**PO4 Verb : Analyze(L4)**
CO5 Action verb is less than PO4 verb by one level. Therefore the correlation is moderate (2)
**PO5 Verb : Apply(L3)**
CO5 Action verb is same as PO5 verb. Therefore the correlation is high (3)

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**Computer Science & Information Technology (CSIT)**

| Course Code | Year & Sem | Design Thinking & Innovation | L | T | P | C |
|---|---|---|---|---|---|---|
| 23AES0304 | II-II | | 0 | 1 | 2 | 2 |

**Course Outcomes:**

After studying the course, student will be able to

**CO1:** **Understand** the concepts and principles of design thinking process.

**CO2:** **Apply** the design thinking techniques for solving problems in various sectors.

**CO3:** **Analyze** the art of innovation & creativity in product development.

**CO4:** **Apply** the design guidelines for produced development.

**CO5:** **Analyze** the design thinking strategies for solving real time business issues.

| CO | Action Verb | Knowledge Statement | Condition | Criteria | Blooms level |
|---|---|---|---|---|---|
| **CO1** | Understand | the concepts and principles of design thinking process. | | | L1 |
| **CO2** | Apply | the design thinking techniques for solving problems in various sectors. | | | L3 |
| **CO3** | Analyze | the art of innovation & creativity in product development. | | | L4 |
| **CO4** | Apply | the design guidelines for produced development. | | | L3 |
| **CO5** | Analyze | the design thinking strategies for solving real time business issues. | | | L4 |

**Unit I:**

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.

**Unit II**

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 III**

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 IV**

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications- Innovation towards product design- Case studies

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

**Unit V**

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.

**Text Books:**


1. Tim Brown, Change by design, Harper Bollins (2009)
2. Idris Mootee, Design Thinking for Strategic Innovation, 2013, John Wiley & Sons.


**Reference Books:**


1. David Lee, Design Thinking in the Classroom, Ulysses press

2. Shrutin N Shetty, Design the Future, Norton Press
3. William Lidwell, Universal Principles of Design- Kritina holden, Jill Butter.
4. Chesbrough. H, The Era of Open Innovation – 2013

**Online Learning Resources:**

1. https://nptel.ac.in/courses/110/106/110106124/
2. https://nptel.ac.in/courses/109/104/109104109/
3. https://swayam.gov.in/nd1_noc19_mg60/preview

| Course Title | COs | Programme Outcomes (POs) & Programme Specific Outcomes (PSOs) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| Design Thinking & Innovation | CO1 | 2 | | 2 | | | | | | | | | | 2 | 2 |
| | CO2 | 2 | 2 | 2 | | | | | | | | | | 2 | 2 |
| | CO3 | 2 | 2 | 2 | | | 1 | | | | | | | 2 | 2 |
| | CO4 | 2 | 2 | 2 | | | 1 | | | | | | | 2 | 2 |
| | CO5 | 2 | 2 | 2 | | | 2 | | | | | | | 2 | 2 |

**Correlation matrix**

| CO | Percentage of contact hours over the total planned contact hours | | | CO | | Program Outcome (PO) | PO(s): Action verb and BTL (for PO1 to PO5) | Level of Correlation (0-3) |
|---|---|---|---|---|---|---|---|---|
| | Lesson Plan (Hrs) | % | correlation | Verb | BTL | | | |
| 1 | 11 | 20.3 | L3 | Understand | L2 | PO1<br>PO3 | Apply (L3)<br>Develop (L3) | 2<br>2 |
| 2 | 10 | 18.5 | L2 | Apply | L3 | PO1<br>PO2<br>PO3 | Apply (L3)<br>Identify (L3)<br>Develop (L3) | 3<br>3<br>3 |
| 3 | 11 | 20.3 | L3 | Analyze | L4 | PO1<br>PO2<br>PO3<br>PO6 | Apply (L3)<br>Identify (L3)<br>Develop (L3)<br>Thumb Rule | 3<br>3<br>3<br>1 |
| 4 | 12 | 22.2 | L3 | Apply | L3 | PO1<br>PO2<br>PO3<br>PO6 | Apply (L3)<br>Identify (L3)<br>Develop (L3)<br>Thumb Rule | 3<br>3<br>3<br>1 |
| 5 | 10 | 18.5 | L2 | Analyze | L4 | PO1<br>PO2<br>PO3<br>PO6 | Apply (L3)<br>Identify (L3)<br>Develop (L3)<br>Thumb Rule | 3<br>3<br>3<br>2 |
| Total | 54 | 100 | | | | | | |

**Justification Statements:**

**CO1: Understand** the concepts and principles of design thinking process.
Action Verb: Understand (L2)
PO1Verb: **Apply (L3)**
CO1 Action verb is lower than PO1 verb. Therefore, the correlation is medium (2)
PO3 Verb: **Develop (L3)**
CO1 Action verb is lower than PO3 verb. Therefore, the correlation is medium (2)
**CO2: Apply** the design thinking techniques for solving problems in various sectors.
PO1 Verb: **Apply (L3)**
CO2 Action verb is same level as PO1 verb. Therefore, the correlation is high (3)
PO2 Verb: **Identify (L3)**
CO2 Action verb is same level as PO2 verb. Therefore, the correlation is high (3)
PO3 Verb: **Develop (L3)**
CO2 Action verb is same level as PO3 verb. Therefore, the correlation is high (3)
**CO3: Analyze** the art of innovation & creativity in product development.
Action Verb: **Analyze** (L4)
PO1 Verb: **Apply (L3)**
CO3 Action verb is same level (greater) as PO1 verb. Therefore, the correlation is high (3)
PO2 Verb: **Identify (L3)**
CO3 Action verb is same level (greater) as PO2 verb. Therefore, the correlation is high (3)
PO3 Verb: **Develop (L3)**

CO3 Action verb is same level (greater) as PO3 verb. Therefore, the correlation is high (3)
PO6 Verb: Thumb Rule
As per thumb rule CO3 co-relates slightly with PO6 verb. Therefore, the correlation is high (3)
**CO4: Apply** the design guidelines for produced development.

**Action Verb: Apply (L3)**
PO1 Verb: **Apply (L3)**
CO4 Action verb is same level as PO1 verb. Therefore, the correlation is high (3)
PO2 Verb: **Identify (L3)**
CO4 Action verb is same level as PO2 verb. Therefore, the correlation is high (3)
PO3 Verb: **Develop (L3)**
CO4 Action verb is same level as PO3 verb. Therefore, the correlation is high (3)
PO6 Verb: Thumb Rule
As per thumb rule CO4 co-relates slightly with PO6 verb. Therefore, the correlation is high (3)
**CO5: Analyze** the design thinking strategies for solving real time business issues.
**Action Verb:** Analyze (L4)
PO1 Verb: **Apply (L3)**
CO5 Action verb is same level (greater) as PO1 verb. Therefore, the correlation is high (3)
PO2 Verb: **Identify (L3)**
CO5 Action verb is same level (greater) as PO2 verb. Therefore, the correlation is high (3)
PO3 Verb: **Develop (L3)**
CO5 Action verb is same level (greater) as PO3 verb. Therefore, the correlation is low (1)
PO6 Verb: Thumb Rule
As per thumb rule CO5 co-relates moderately with PO6 verb. Therefore, the correlation is high (3)

**COMMUNITY SERVICE PROJECT**

**……Experiential learning through community engagement**

**Introduction**

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development.
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will benefit with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and emerge as a socially responsible institution.

**Objective**

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

**Implementation of Community Service Project**

- Every student should put in 6 weeks for the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.
- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, housewives, etc
- A logbook must be maintained by each of the students, where the activities undertaken/involved to be recorded.
- The logbook has to be countersigned by the concerned mentor/faculty in charge.
- An evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.
- The Community Service Project should be different from the regular programs of NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project reports should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training.

**Procedure**

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one –
    - First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
    - Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –
        - Agriculture
        - Health
        - Marketing and Cooperation
        - Animal Husbandry
        - Horticulture
        - Fisheries
        - Sericulture
        - Revenue and Survey
        - Natural Disaster Management
        - Irrigation
        - Law & Order
        - Excise and Prohibition
        - Mines and Geology
        - Energy
        - Internet
        - Free Electricity
        - Drinking Water

## EXPECTED OUTCOMES
## BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

**Learning Outcomes**

- Positive impact on students' academic learning
- Improves students' ability to apply what they have learned in "the real world"
- Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development.
- Improved ability to understand complexity and ambiguity

**Personal Outcomes**

- Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
- Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills.

**Social Outcomes**

- Reduced stereotypes and greater inter-cultural understanding
- Improved social responsibility and citizenship skills
- Greater involvement in community service after graduation

**Career Development**

- Connections with professionals and community members for learning and career opportunities
- Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity.

**Relationship with the Institution**

- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates

**BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS**

- Satisfaction with the quality of student learning
- New avenues for research and publication via new relationships between faculty and community
- Providing networking opportunities with engaged faculty in other disciplines or institutions
- A stronger commitment to one's research.

**BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES**

- Improved institutional commitment.
- Improved student retention
- Enhanced community relations

**BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY**

- Satisfaction with student participation
- Valuable human resources needed to achieve community goals.
- New energy, enthusiasm and perspectives applied to community work.
- Enhanced community-university relations.

**SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT**

The following the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions, and modifications. Colleges are expected to focus on specific local issues for this kind of project. The students are expected to carry out these projects with involvement, commitment, responsibility, and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of project. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting should be ensured.

**For Engineering Students**

1. Water facilities and drinking water availability
2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programmes
5. Horticulture
6. Herbal plants
7. Botanical survey
8. Zoological survey
9. Marine products
10. Aqua culture
11. Inland fisheries
12. Animals and species
13. Nutrition
14. Traditional health care methods
15. Food habits
16. Air pollution
17. Water pollution
18. Plantation
19. Soil protection
20. Renewable energy
21. Plant diseases
22. Yoga awareness and practice
23. Health care awareness programmes and their impact
24. Use of chemicals on fruits and vegetables
25. Organic farming

26. Crop rotation
27. Floury culture
28. Access to safe drinking water
29. Geographical survey
30. Geological survey
31. Sericulture
32. Study of species
33. Food adulteration
34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood levels
37. Internet Usage in Villages
38. Android Phone usage by different people
39. Utilisation of free electricity to farmers and related issues
40. Gender ration in schooling lvel- observation.

**Complimenting the community service project the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programs**

Programs for School Children

1. Reading Skill Program (Reading Competition)
2. Preparation of Study Materials for the next class.
3. Personality / Leadership Development
4. Career Guidance for X class students
5. Screening Documentary and other educational films
6. Awareness Program on Good Touch and Bad Touch (Sexual abuse)
7. Awareness Program on Socially relevant themes.

Programs for Women Empowerment

1. Government Guidelines and Policy Guidelines
2. Women's Rights
3. Domestic Violence
4. Prevention and Control of Cancer
5. Promotion of Social Entrepreneurship

General Camps

1. General Medical camps
2. Eye Camps
3. Dental Camps
4. Importance of protected drinking water
5. ODF awareness camp
6. Swatch Bharath
7. AIDS awareness camp
8. Anti Plastic Awareness
9. Programs on Environment
10. Health and Hygiene
11. Hand wash programmes
12. Commemoration and Celebration of important days

Programs for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco
4. Awareness on Competitive Examinations
5. Personality Development

Common Programs

1. Awareness on RTI
2. Health intervention programmes
3. Yoga
4. Tree plantation
5. Programs in consonance with the Govt. Departments like –
    i. Agriculture

ii. Health
iii. Marketing and Cooperation
iv. Animal Husbandry
v. Horticulture
vi. Fisheries
vii. Sericulture
viii. Revenue and Survey
ix. Natural Disaster Management
x. Irrigation
xi. Law & Order
xii. Excise and Prohibition
xiii. Mines and Geology
xiv. Energy

**Role of Students:**

- Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.
- For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
- As and when required the College faculty themselves act as Resource Persons.
- Students can work in close association with Non-Governmental Organizations like
- Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.
- And also, with the Governmental Departments. If the program is rolled out, the District Administration could be roped in for the successful deployment of the program.
- An in-house training and induction program could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

**Timeline for the Community Service Project Activity**
**Duration: 8 weeks**

1. **Preliminary Survey (One Week)**
   - A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.
   - A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.
   - The Governmental agencies, like revenue administration, corporation and municipal authorities and village secreteriats could be aligned for the survey.

2. **Community Awareness Campaigns (One Week)**
   - Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmesto be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.

3. **Community Immersion Programme (Three Weeks)**

**Along with the Community Awareness Programmes**, the student batch can also work with any one of the below-listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to experiential learning about the community and its dynamics. Programs could be in consonance with the Govt. Departments.

4. **Community Exit Report (One Week)**

- During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks' works to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University.Throughout the Community Service Project, a daily logbook need to be maintained by the students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.