

**Scheme**

**(w.e.f. 2022-2023)**

**4 Year B.Tech Program**

**of**

**CSE (Artificial Intelligence and Machine Learning)**

****

**Department of CYBER SECURITY, DATASCIENCE & AIML**

**Bapatla Engineering College :: Bapatla**

**(Autonomous under Acharya Nagarjuna University)**

**(Sponsored by Bapatla Education Society)**

**BAPATLA - 522102 Guntur District, A.P.**

**www.becbapatla.ac.in**

**List of Abbreviations**

**CIE**: Continuous Internal Evaluation

**SEE**: Semester End Examination

**L**: Lecture

**T**: Tutorial

**P**: Practical

**Course Structure Summary**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Category** | **Credits** | **% of Credits** |
| 1 | Humanities & Social Science including Management Courses | 10.5 | 6.5 |
| 2 | Basic Science Courses | 18 | 11.5 |
| 3 | Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc. | 22.5 | 14.0 |
| 4 | Professional Core Courses | 49.5 | 24.5 |
| 5 | Professional Elective Courses | 12 | 7.5 |
| 6 | Job Oriented/Open Elective Courses | 18 | 11.5 |
| 7 | Project work, seminar, and internship in industry or elsewhere | 16.5 | 16.5 |
| 8 | Skill Oriented Courses | 13 | 8.0 |
| 9 | Mandatory Courses  [Environmental Science, PEHV, Indian Constitution, Essence of Indian Traditional Knowledge etc] | - | - |
| **Total** | | **160** | **100** |

**Semester Wise Credits Summary**

|  |  |  |
| --- | --- | --- |
| **Semester** | **Credits** | **With Honor Credits** |
| Semester-I | 19.5 | 19.5 |
| Semester-II | 19.5 | 19.5 |
| Semester-III | 21.5 | 21.5 |
| Semester-IV | 21.5 | 25.5 |
| Semester-V | 21.5 | 25.5 |
| Semester-VI | 21.5 | 25.5 |
| Semester-VII | 23 | 27 |
| Semester-VIII | 12 | 16 |
| **Total** | **160** | **180** |

***CSE(Artificial Intelligence and Machine Learning)***

**First Year B.Tech (SEMESTER – I) w.e.f AY: 2022-23(R20)**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Category** | **Course Title** | **Scheme of Instruction**  **(Hours per week)** | | | | **Scheme of Examination**  **(Maximum marks)** | | | **No. of Credits** |
| **L** | **T** | **P** | **Total** | **CIE** | **SEE** | **Total** |
| 22CM101/MA01 | BS | Linear Algebra and Ordinary Differential Equations | 2 | 1 | 0 | 3 | 30 | 70 | 100 | 3 |
| 22CM102/PH03 | BS | Semiconductor Physics and Nano Materials | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 22CM103/EE01 | ES | Basic Electrical & Electronics Engineering | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 22CM104/EL01 | HS | Communicative English | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 22CM105/CS03 | ES | Introduction to Problem Solving | 2 | 0 | 2 | 4 | 30 | 70 | 100 | 3 |
| 22CML101/PHL02 | BS | Semiconductor Physics Lab | 0 | 0 | 3 | 3 | 30 | 70 | 100 | 1.5 |
| 22CML102/EEL01 | ES | Basic Electrical & Electronics Engineering Lab | 0 | 0 | 3 | 3 | 30 | 70 | 100 | 1.5 |
| 22CML103/ELL01 | HS | English Communication Skills Lab | 0 | 0 | 3 | 3 | 30 | 70 | 100 | 1.5 |
| **TOTAL** | | | **13** | **1** | **09** | **23** | **240** | **490** | **730** | **19.5** |
| INDUCTION PROGRAM | First Three Weeks  (Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Familiarization to Dept./Branch & Innovations) | | | | | | | | | |

1 Hr. Lecture (L) per week - 1 credit  
1 Hr. Tutorial (T) per week - 1 credit  
1 Hr. Practical (P) per week - 0.5 credits  
2 Hours Practical (Lab)/week - 1 credit

**SCHEME OF INSTRUCTION & EXAMINATION (Semester System)**

**For**

***CSE(Artificial Intelligence and Machine Learning)***

**First Year B.Tech(SEMESTER – II)**

**w.e.f AY:2022-23(R20)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Category** | | **Course Title** | | **Scheme of Instruction**  **(Hours per week)** | | | | | | | | **Scheme of Examination**  **(Maximum marks)** | | | | | | **No. of Credits** |
| **L** | | **T** | | **P** | | **Total** | | **CIE** | | **SEE** | | **Total** | |
| 22CM201/MA02 | BS | | Numerical Methods & Advanced Calculus | | 2 | | 1 | | 0 | | 3 | | 30 | | 70 | | 100 | | 3 |
| 22CM202/CY01 | BS | | Engineering Chemistry | | 3 | | 0 | | 0 | | 3 | | 30 | | 70 | | 100 | | 3 |
| 22CM203/CS01 | ES | | Programming for Problem Solving | | 2 | | 1 | | 0 | | 3 | | 30 | | 70 | | 100 | | 3 |
| 22CM204/CC01 | ES | | Digital Logic Design | | 3 | | 0 | | 0 | | 3 | | 30 | | 70 | | 100 | | 3 |
| 22CM205/CC02 | ES | | Discrete Mathematics | | 3 | | 0 | | 0 | | 3 | | 30 | | 70 | | 100 | | 3 |
| 22CML201/CYL01 | BS | | Chemistry Lab | | 0 | | 0 | | 3 | | 3 | | 30 | | 70 | | 100 | | 1.5 |
| 22CML202/CSL01 | ES | | Programming for Problem Solving Lab | | 0 | | 0 | | 3 | | 3 | | 30 | | 70 | | 100 | | 1.5 |
| 22CML203/ CSL03 | ES | | Computer Fundamentals Lab | | 0 | | 0 | | 3 | | 3 | | 30 | | 70 | | 100 | | 1.5 |
| 22CM206/MC01 | MC | | Environmental Studies | | 2 | | 0 | | 0 | | 2 | | 30 | | 0 | | 30 | | 0 |
| NSS |  | NSS | | 0 | | 0 | | 3 | | 3 | |  | |  | |  | | 0 | |
| **TOTAL** | | | | | **15** | | **2** | | **12** | | **29** | | **270** | | **630** | | **900** | | **19.5** |
|  | | | | | | | | | | | | | | | | | | | | |
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**SCHEME OF INSTRUCTION & EXAMINATION (Semester System)**

**For**

***CSE(Artificial Intelligence and Machine Learning)***

**II B.Tech (SEMESTER – III)**

**w.e.f AY:2023-24(R20)**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Category** | **Course Title** | **Scheme of Instruction**  **(Hours per week)** | | | | **Scheme of Examination**  **(Maximum marks)** | | | **No. of Credits** |
| **L** | **T** | **P** | **Total** | **CIE** | **SEE** | **Total** |
| 22CM301/MA03 | BS | Probability & Statistics | 2 | 1 | 0 | 3 | 30 | 70 | 100 | 3 |
| 22CM302/CC03 | PC | Data Structures | 2 | 1 | 0 | 3 | 30 | 70 | 100 | 3 |
| 22CM303/ CC04 | PC | Object Oriented Programming | 2 | 1 | 0 | 3 | 30 | 70 | 100 | 3 |
| 22CM304/ CC05 | PC | Operating Systems | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 22CM305/ CC06 | PC | Computer Organization | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 22CML301/SOC1 | SO | Basics of Python(Skill Oriented Course I) | 2 | 0 | 3 | 5 | 30 | 70 | 100 | 3 |
| 22CML302 | BS | Probability & Statistics Lab | 0 | 0 | 3 | 3 | 30 | 70 | 100 | 2 |
| 22CML303/ CC07 | PC | Data Structures Lab | 0 | 0 | 3 | 3 | 30 | 70 | 100 | 1.5 |
| 22CML304/ CC08 | PC | Object Oriented Programming Lab | 0 | 0 | 3 | 3 | 30 | 70 | 100 | 1.5 |
| 22CM306/MC02 | MC | Professional Ethics & Human Values | 2 | 0 | 0 | 2 | 30 | 0 | 30 | 0 |
| **TOTAL** | | | **16** | **3** | **9** | **28** | **270** | **560** | **830** | **21.5** |
|  | | | | | | | | | | | |
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**SCHEME OF INSTRUCTION & EXAMINATION (Semester System)**

**For**

***Artificial Intelligence and Machine Learning***

**Second Year B.Tech (SEMESTER – IV)**

**w.e.f AY:2022-23(R20)**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Category** | | **Course Title** | **Scheme of Instruction**  **(Hours per week)** | | | | **Scheme of Examination**  **(Maximum marks)** | | | **No. of Credits** |
| **L** | **T** | **P** | **Total** | **CIE** | **SEE** | **Total** |
| 22CM401/PE1A | PC | | Artificial Intelligence | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 22CM402/ CC09 | PC | | Web Technologies | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 22CM403/ CC10 | PC | | Database Management Systems | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 22CM404/ CC11 | PC | | Design and Analysis of Algorithms | 2 | 1 | 0 | 3 | 30 | 70 | 100 | 3 |
| 22CB405/EL02 | HS | | Technical English | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 22CML401/  SOC2 | SO | | Advances of Python (Skill Oriented Course II) | 1 | 0 | 2 | 3 | 30 | 70 | 100 | 3.5 |
| 22CML402/ CC13 | PC | | Artificial Intelligence Lab | 0 | 0 | 3 | 3 | 30 | 70 | 100 | 1.5 |
| 22CML403/ CC12 | PC | | Web Technologies Lab | 0 | 0 | 3 | 3 | 30 | 70 | 100 | 1.5 |
| 22CML404/ CC12 | PC | | RDBMS Lab | 0 | 0 | 3 | 3 | 30 | 70 | 100 | 1.5 |
| **TOTAL** | | | | **16** | **1** | **11** | **27** | **270** | **630** | **900** | **21.5** |
| 22CMH4/  22CMM4 | | **Honors/Minor Course** | | **3** | **1** | **0** | **4** | **30** | **70** | **100** | **4** |
| **Grand Total** | | | | **19** | **2** | **9** | **30** | **270** | **630** | **900** | **25.5** |
|  | | | | | | | | | | | | |
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**SCHEME OF INSTRUCTION & EXAMINATION (Semester System)**

**For**

***CSE (Artificial Intelligence and Machine Learning)***

**Third Year B.Tech (SEMESTER – V)**

**w.e.f AY: 2022-23(R20)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Category** | **Course Title** | | **Scheme of Instruction**  **(Hours per week)** | | | | | | | | **Scheme of Examination**  **(Maximum marks)** | | | | | | **No. of Credits** | |
| **L** | | **T** | | **P** | | **Total** | | **CIE** | | **SEE** | | **Total** | |  | |
| 22CM501/MA05 | PC | Machine Learning | | 2 | | 1 | | 0 | | 3 | | 30 | | 70 | | 100 | | 3 | |
| 22CM502 | PC | Computer Networks | | 3 | | 0 | | 0 | | 3 | | 30 | | 70 | | 100 | | 3 | |
| 22CM503 | PC | Software Engineering | | 3 | | 0 | | 0 | | 3 | | 30 | | 70 | | 100 | | 3 | |
| 22CM504/PE1 | PE | Professional Elective – I | | 3 | | 0 | | 0 | | 3 | | 30 | | 70 | | 100 | | 3 | |
| 20CM505/JO1 | JO | Job Oriented Elective – I | | 3 | | 0 | | 0 | | 3 | | 30 | | 70 | | 100 | | 3 | |
| 22CML501/SOC3 | SO | Soft Skills (Skill Oriented Course- I) | | 1 | | 0 | | 2 | | 3 | | 30 | | 70 | | 100 | | 2 | |
| 22CML502 | PC | Machine Learning Lab | | 0 | | 0 | | 3 | | 3 | | 30 | | 70 | | 100 | | 1.5 | |
| 22CML503 | JO | Job Oriented Elective-I Lab | | 0 | | 0 | | 3 | | 3 | | 30 | | 70 | | 100 | | 1.5 | |
| 22CML504  /INT01 | INT | Summer Internship | | 0 | | 0 | | 0 | | 0 | | 0 | | 100 | | 100 | | 1.5 | |
| 22CM506/MC03 | MC | Essence of Indian Traditional Knowledge | | 2 | | 0 | | 0 | | 2 | | 30 | | 0 | | 30 | | 0 | |
| **TOTAL** | | | | **17** | | **1** | | **8** | | **26** | | **270** | | **660** | | **930** | | **21.5** | |
| 22CMH5/  22CMM5 | **Honors Course** | | **3** | | **1** | | **0** | | **4** | | **30** | | **70** | | **100** | | **4** | |
| **Grand Total** | | | | **20** | | **2** | | **8** | | **30** | | **300** | | **730** | | **1030** | | **25.5** | |

* Internship to be completed after IV semester, evaluated in V semester

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **List of Professional Electives 1** | |  | **List of Job Oriented Electives 1** | |
| 1A | Automata Theory and Formal Languages |  | 1A | Enterprise Programming |
|  |  | Enterprise Programming Lab |
| 1B | DataMining & DataWarehouse |  | 1B | Middleware Technologies |
|  |  | Middleware Technologies Lab |
| 1C | Parallel Algorithms |  | 1C | Object Oriented Analysis & Design |
|  |  | Object Oriented Analysis & Design Lab |

**SCHEME OF INSTRUCTION & EXAMINATION (Semester System)**

**For**

***CSE (Artificial Intelligence and Machine Learning)***

**Third Year B.Tech (SEMESTER – VI)**

**w.e.f AY: 2022-23(R20)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Category** | **Course Title** | | **Scheme of Instruction**  **(Hours per week)** | | | | | | | | **Scheme of Examination**  **(Maximum marks)** | | | | **No. of Credits** |
| **L** | | **T** | | **P** | | **Total** | | **CIE** | | **SEE** | **Total** |  |
| 22CM601 | PC | Automata Theory & Compiler Design | | 3 | | 0 | | 0 | | 3 | | 30 | | 70 | 100 | 3 |
| 22CM602 | PC | Deep Learning | | 2 | | 1 | | 0 | | 3 | | 30 | | 70 | 100 | 3 |
| 22CM603 | PC | Natural Language Processing | | 3 | | 0 | | 0 | | 3 | | 30 | | 70 | 100 | 3 |
| 22CM604/PE | PE | Professional Elective –II | | 3 | | 0 | | 0 | | 3 | | 30 | | 70 | 100 | 3 |
| 22CM605/JO | JO | Job Oriented Elective – II | | 3 | | 0 | | 0 | | 3 | | 30 | | 70 | 100 | 3 |
| 22CML601/SOC4 | SO | DevOps (Skill Advanced Course- I) | | 1 | | 0 | | 2 | | 3 | | 30 | | 70 | 100 | 2 |
| 22CML602 | PC | Deep Learning Lab | | 0 | | 0 | | 3 | | 3 | | 30 | | 70 | 100 | 1.5 |
| 22CML603 | PC | Natural Language Processing Lab | | 0 | | 0 | | 3 | | 3 | | 30 | | 70 | 100 | 1.5 |
| 22CML604 | JO | Job Oriented Elective –II Lab | | 0 | | 0 | | 3 | | 3 | | 30 | | 70 | 100 | 1.5 |
| 22CM606/MC04 | MC | Indian Constitution | | 2 | | 0 | | 0 | | 2 | | 30 | | 0 | 30 | 0 |
| **TOTAL** | | | | **17** | | **1** | | **11** | | **29** | | **300** | | **630** | **930** | **21.5** |
| 22CMH6/20CMM6 | **Honors Course** | | **3** | | **1** | | **0** | | **4** | | **30** | | **70** | | **100** | **4** |
| **Grand Total** | | | | **20** | | **2** | | **11** | | **33** | | **330** | | **700** | **1030** | **25.5** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **List of Professional Electives 2** | |  | **List of Job Oriented Electives 2** | |
| 2A | Distributed Systems |  | 2A | Mobile Applications Development |
|  |  | Mobile Applications Development Lab |
| 2B | Blockchain Technologies |  | 2B | Indistrial IOT |
|  |  | Indistrial IOT Lab |
| 2C | Compiler Design |  | 2C | Software Testing Methodologies |
|  |  | Software Testing Methodologies Lab |

**SCHEME OF INSTRUCTION & EXAMINATION (Semester System)**

**For**

***CSE (Artificial Intelligence and Machine Learning)***

**Fourth Year B.Tech (SEMESTER – VII)**

**w.e.f AY: 2022-23(R20)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code.** | **Category** | **Course Title** | | **Scheme of Instruction**  **(Hours per week)** | | | | | | | | **Scheme of Examination**  **(Maximum marks)** | | | | | | **No. of Credits** | |
| **L** | | **T** | | **P** | | **Total** | | **CIE** | | **SEE** | | **Total** | |  | |
| 22CM701/PE | PE | Professional Elective – III | | 3 | | 0 | | 0 | | 3 | | 30 | | 70 | | 100 | | 3 | |
| 22CM702/PE | PE | Professional Elective – IV | | 3 | | 0 | | 0 | | 3 | | 30 | | 70 | | 100 | | 3 | |
| 22CM703/JO | JO | Job Oriented Elective – III | | 3 | | 0 | | 0 | | 3 | | 30 | | 70 | | 100 | | 3 | |
| 22CM704/OE | OE | Open Elective | | 3 | | 0 | | 0 | | 3 | | 30 | | 70 | | 100 | | 3 | |
| 22CM705/ME05 | HS | Industrial Management & Entrepreneurship Development | | 3 | | 0 | | 0 | | 3 | | 30 | | 70 | | 100 | | 3 | |
| 22CML701/SOC5 | SO | Virtual Reality and Augmented Reality(Skill Advanced Course-II) | | 1 | | 0 | | 2 | | 3 | | 30 | | 70 | | 100 | | 2 | |
| 22CML702 | PC | Job Oriented Elective – III Lab | | 0 | | 0 | | 3 | | 3 | | 30 | | 70 | | 100 | | 1.5 | |
| 22CML703 | JO | Job Oriented Elective – IV Lab | | 0 | | 0 | | 3 | | 3 | | 30 | | 70 | | 100 | | 1.5 | |
| 22CML703/  INT02 | INT | Industrial/ Research Internship | | 0 | | 0 | | 0 | | 0 | | 0 | | 100 | | 100 | | 3 | |
| **TOTAL** | | | | **14** | | **0** | | **6** | | **20** | | **180** | | **520** | | **700** | | **23** | |
| 22CSH7/  22CSM7 | **Honors Course** | | **3** | | **1** | | **0** | | **4** | | **30** | | **70** | | **100** | | **4** | |
| **Grand Total** | | | | **17** | | **1** | | **6** | | **24** | | **210** | | **590** | | **800** | | **27** | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **List of Professional Electives 3** | |  | **List of Job Oriented Electives 3** | |
| 3A | Wireless Networks |  | 3A | Full Stack Development |
|  |  | Full Stack Development Lab |
| 3B | Robotic Process Automation |  | 3B | Network Programming |
|  |  | Network Programming Lab |
| 3C | Social Network Analysis |  | 3C | Bigdata Analytics |
|  |  | Bigdata Analytics Lab |
| **List of Professional Electives 4** | |  |  |  |
| **4A** | Artificial Neural Networks and Deep Learning |  |  |  |
| **4B** | Natural Language Processing |  |  |  |
| **4C** | Protocols for Secure Electronic Commerce |  |  |  |

* Internship to be completed after VI semester, evaluated in VII semester

**List of Subjects offered under Open Elective:-**

|  |  |  |
| --- | --- | --- |
| **Open Electives** | | |
| **Department** | **Code** | **Subject** |
| AIML | CM1 | Artificial Intelligence |
| CM2 | Introduction to Machine Learning |
| CIVIL | CE1 | Air Pollution and Control |
| CE2 | Remote Sensing and GIS |
| CB | CB1 | Digital Forensics |
| CB2 | Introduction to Information Security and Cyber Laws |
| CSE | CS1 | Database Management Systems |
| CS2 | Java Programming |
| DS | DS1 | Data Warehousing and Data Mining |
| DS2 | Social Network Analysis |
| ECE | EC1 | Digital Image Processing |
| EC2 | Embedded System & Design |
| EEE | EE1 | Non Conventional Energy Sources |
| EE2 | Electrical Energy Conservation and Auditing |
| EE3 | Industrial Electrical Systems |
| EIE | EI1 | Sensors and Signal Conditioning |
| IT | IT1 | Cyber Security |
| IT2 | Web Technologies |
| MECH | ME1 | Automobile Engineering |
| ME2 | Renewable energy sources |
| ME3 | Project Management |
| ME4 | Entrepreneurship Development |
| CHEMISTRY | CY1 | Chemistry in Space technology |
| CY2 | Artificial Intelligence in Sustainable Chemistry |
| CY3 | Material Chemistry in daily life |
| ENGLISH | EL1 | Professional Communication |
| MATHS | MA1 | Graph Theory |
| MA2 | Linear Algebra |
| PHYSICS | PH1 | Nanomaterials and Technology |
| PH2 | Optoelectronic devices and applications |
| PH3 | Fiber optics communication |
| NCC | NCC | National Cadet Corps |

**SCHEME OF INSTRUCTION & EXAMINATION (Semester System)**

**For**

***CSE (Artificial Intelligence and Machine Learning)***

**Fourth Year B.Tech (SEMESTER – VIII)**

**w.e.f AY: 2022-23(R20)**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Category** | | **Course Title** | **Scheme of Instruction**  **(Hours per week)** | | | | **Scheme of Examination**  **(Maximum marks)** | | | **No. of Credits** |
| **L** | **T** | **P** | **Total** | **CIE** | **SEE** | **Total** |
| 22CM801/PW01 | PW | | Project Work & Internship | 0 | 0 | 24 | 24 | 30 | 70 | 100 | 12 |
| 22CMHM1/  22CMMM1 | | **Honors Courses (MOOCs - 1)** | | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **2** |
| 22CMHM2/  22CMMM2 | | **Honors Courses (MOOCs - 2)** | | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **2** |
| **Grand Total** | | | | **0** | **0** | **0** | **0** | **30** | **70** | **100** | **16** |
|  | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **List of Subjects offered under Honors :**   |  |  | | --- | --- | | **Code** | **List of HONOR Courses** | | A | Advanced Data Structures. | | B | Advanced Computer Architecture. | | C | Numerical Optimization | | D | Advanced Database Systems | | E | Parallel Algorithms | | F | Embedded Systems | | G | Design Patterns. | | H | Storage Area Networks | | I | Computational Complexity | | J | Competitive Programming | | K | Spatial Informatics | | L | Perception & Computer Vision |   **List of Minors course:**   |  |  | | --- | --- | | **List of MINOR Courses** | | | A | Computer System Architecture | | B | Operating Systems | | C | Data Structures using C | | D | Statistics with R | | E | Database Management Systems | | F | Software Engineering | |  | Web Application Programming | | H | Computer Networks | | I | Cloud Computing | | J | Machine Learning | | K | Data Structures and Algorithms | | L | Artificial Intelligence | | N | Computer Networks and Internet Protocol | | O | Foundations of Cryptography | | P | Discrete Mathematics | | Q | Programming in Java | | | | | | | | | | | | | |

**BS**: Basic Sciences

**HS**: Humanities and Social Sciences

**ES**: Engineering Sciences

**MC**: Mandatory Course

**PC**: Professional Core

**NCC**: National Cadet Corps

**NSS**: National Service Scheme

**SO**: Skill Oriented Elective

**PE**: Professional Elective

**JO**: Job Oriented Elective

**INT**: Internship

**OE:** Open Elective

**PW:** Project Work

**MOOC:** Massive Open Online Course

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **List of Professional Electives** | | |  | **List of Job Oriented Electives** | |
| 1A | | Automata Theory and Formal Languages |  | 1A | Enterprise Programming |
|  |  | Enterprise Programming Lab |
| 1B | | DataMining & DataWarehouse |  | 1B | Middleware Technologies |
|  |  | Middleware Technologies Lab |
| 1C | | Parallel Algorithms |  | 1C | Object Oriented Analysis & Design |
|  |  | Object Oriented Analysis & Design Lab |
| 2A | | Distributed Systems |  | 2A | Mobile Applications Development |
|  |  | Mobile Applications Development Lab |
| 2B | | Blockchain Technologies |  | 2B | Indistrial IOT |
|  |  | Indistrial IOT Lab |
| 2C | | Compiler Design |  | 2C | Software Testing Methodologies |
|  |  | Software Testing Methodologies Lab |
| 3A | | Wireless Networks |  | 3A | Full Stack Development |
|  |  | Full Stack Development Lab |
| 3B | | Robotic Process Automation |  | 3B | Network Programming |
|  |  | Network Programming Lab |
| 3C | | Social Network Analysis |  | 3C | Bigdata Analytics |
|  |  | Bigdata Analytics Lab |
| 4A | Artificial Neural Networks and Deep Learning | |
| 4B | Natural Language Processing | |
| 4C | Protocols for Secure Electronic Commerce | |

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**Syllabus**

**(w.e.f. 2022-2023)**

**4 Year B.Tech Program**

**of**

**Artificial Intelligence and Machine Learning**

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**Department of CB, DS & AIML**

**Bapatla Engineering College :: Bapatla**

**(Autonomous under Acharya Nagarjuna University)**

**(Sponsored by Bapatla Education Society)**

**BAPATLA - 522102 Guntur District, A.P.**

[**www.becbapatla.ac.in**](http://www.becbapatla.ac.in)

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| **LINEAR ALGEBRA AND ORDINATRY DIFFERENTIAL EQUATIONS**  **I B. Tech. I Semester 22CM101/MA01** | | | | | | | | | | | |
| Lectures | | | : | 2 Hours/Week | Tutorial | : | 1 Hour/Week | Practical | | : | 0 |
| CIE Marks | | | : | 30 | SEE Marks | : | 70 | Credits | | : | 3 |
|  | | | | | | | | | | | |
| **Pre-Requisite**: None | | | | | | | | | | | |
|  | | | | | | | | | | | |
| **Course Objectives:** Students will learn how to | | | | | | | | | | | |
|  | Solve a system of linear homogeneous and non-homogeneous equations, finding the inverse of a given square matrix and also its Eigen values and Eigen vectors | | | | | | | | | | |
|  | Identify the type of a given differential equation and select and apply the appropriate  analytical technique for finding the solution of first order ordinary differential equations. | | | | | | | | | | |
|  | Create and analyze mathematical models using higher order differential equations to solve application problems that arise in engineering. | | | | | | | | | | |
|  | Solve a linear differential equation with constant coefficients with the given initial conditions using Laplace Transforms. | | | | | | | | | | |
|  | | | | | | | | | | | |
| **Course Outcomes**: After studying this course, the students will be able to | | | | | | | | | | | |
| CO-1 | Find the eigen values and eigen vectors of a given matrix and its inverse. | | | | | | | | | | |
| CO-2 | Apply the appropriate analytical technique to find the solution of a first order ordinary differential equation. | | | | | | | | | | |
| CO-3 | Solve higher order linear differential equations with constant coefficients arise in engineering applications. | | | | | | | | | | |
| CO-4 | Apply Laplace transforms to solve differential equations arising in engineering | | | | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | | | | |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | **PO’s** | | | | | | | | | | | | **PSO’s** | | | | **CO** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | | | **CO-1** | 3 | 3 | 2 | - | - | - | - | - | - | - | - | 2 | - | 3 | - | | | **CO-2** | 3 | 3 | 3 | - | - | - | - | - | - | - | - | 2 | - | 2 | - | | | **CO-3** | 3 | 3 | 3 | - | - | - | - | - | - | - | - | 2 | - | 2 | - | | | **CO-4** | 3 | 3 | 3 | - | - | - | - | - | - | - | - | 2 | - | 2 | - | | | | | | | | | | | | | |
|  | | | | | | | | | | | |
| **UNIT-1** | | | | | | | | | (12 Hours) | | |
| **Linear Algebra**: Rank of a Matrix; Elementary transformations of a matrix; Gauss-Jordan method of finding the inverse; Consistency of linear System of equations: Rouches theorem, System of linear Non-homogeneous equations, System of linear homogeneous equations; vectors; Eigen values; properties of Eigen values(without proofs); Cayley-Hamilton theorem (without proof).  [Sections: 2.7.1; 2.7.2; 2.7.6; 2.10.1; 2.10.2; 2.10.3; 2.12.1; 2.13.1; 2.14; 2.15.] | | | | | | | | | | | |
| **UNIT-2** | | | | | | | | | (12 Hours) | | |
| **Differential Equations of first order**: Definitions; Formation of a Differential equation; Solution of a Differential equation; Equations of the first order and first degree; variables separable; Linear Equations; Bernoulli’s equation; Exact Differential equations; Equations reducible to Exact equations: I.F found by inspection, I.F of a Homogeneous equation, In the equation M dx+ N dy = 0, is a function of x and is a function of y.  Applications of a first order Differential equations: Newton’s law of cooling; Rate of decay of Radio-active materials.  [Sections: 11.1; 11.3; 11.4; 11.5; 11.6; 11.9; 11.10; 11.11; 11.12.1; 11.12.2; 11.12.4; 12.6; 12.8] | | | | | | | | | | | |
| **UNIT-3** | | | | | | | | | (12 Hours) | | |
| **Linear Differential Equations**: Definitions; Theorem; Operator D; Rules for finding the complementary function; Inverse operator; Rules for finding the Particular Integral; Working procedure to solve the equation; Method of Variation of Parameters; Applications of Linear Differential Equations: Oscillatory Electrical Circuits.  [Sections: 13.1; 13.2.1; 13.3; 13.4; 13.5; 13.6; 13.7;13.8.1;14.1;14.5]. | | | | | | | | | | | |
| **UNIT-4** | | | | | | | | | (12 Hours) | | |
| **Laplace Transforms:** Definition; conditions for the existence; Transforms of elementary functions; properties of Laplace Transforms; Transforms of derivatives; Transforms of integrals; Multiplication by tn; Division by t; Inverse transforms- Method of partial fractions; Other methods of finding inverse transforms; Convolution theorem(without proof); Application to differential equations: Solution of ODE with constant coefficients using Laplace transforms.  [Sections:21.2.1; 21.2.2; 21.3; 21.4; 21.7; 21.8; 21.9; 21.10; 21.12; 21.13; 21.14; 21.15.1] | | | | | | | | | | | |
| **Text Books :** | | B.S.Grewal, “Higher Engineering Mathematics”, 44thedition, Khanna publishers, 2017. | | | | | | | | | |
|  | |  | | | | | | | | | |
| **References :** | | [1] Erwin Kreyszig, “Advanced Engineering Mathematics”, 9th edition, John Wiley & Sons.  [2] N.P.Bali and M.Goyal, “A Text book of Engineering Mathematics” Laxmi Publications, 2010. | | | | | | | | | |

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| **SEMICONDUCTOR PHYSICS AND NANO MATERIALS**  I B. Tech. - I semester (Code: 22CM102/PH03) | | | | | | | | |
| Lectures | | : | | 3 Hours/Week | Continuous Assessment | | : | 30 |
| Final Exam | | : | | 3 Hours | Final Exam Marks | | : | 70 |
|  | | | | | | | | |
| **Pre-Requisite**: None | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | |
|  | This unit aim to build the foundation and inspires interest of freshmen into electrical and electronics and to focus on fundamental concepts and basic principles regarding electrical conduction. | | | | | | | |
|  | This unit provides various properties of semiconductor materials and their importance in various device fabrications | | | | | | | |
|  | This unit aim to educate the student on various opto-electronic devices and their applications. | | | | | | | |
|  | This unit provide information about the principles of processing, manufacturing and characterization of nano materials, nanostructures and their applications | | | | | | | |
|  | | | | | | | | |
| **Course Outcomes**: Students will be able to | | | | | | | | |
| CO1 | Acknowledge the important aspects of earth magnetic field, concept of hole and effective mass of electron in semiconductors. | | | | | | | |
| CO2 | Maxwells equations in various magnetic applications | | | | | | | |
| CO3 | Use the fundamentals of optics, one can estimate physical parameters. | | | | | | | |
| CO4 | Realization of material properties and parameters. | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | **POs** | | | | | | | | | | | | **PSOs** | | | | **CO** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | | **CO1** | 2 | 2 | - | 1 | - | - | - | - | - | - | - | - | - | - | - | | **CO2** | 3 | 1 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - | | **CO3** | 3 | 2 | 2 | - | 2 | - | - | - | - | - | - | - | - | - | - | | **CO4** | 3 | 2 | 2 | - | 2 | - | - | - | - | - | - | - | - | - | - | | | | | | | | | |
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| **UNIT-1** | | | | | | (12 Hours) | | |
| **ELECTRONIC MATERIALS:**  Somerfield free electron theory, Fermi level and energy, density of states, Failure of free electron theory (Qualitative), Energy bands in solids, E-K diagrams, Direct and Indirect band gaps. Types of Electronic materials: Metals, Semi conductors and Insulators, Occupation Probability, effective mass, Concept of hole | | | | | | | | |
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| **UNIT-2** | | | | | | (12 Hours) | | |
| **SEMICONDUCTORS:**  Introduction to semiconductors, intrinsic and extrinsic semiconductors, carrier concentrations, Fermi level and temperature dependence, Continuity equation, Diffusion and drift, P-N junction (V-I characteristics), Metal – Semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for opto- electronic devices. | | | | | | | | |
| **UNIT-3** | | | | | | (12 Hours) | | |
| **OPTO-ELECTRONIC DEVICES AND DISPLAY DEVICES:**  Photo voltaic effect, principle and working of LED, Applications of Photo diode, Solar cell, PIN & APD Diode, Liquid crystal display, Opto electric effect: Faraday Effect and Kerr effect. | | | | | | | | |
| **UNIT-4** | | | | | | (12 Hours) | | |
| **NANO-MATERIALS:**  Introduction to nano technology, quantum confinement, surface to volume ratio, properties of nano materials, synthesis of nano-materials: CVD, sol-gel methods, laser ablation.  Carbon nano tubes: types, properties, applications. Characterization of nano materials: XRD, SEM, applications of nano materials. | | | | | | | | |
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| **Text Books:** | | | 1. A text book of engineering physics by Avadhanulu and KshirsagarS.Chand& Co. (2013) 2. Applied physics by Dr.P.SrinivasaRao. Dr.K.Muralidhar | | | | | |
|  | | |  | | | | | |
| **References:** | | | 1. Introduction to solid state state physics, Charles Kittel, 8th edition 2. Solid state physics, S.O. Pillai 3. Text book on Nanoscience and Nanotechnology (2013): B.S. Murty, P. Shankar, Baldev Raj, B.B. Rath and J. Murday, Springer Science & Business Media. 4. Basic Engineering Physics ,Dr.P.SrinivasaRao. Dr.K.Muralidhar. Himalaya Publications, 2016 | | | | | |

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| **BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**  I B. Tech. – I Semester (Code: 22CM103/EE01) | | | | | | | | |
| Lectures | | : | | 3 Hours/Week | Continuous Assessment | | : | 30 |
| Final Exam | | : | | 3 Hours | Final Exam Marks | | : | 70 |
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| **Pre-Requisite**: None. | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | |
|  | To understand basic Laws in circuits, analysis of simple DC circuits, Theorems and  its applications, fundamentals of AC circuits & its analysis and concepts of three  phase balanced circuits | | | | | | | |
|  | To learn basic properties of magnetic materials and its applications. | | | | | | | |
|  | To understand working principle, construction, applications and performance of DC machines, AC machines. | | | | | | | |
|  | To learn basic concepts, working principal, characteristics and applications of semiconductor diode and transistor family. | | | | | | | |
|  | To gain knowledge about the static converters and regulators. | | | | | | | |
|  | To learn basic concepts of power transistors and operational amplifiers closer to practical applications. | | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | | |
| CO1 | Solve problems involving with DC and AC excitation sources in electrical circuits. | | | | | | | |
| CO2 | Compare properties of magnetic materials and its applications | | | | | | | |
| CO3 | Analyze construction, principle of operation, application and performance of DC machines and AC machines. | | | | | | | |
| CO4 | Explore characteristics and applications of semiconductor diode and transistion  family. | | | | | | | |
| CO5 | Make the static converters and regulators | | | | | | | |
| CO6 | Analyze concepts of power transistors and operational amplifiers closer to practical applications | | | | | | | |
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| **UNIT-1** | | | | | | (13 Hours) | | |
| **Electrical Circuits**  Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation.Superposition, Thevenin and Norton Theorems. Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase AC circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections. | | | | | | | | |
|  | | | | | | | | |
| **UNIT-2** | | | | | | (11 Hours) | | |
| **Electrical Machines**  Magnetic materials, BH characteristics, Construction, working of DC machines, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency.Auto-transformer and three-phase transformer connections.Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor.Single-phase induction motor.Construction and working of synchronous generators. | | | | | | | | |
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| **UNIT-3** | | | | | | (12 Hours) | | |
| **Semiconductor Diodes and applications**  Semiconductor materials, semiconductor diode, Resistance levels, Diode equivalent circuits, Zener diode, Light emitting diode, Load line analysis, half wave rectification, Full wave rectification, Bridge rectifier, Use of capacitor filter in rectifier, Zener diode voltage regulator, Clippers, Clampers  **Bipolar Junction Transistors**  Transistor construction and operation, Common base configuration, Transistor amplifying action, Common emitter configuration, Common collector configuration, Limits of operation. DC load line and bias point, Voltage divider bias of transistor. | | | | | | | | |
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| **UNIT-4** | | | | | | (12 Hours) | | |
| **Field Effect Transistors**  Construction and characteristics of JFET and MOSFET  **Operational Amplifiers**  Introduction, Differential and common mode operation, OP-AMP Basics, Practical OP-AMP circuits: Inverting amplifier, Non inverting amplifier, Unity follower, summing amplifier, Integrator and differentiator | | | | | | | | |
|  | | | | | | | | |
| **Text Books:** | | | 1. S.K. Bhattacharya, “Basic Electrical and Electronics Engineering”, Pearson Publications 2. Robert L. Boylestad& Louis Nashelsky, ‘ Electronic Devices and circuit theory’, PHI Pvt.Limited, 11th edition | | | | | |
|  | | |  | | | | | |
| **References:** | | | 1. “Basics of Electrical and Electronics Engineering”, Nagsarkar T K and Sukhija M S, Oxford press University Press. 2. David A. Bell, ‘Electronic Devices and Circuits’, oxford publisher,5th edition 3. “Basic Electrical, Electronics and Computer Engineering”, Muthusubramanian R, Salivahanan S and Muraleedharan K A, Tata McGraw Hill, Second Edition, (2006). | | | | | |

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| **COMMUNICATIVE ENGLISH**  I B. Tech. – I Semester (Code: 22CM104/EL01) | | | | | | | | | |
| Lectures | | | : | 3 Hours/Week | Continuous Assessment | : | | | 30 |
| Final Exam | | | : | 3 Hours | Final Exam Marks | : | | | 70 |
|  | | | | | | | | | |
| **Pre-Requisite**: None. | | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | | |
|  | To comprehend the importance, barriers and strategies of listening skills in English. | | | | | | | | |
|  | To illustrate and impart practice Phonemic symbols, stress and intonation. | | | | | | | | |
|  | To practice oral skills and receive feedback on learners’ performance. | | | | | | | | |
|  | To practice language in various contexts through pair work, role plays, group work and dialogue conversations | | | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | | | |
| CO1 | Understand how to build academic vocabulary to enrich their writing skills | | | | | | | | |
| CO2 | Produce accurate grammatical sentences | | | | | | | | |
| CO3 | Analyse the content of the text in writing | | | | | | | | |
| CO4 | Produce coherent and unified paragraphs with adequate support and detail | | | | | | | | |
| CO5 | Understand how to build academic vocabulary to enrich their writing skills | | | | | | | | |
|  | | | | | | | | | |
| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | | |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | **POs** | | | | | | | | | | | | **PSOs** | | | | **CO** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | | **CO1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **2** | **3** | **2** | **-** | **-** | **2** | 1 | | **CO2** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **2** | **3** | **2** | **-** | **-** | **2** | 1 | | **CO3** | **-** | - | **-** | **-** | **-** | **-** | **-** | **-** | **2** | **3** | **2** | **-** | **-** | **2** | **1** | | **CO4** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **2** | **3** | **2** | **-** | **-** | **2** | 1 | | | | | | | | | | |
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| **UNIT-1** | | | | | | | (12 Hours) | | |
| 1.**1 Vocabulary Development:** Word formation-Formation of Nouns, Verbs & Adjectives from Root words-Suffixes and Prefixes  1.2 **Essential Grammar:** Prepositions, Conjunctions, Articles  1.3 **Basic Writing Skills:** Punctuation in writing  1.4 **Writing Practices:** Mind Mapping, Paragraph writing (structure-Descriptive, Narrative, Expository & Persuasive) | | | | | | | | | |
|  | | | | | | | | | |
| **UNIT-2** | | | | | | | (12 Hours) | | |
| 2.**1 Vocabulary Development:** Synonyms and Antonyms  2.2 **Essential Grammar:** Concord, Modal Verbs, Common Errors  2.3 **Basic Writing Skills**: Using Phrases and clauses  2.4 **Writing Practices**: Hint Development, Essay Writing | | | | | | | | | |
|  | | | | | | | | | |
| **UNIT-3** | | | | | | | | (12 Hours) | |
| 3.1 **Vocabulary Development:** One word Substitutes  3.2 **Essential Grammar:**Tenses, Voices  3.**3 Basic Writing Skills:** Sentence structures (Simple, Complex, Compound)  3.4 **Writing Practices:** Note Making | | | | | | | | | |
|  | | | | | | | | | |
| **UNIT-4** | | | | | | | | (12 Hours) | |
| 4.1 **Vocabulary Development**: Words often confused  4.2 **Essential Grammar**: Reported speech, Common Errors  4.3 **Basic Writing Skills**: Coherence in Writing: Jumbled Sentences  **Writing Practices**: Paraphrasing &Summarizing | | | | | | | | | |
|  | | | | | | | | | |
| **Text Books:** | | 1. Communication Skills, Sanjay Kumar &PushpaLatha. Oxford University Press:2011. 2. Practical English Usage, Michael Swan. Oxford University Press:1995. | | | | | | | |
| **References:** | | * + - 1. Remedial English Grammar, F.T.Wood. Macmillan:2007.       2. Study Writing, Liz Hamplyons & Ben Heasley. Cambridge University Press:2006 | | | | | | | |

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| **Introduction to Problem Solving**  I B.Tech – I Semester (Code: 22CM105/CS03) | | | | | | | |
| Lectures | : | 2T + 2P / Week | Continuous Assessment | | | : | 30 |
| Final Exam | : | 3 Hours | Final Exam Marks | | | : | 70 |
|  | | | | | | | |
| **Pre-Requisite**: None | | | | | | | |
| **UNIT-1** | | | | (13 Hours) | | | |
| **Introduction to components of a computer system**: Memory, processor, I/O Devices, storage.  **Software**: system software, application software, computer classifications, generation of computer.  **Procedure**: steps involved in problem solving, Algorithm, Steps involved in algorithm development. Flow Chart, Advantages of Flowcharts, Symbols used in Flow Charts, Simple problems using flow chart, pseudo code method. | | | | | | | |
| **UNIT-2** | | | | | (11 Hours) | | |
| **Fundamental algorithms**: exchange the values of two variables, counting, summation of a set of numbers, factorial computation, sine function computation, generation of the Fibonacci sequence, reverse the digits of an integer, base conversion, charter to number conversion. | | | | | | | |
| **UNIT-3** | | | | | (12 Hours) | | |
| **Factoring methods**: finding the square root of a number, the smallest divisor of an integer, the greatest common divisor of two integers, generate prime numbers, computing the prime factors of an integer, generation of pseudo-random numbers, raising a number to a large power. | | | | | | | |
| **UNIT-4** | | | | | (12 Hours) | | |
| **Array Techniques**: array order reversals, remove of duplicates from an order array, finding the Kth smallest element, finding the kth largest element and higher dimensional arrays.  **Efficiency of algorithm**: redundant computation, referencing array elements, inefficiency duo to late termination, early detection of desired output conditions, trading storage for efficiency gain.  **Analysis of algorithms**: computational complexity, order notation, best, worst and average case behavior. | | | | | | | |
| **Text Books :** | How to Solve it by Computer, R.G. Dromey, First Edition, 2006, Pearson. | | | | | | |

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| **SEMICONDUCTOR PHYSICS LAB**  I B.Tech – I Semester (Code: 22CML101/PHL02) | | | | | | | |
| Labs | | : | | 3 Hours/Week | Continuous Assessment | : | 30 |
| Final Exam | | : | | 3 hours | Final Exam Marks | : | 70 |
|  | | | | | | | |
| **Pre-Requisite**: None. | | | | | | | |
|  | | | | | | | |
| **Course Objectives:** Students will be able to | | | | | | | |
|  | This unit aim to build the foundation and inspires interest of freshmen into electrical and electronics and to focus on fundamental concepts and basic principles regarding electrical conduction. | | | | | | |
|  | This unit provides various properties of semiconductor materials and their importance in various device fabrications | | | | | | |
|  | This unit aim to educate the student on various opto-electronic devices and their applications. | | | | | | |
|  | This unit provide information about the principles of processing, manufacturing and characterization of nano materials, nano structures and their applications | | | | | | |
|  | | | | | | | |
| **Course Outcomes**: Students will be able to | | | | | | | |
| CO1 | Acknowledge the important aspects of earth magnetic field, realize the use of Maxwells equations in various magnetic applications | | | | | | |
| CO2 | Applications of basic principles of optics to estimate physical parameters. | | | | | | |
| CO3 | Realization of material properties and parameters. | | | | | | |
| CO4 | Get hands on experience in various opto-electronic devices like Solar Cell, Photo Cell and their applications. | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | |
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| **LIST OF EXPERIMENTS**   1. Determination of acceleration due to gravity at a place using compound pendulum. 2. Study the variation of intensity of magnetic field along the axis of a circular coil usingStewart-Gee’s apparatus. 3. Determination of thickness of thin wire using air wedge interference bands 4. Determination of radius of curvature of a Plano convex lens by forming Newton’s rings.. 5. Determination of wavelengths of mercury spectrum using grating normal incidencemethod. 6. Determination of dispersive power of a given material of prism using prism minimumdeviation method. 7. Draw the resonant characteristic curves of L.C.R. series circuit and calculate the resonantfrequency. 8. Draw the characteristic curves of a photocell and calculate the maximum velocity of electron. 9. Verify the laws of transverse vibration of stretched string using sonometer. 10. Determine the rigidity modulus of the given material of the wire using Torsionalpendulum. 11. Draw the load characteristic curves of a solar cell. 12. Determination of Hall coefficient of a semiconductor. 13. Determination of voltage and frequency of an A.C. signal using C.R.O. 14. Determination of Forbidden energy gap of Si &Ge. 15. Determination of wavelength of laser source using Diode laser.   **Any three experiments are virtual** | | | | | | | |
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| **Text Books:** | | | * + - 1. Engineering physics laboratorymanualP.Srinivasarao & K.Muraldhar, Himalaya publications. | | | | |

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| **BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB**  I B.Tech – I Semester (Code: 22CML102/EEL01) | | | | | | |
| Labs | | : | 3 Hours/Week | Continuous Assessment | : | 30 |
| Final Exam | | : | 3 Hours | Final Exam Marks | : | 70 |
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| **Pre-Requisite**: None. | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | |
|  | To understand basic Laws in circuits, analysis of simple DC circuits, Theorems and its applications, fundamentals of AC circuits & its analysis and concepts of three phase balanced circuits | | | | | |
|  | To learn basic properties of magnetic materials and its applications. | | | | | |
|  | To understand working principle, construction, applications and performance of DC machines, AC machines. | | | | | |
|  | To learn basic concepts, working principal, characteristics and applications of semiconductor diode and transistor family. | | | | | |
|  | To gain knowledge about the static converters and regulators. | | | | | |
|  | To learn basic concepts of power transistors and operational amplifiers closer to practical applications. | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | |
| CO1 | Solve Problems involving with DC and AC excitation sources in electrical circuits | | | | | |
| CO2 | Compare properties of magnetic materials and its applications | | | | | |
| CO3 | Analyze construction, principle of operation, application and performance of DC machines and AC machines | | | | | |
| CO4 | Explore characteristics and applications of semi conductor diode and transistor family | | | | | |
| CO5 | Make the static converts and regulators | | | | | |
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| **LIST OF EXPERIMENTS**   1. Verification of KCL and KVL 2. Verification of Superposition theorem 3. Verification of Thevenin’s theorem 4. Verification of Norton’s theorem 5. Parameters of choke coil 6. Measurement of low and medium resistance using volt ampere method 7. OC & SC test of single phase transformer 8. Load test on single phase transformer 9. V-I characteristics of PN junction Diode 10. V-I characteristics of Zener Diode 11. Characteristics of CE Configuration 12. Transfer and Drain Characteristics of JFET 13. Calculation of Ripple factor using Half wave rectifier 14. Calculation of Ripple factor using Full wave rectifier 15. Non linear wave shaping – clippers/clampers   Note: Minimum 10 experiments should be carried out. | | | | | | |

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| **ENGLISH COMMUNICATION SKILLS LAB**  I B. Tech. – I Semester (Code: 22CML103/ELL01) | | | | | | | |
| Labs | | : | | 3 Hours/Week | Continuous Assessment | : | 30 |
| Final Exam | | : | | 3 Hours | Final Exam Marks | : | 70 |
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| **Pre-Requisite**: None. | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | |
|  | To comprehend the importance, barriers and strategies of listening skills in English. | | | | | | |
|  | To illustrate and impart practice Phonemic symbols, stress and intonation. | | | | | | |
|  | To practice oral skills and receive feedback on learners’ performance. | | | | | | |
|  | To practice language in various contexts through pair work, role plays, group work and dialogue conversations | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | |
| CO1 | Learn to research and critically analyze issues to write critically and coherently; | | | | | | |
| CO2 | Communicate pleasantly in kinds of Interpersonal Interactions; | | | | | | |
| CO3 | Understand dynamics of Telephone Conversations through practice; and | | | | | | |
| CO4 | Become familiar with the Pronunciation rules and application | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | |
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| 1.1 Listening Skills; Importance – Purpose- Process- Types  1.2 Barriers to Listening  1.3 Strategies for Effective Listening   * 1. Phonetics; Introduction to Consonant, Vowel and Diphthong sounds   2. Stress   3. Rhythm   4. Intonation   3.1Formal and Informal Situations  3.2 Expressions used in different situations  3.3 Introducing Yourself & Others-Greeting & Parting-Congratulating-Giving Suggestions  & Advices-Expressing Opinions-Inviting People-Requesting-Seeking Permission-Giving  Information- Giving Directions- Sympathizing- Convincing People- Complaining &  Apologizing-Thanking Others- Shopping- Travelling- Conversational Gambits  4.1 JAM Session  4.2 Debates  4.3 Extempore | | | | | | | |
| **Text Books:** | | | 1. Communication Skills, Sanjay Kumar and Pushpa Lata. Oxford University Press. 2011 2. Better English Pronunciation, J.D. O’ Connor. Cambridge University Press:1984 | | | | |
| **References:** | | | New Interchange (4rth Edition), Jack C Richards. Cambridge University Press:2015  English Conversation Practice, Grant Taylor. McGraw Hill:2001 | | | | |
| **Software:** | | | 1. Buzzers for conversations, New Interchange series 2. English in Mind series, Telephoning in English 3. Speech Solutions, A Course in Listening and Speaking | | | | |

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| **NUMERICAL METHODS AND ADVANCED CALCULUS**  **I B. Tech. II Semester 22CM201/MA02** | | | | | | | | | | | |
| Lectures | | | : | 2 Hours/Week | Tutorial | : | 1 Hour/Week | Practical | | : | 0 |
| CIE Marks | | | : | 30 | SEE Marks | : | 70 | Credits | | : | 3 |
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| **Pre-Requisite**: None | | | | | | | | | | | |
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| **Course Objectives:** Students will learn how to | | | | | | | | | | | |
|  | Solve algebraic, transcendental and system of linear equations with the help of numerical methods. | | | | | | | | | | |
|  | Apply the techniques of numerical integration whenever and wherever routine methods are not applicable and solve the first order ordinary differential equations numerically with the given initial condition using different methods. | | | | | | | | | | |
|  | Evaluate double and triple integrals and apply them to find areas and volumes. | | | | | | | | | | |
|  | Evaluate the line, surface and volume integrals and learn their inter-relations and applications. | | | | | | | | | | |
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| **Course Outcomes**: After studying this course, the students will be able to | | | | | | | | | | | |
| CO-1 | Solve non-linear equations and system of linear equations with the help of Numerical techniques. | | | | | | | | | | |
| CO-2 | Solve the first order ordinary differential equations numerically with the given initial condition. | | | | | | | | | | |
| CO-3 | Find the area and volume of plane and three dimensional figures using multiple integrals. | | | | | | | | | | |
| CO-4 | Apply vector integral theorems to obtain the solutions of engineering problems involving circulation, flux, and divergence in vector fields. | | | | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | | | | |
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| **UNIT-1** | | | | | | | | | (12 Hours) | | |
| **Numerical Solution of Equations**: Introduction; Solution of algebraic and transcendental equations: Bisection method, Method of false position, Newton-Raphson method; Useful deductions from the Newton-Raphson formula; Solution of linear simultaneous equations; Direct methods of solution: Gauss elimination method, Gauss-Jordan method, Factorization method; Iterative methods of solution: Jacobi’s iterative method, Gauss-Seidel iterative method.  [Sections:28.1; 28.2; 28.3; 28.5; 28.6; 28.7.1;28.7.2]. | | | | | | | | | | | |
| **UNIT-2** | | | | | | | | | (12 Hours) | | |
| **Finite differences and Interpolation**: Finite differences: Forward differences, Backward differences; Newton’s interpolation formulae: Newton’s forward interpolation formula, Newton’s backward interpolation formula; Interpolation with unequal intervals; Lagrange’s interpolation formula; Divided differences; Newton’s divided difference formula; Numerical integration; Trapezoidal rule; Simpson’s one-third rule; Simpson’s three-eighth rule; Numerical solution of ODE’s: Introduction; Picard’s method; Euler’s method; Runge-Kutta method.  [Sections:29.1; 29.1-1; 29.1.2; 29.6; 29.9; 29.10; 29.11; 29.12; 30.4; 30.6; 30.7; 30.8; 32.1; 32.2; 32.4; 32.7]. | | | | | | | | | | | |
| **UNIT-3** | | | | | | | | | (12 Hours) | | |
| **Multiple Integrals**: Double integrals; Change of order of integration; Double integrals in polar coordinates; Area enclosed by plane curves; Triple integrals; Volumes of solids: Volume as Triple integral, Change of variables.  [Sections: 7.1; 7.2; 7.3; 7.4; 7.5; 7.6.2; 7.7.2]. | | | | | | | | | | | |
| **UNIT-4** | | | | | | | | | (12 Hours) | | |
| **Vector calculus and its Applications:** Scalar and vector point functions; Del applied to scalar point functions-Gradient: Definition, Directional derivative; Del applied to vector point functions: Divergence, Curl; Line integral; Surfaces: Surface integral, Flux across a surface; Green’s theorem in the plane (without proof); Stokes theorem (without proof); Gauss divergence theorem(without proof).  [Sections: 8.4; 8.5; 8.5.1; 8.5.3; 8.6; 8.11.1; 8.12.2; 8.12.3; 8.13; 8.14; 8.16] | | | | | | | | | | | |
| **Text Books :** | | B.S.Grewal, “Higher Engineering Mathematics”, 44thedition, Khanna publishers, 2017. | | | | | | | | | |
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| **References :** | | [1] Erwin Kreyszig, “Advanced Engineering Mathematics”, 9th edition, John Wiley & Sons.  [2] N.P.Bali and M.Goyal, “A Text book of Engineering Mathematics” Laxmi Publications, 2010. | | | | | | | | | |

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| **ENGINEERING CHEMISTRY**  I B. Tech. – II Semester (Code: 22CM202/CY01) | | | | | | | |
| Lectures | : | | 3 Hours/Week | Continuous Assessment | | : | 30 |
| Final Exam | : | | 3 Hours | Final Exam Marks | | : | 70 |
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| **Pre-Requisite**:  None. | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | |
|  | With the principles of water characterization and treatment of water for industrial purposes and methods of producing water for potable purposes. | | | | | | |
|  | To understand the thermodynamic concepts, energy changes, concept of corrosion & its control. | | | | | | |
|  | With the conventional energy sources, solid, liquid and gaseous Fuels & knowledge of knocking and anti-knocking characteristics | | | | | | |
|  | With aim to gain good knowledge of organic reactions, plastics, conducting polymers & biodegradable polymers. | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | |
| CO1 | Develop innovative methods to produce soft water for industrial use and potable water at cheaper cost. | | | | | | |
| CO2 | Apply their knowledge in converting various energies of different systems and protection of different metals from corrosion. | | | | | | |
| CO3 | Have the capacity of applying energy sources efficiently and economically for various needs. | | | | | | |
| CO4 | Design economically and new methods of organic synthesis and substitute metals with conducting polymers and also produce cheaper biodegradable polymers to reduce environmental pollution. | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | |
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| **UNIT-1** | | | | | (12 Hours) | | |
| **Introduction:** water quality parameters  **Characteristics**: Alkalinity, Hardness **-** Estimation & simple numerical problems,  **Boiler Troubles** - Sludges, Scales, Caustic embrittlement, boiler corrosion, Priming and foaming;  **Internal conditioning**- phosphate, calgon and carbonate methods.  **External conditioning** - Ion exchange process & Zeolite process WHO Guidelines, Potable water, Sedimentation, Coagulation, Filtration.  **Disinfection methods:** Chlorination, ozonization and UV treatment.  **Salinity** – Treatment of Brackish water by Reverse Osmosis and Electrodialysis. | | | | | | | |
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| **UNIT-2** | | | | | (12 Hours) | | |
| **Thermodynamic functions**: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications.  **Corrosion:** Types of corrosion - Chemical or dry corrosion, Electrochemical or wet corrosion; Galvanic, stress, pitting  and differential aeration corrosion; Factors effecting corrosion, **Corrosion control** – Cathodic protection, and   electro plating (Au) & electrodes Ni plating. | | | | | | | |
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| **UNIT-3** | | | | | (12 Hours) | | |
| **Fuels:** Classification of fuels; Calorific value of fuels (lower, higher)  **Solid fuels**: Determination of calorific value (Bomb Calorimeter) & related problems, Coal ranking.  **Liquid Fuels:** Petroleum refining and fractions, composition and uses. Knocking and anti- knocking Agents, Octane number and Cetane number; Bio fuels- Biodiesel, general methods of preparation and advantages  **Gaseous fuels:** CNG and LPG,  **Flue gas analysis –** Orsat apparatus. | | | | | | | |
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| **UNIT-4** | | | | | (12 Hours) | | |
| **Organic reactions and synthesis of a drug molecule**  Introduction to reactions involving substitution (SN1, SN2), addition (Markownikoff’s and anti-Markwnikoff’s rules) , elimination (E1& E2), Synthesis of a commonly used drug molecule.(Aspirin and Paracetamol)  **Polymers:** Conducting polymers: Classification, Intrinsic and Extrinsic conducting polymers and their applications**.** Plastics: Thermoplasts and thermosetting plastics, Bskelite and PVC.  Bio degradable polymers: types, examples-Polyhydroxybuterate (PHB), Polyhydroxybuterate-co-β-hydroxyvalerate (PHBV), applications. | | | | | | | |
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| **Text Books:** | | 1. P.C. Jain and Monica Jain, “Engineering Chemistry” DhanpatRai Pub, Co., New Delhi 17th edition (2017). 2. SeshiChawla, “Engineering Chemistry” DhanpatRai Pub, Co LTD, New Delhi  13 th edition, 2013. | | | | | |
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| **References:** | | 1. Essential of Physical Chemistry by ArunBahl, B.S. Bahl, G.D.Tuli, by ArunBahl, B.S. Bahl, G.D.Tuli, Published by S Chand Publishers, 12th Edition, 2012. 2. Engineering Chemistry by C.P. Murthy, C.V. Agarwal, A. Naidu B.S. Publications, Hyderabad (2006). 3. Engineering Chemistry by K. Maheswaramma, Pearson publishers 2015. | | | | | |

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| **PROBLEM SOLVING USING PROGRAMMING**  I B.Tech – II Semester (Code: 22CM203/CS01) | | | | | | | | | | | |
| Lectures | | : | 3 Hours/Week, 1 Hour Tutorial | | Continuous Assessment | | | | : | 30 | |
| Final Exam | | : | 3 Hours | | Final Exam Marks | | | | : | 70 | |
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| **Pre-Requisite**: | | | | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | | | | |
|  | Understand basic concepts of C Programming such as: C-tokens, Operators, Input/output, Arithmetic rules. | | | | | | | | | | |
|  | Develop problem-solving skills to translate “English‟ described problems into Programs written using C language. | | | | | | | | | | |
|  | Use Conditional Branching, Looping, and Functions. | | | | | | | | | | |
|  | Apply pointers for parameter passing, referencing and differencing and linking data structures. | | | | | | | | | | |
|  | Manipulate variables and types to change the problem state, including numeric, character, array and pointer types, as well as the use of structures and unions, File. | | | | | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | | | | | |
| CO1 | Choose and Analyze the right data representation formats and algorithms to solve the problem. | | | | | | | | | | |
| CO2 | Use the comparisons and limitations of the various programming constructs and choose the right one for the task in hand. | | | | | | | | | | |
| CO3 | Write the program on a computer, edit, compile, debug, correct, recompile and run it. | | | | | | | | | | |
| CO4 | Identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task. | | | | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | | | | |
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| **UNIT-1** | | | | | | (12 Hours) | | | | | |
| Overview of C, Constants, Variables and Data Types, Operators and Expressions, Managing I/O Operations. Decision Making and Branching.  **Programming Exercises for Unit I:** C-expressions for algebraic expressions, evaluation of arithmetic and Boolean expressions. Syntactic and logical errors in a given program, output of a given program, values of variables at the end of execution of a program fragment, Programs using Scientific and Engineering formulae. Finding the largest of the three given numbers. Computation of discount amount on different types of products with different discount percentages. Finding the class of an input character, finding the type of triangle formed with the given sides, computation of income-tax, finding given year is leap year or not, and conversion of lower case character to its uppercase. | | | | | | | | | | | |
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| **UNIT-2** | | | | | | | (12 Hours) | | | | |
| Decision Making and Looping, Arrays, Character Arrays and Strings.  **Programming Exercises for UnitII:** To print the sum of the digits of a given number and to display the image of a given number. To find whether a given number is prime, printing Fibonacci sequence and to find prime factors of a given number. To print graphic patterns of symbols and numbers. To find the length of a string, compare strings, reverse a string, copy a string and to find whether the given string is palindrome or not with and without using String Handling Functions. Transpose of a matrix and sorting of names using arrays. | | | | | | | | | | | |
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| **UNIT-3** | | | | | | | (12 Hours) | | | | |
| User-defined Functions, Structures and Unions, Pointers  **Programming Exercises for Unit -III:** Functions-Recursive functions to find factorial & GCD (Greatest Common Divisor), string operations using pointers and pointer arithmetic. Swapping two variable values. Sorting a list of student records on register number using array of pointers. | | | | | | | | | | | |
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| **UNIT-4** | | | | | | | | (12 Hours) | | |
| File Management in C, Dynamic Memory Allocation, Preprocessor  **Programming Exercises for Unit - IV**: Operations on complex numbers, and to read an input file of marks and generate a result file, sorting a list of names using command line arguments. Copy the contents of one file to another file. Allocating memory to variables dynamically. | | | | | | | | | | | |
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| **Text Books:** | | | | 1. “Programming in ANSIC” by E. Balaguruswamy, Fifth Edition, McGraw   Hill Education India.   1. “Let us C” by Yashavant P.Kanetkar, 14th Edition, BPB Publications. | | | | | | | | |
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| **References:** | | | | 1. Kernighan BW and Dennis Ritchie M, “C programming language”, 2nd edition, Prentice Hall. 2. HerbertSchildt,“C:TheCompleteReference”,4thedition,TataMcgraw-Hill. 3. AshokN.Kamthane,“ProgramminginC”,PEARSON2ndEdition. 4. ReemaThareja, “Programming in C”, Oxford University Press, 2nd Edition, 2015 | | | | | | | | |

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| **DIGITAL LOGIC DESIGN**  I B.Tech – II Semester (Code: 22CM204/CC01) | | | | | | | | |
| Lectures | | : | | 3 Hours /Week | Continuous Assessment | | : | 30 |
| Final Exam | | : | | 3 Hours | Final Exam Marks | | : | 70 |
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| **Pre-Requisite**: Basic Computer Knowledge. | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | |
|  | Understand of the fundamental concepts and techniques used in digital electronics, and Number conversions. | | | | | | | |
|  | Understand basic arithmetic operations in different number systems and simplification of Boolean functions using Boolean algebra and K-Maps. | | | | | | | |
|  | Simplify the Boolean functions using Tabulation method, Concepts of combinational logic circuits. | | | | | | | |
|  | Understand the concepts of Flip-Flops, Analysis of sequential circuits | | | | | | | |
|  | Understand the concepts of Registers, Counters and classification of Memory units. | | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | | |
| CO1 | Understand basic arithmetic operations in different number systems and simplification of Boolean functions using Boolean algebra and K-Maps. | | | | | | | |
| CO2 | Simplify Boolean functions using Tabulation method, Concepts of combinational logic circuits. | | | | | | | |
| CO3 | Understand the concepts of Flip-Flops, Analysis of sequential circuits. | | | | | | | |
| CO4 | Understand the concepts of Registers, Counters and classification of Memory units. | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | **POs** | | | | | | | | | | | | **PSOs** | | | | **CO** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | | **CO1** | 3 | 3 | - | 3 | 2 | - | - | - | - | - | - | - | - | 2 | 1 | | **CO2** | 2 | 2 | - | 2 | 2 | - | - | - | - | - | - | - | 2 | 2 | 2 | | **CO3** | 1 | 3 | 2 | - | - | - | 2 | - | - | - | - | - | 2 | - | 2 | | **CO4** | 1 | 2 | 1 | - | - | - | 2 | - | - | - | - | - | 1 | - | 2 | | | | | | | | | |
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| **UNIT-1** | | | | | | (12 Hours) | | |
| **DIGITAL SYSTEMS AND BINARY NUMBERS:** Digital System, Binary Numbers, Number base Conversions, Octal and Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Binary Codes, Binary Storage and Registers, Binary Logic, Error Detection and Correction: 7 bit Hamming Code.  **BOOLEAN ALGEBRA & LOGIC GATES**: Introduction, Basic definitions, Axiomatic definition of Boolean algebra, Basic theorems and properties of Boolean algebra, Boolean functions, Canonical and Standard Forms, Other Logic Operations, Digital logic gates.  **GATE –LEVEL MINIMIZATION**: Introduction, The map method, Four-variable K-Map, Product-of-Sums Simplification, Don’t –Care Conditions, NAND and NOR implementation, Other Two level Implementations. | | | | | | | | |
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| **UNIT-2** | | | | | | (12 Hours) | | |
| **MINIMIZATION:** The Tabulation method, Determination of prime implicants, Selection of prime-implicants.  **COMBINATIONAL LOGIC:** Introduction, Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adders - Subtractor, Decimal Adder, Magnitude Comparator, Decoders, Encoders, Multiplexers. | | | | | | | | |
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| **UNIT-3** | | | | | | (12 Hours) | | |
| **SYNCHRONOUS SEQUENTIAL LOGIC:** Introduction, Sequential Circuits, Storage Elements - Latches, Storage Elements -Flip Flops, Analysis of Clocked Sequential Circuits: State Equations, State Table, State Diagram, Flip Flop Input Equations, Analysis with D, JK and T Flip Flops; State reduction and Assignment, Design Procedure. | | | | | | | | |
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| **UNIT-4** | | | | | | (12 Hours) | | |
| **REGISTERS and COUNTERS**: Registers, Shift registers, Ripple Counters, Synchronous Counters.  **MEMORY and PROGRAMMABLE LOGIC:** Introduction, Random Access Memory: Read and Write Operations, Types of Memories; Read Only Memory, Programmable Logic Devices: PROM, PLA, PAL. | | | | | | | | |
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| **Text Books:** | | | 1. M. Morris Mano, Michael D. Ciletti, “Digital Design”, 5thEdition,PrenticeHall, 2013. 2. A. Anand Kumar, “fundamentals of digital circuits”, 4th Edition, PHI. | | | | | |
|  | | |  | | | | | |
| **References:** | | | * + - 1. John F. Wakerly, “Digital Design: Principles and Practices”, 4th Edition, Pearson, 2006.       2. Brian Holdsworth , Clive Woods, “Digital Logic Design”, 4th Edition, Elsevier Publisher, 2002.       3. Donald E Givone, “digital principles and design”, TMT. | | | | | |

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| **DISCRETE MATHEMATICS**  **I B.Tech – II Semester(Code: 22CM205)** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lectures | | | : | | 2 Hours/Week | | | | Tutorial | | | | : | 1 Hour/Week | | | | Practical | | | | : | | 0 | |
| CIE Marks | | | : | | 30 | | | | SEE Marks | | | | : | 70 | | | | Credits | | | | : | | 3 | |
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| **Pre-Requisite**: None | | | | | | | | | | | | | | | | | | | | | | | | | |
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| **Course Objectives:** Students will learn how to | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | | Understand operations on discrete structures such as sets, functions, and relations. Formulate short proofs using methods of proof of an implication. Verify the correctness of an argument using propositional logic and truth tables. Construct mathematical  arguments using logical connectives and quantifiers. | | | | | | | | | | | | | | | | | | | | | | | |
|  | | Verify the correctness of an argument using rules of inference for quantified propositions. Apply algorithms and use definitions to solve problems to prove statements in elementary number theory. Understand counting and indirect counting techniques and  combinatory in the context of discrete probability. | | | | | | | | | | | | | | | | | | | | | | | |
|  | | Understand sequences, generating functions, and recurrence relations. Understand and  compute coefficients for generating functions. Understand and solve homogeneous recurrence relations. | | | | | | | | | | | | | | | | | | | | | | | |
|  | | Understand and solve Inhomogeneous recurrence relations. Understand the properties of  binary relations, partial orderings and lattices. Construct graphs and adjacency matrices for binary relations. | | | | | | | | | | | | | | | | | | | | | | | |
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| **Course Outcomes**: After studying this course, the students will be able to | | | | | | | | | | | | | | | | | | | | | | | | | |
| CO-1 | | Understand the basic principles of sets, relations, functions and inference rules for  validating arguments. | | | | | | | | | | | | | | | | | | | | | | | |
| CO-2 | | Prove that the given statement is valid by using mathematical induction and utilize a  variety of counting strategies to solve computational problems. | | | | | | | | | | | | | | | | | | | | | | | |
| CO-3 | | Discuss different methods for solving different types of recurrence relations. | | | | | | | | | | | | | | | | | | | | | | | |
| CO-4 | | Understand various operations and representations of a binary relation. | | | | | | | | | | | | | | | | | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | | | | | | | | | | | | | | | | | | |
|  |  | | | **PO’s** | | | | | | | | | | | | | | | **PSO’s** | | | | | |  |
| **CO** | | | **1** | | **2** | **3** | **4** | **5** | **6** | **7** | **8** | | **9** | **10** | **11** | **12** | | **1** | **2** | | | **3** | |
| **CO-1** | | | 3 | | 3 | - | - | - | - | - | - | | - | - | - | - | | - | 3 | | | - | |
| **CO-2** | | | 3 | | 3 | - | - | - | - | - | - | | - | - | - | - | | - | 3 | | | - | |
| **CO-3** | | | 3 | | 3 | - | - | - | - | - | - | | - | - | - | - | | - | 3 | | | - | |
| **CO-4** | | | 3 | | 3 | - | - | - | - | - | - | | - | - | - | - | | - | 3 | | | - | |
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| **UNIT-1** | | | | | | | | | | | | | | | | | | | | | (12 Hours) | | | | |

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| **Foundations:** Sets, Relations and Functions, Fundamentals of Logic, Logical Inferences, Methods of Proof of an implication, First order Logic & Other methods of proof. |

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| **UNIT-2** | | (12 Hours) |
| Rules of Inference for Quantified propositions, Mathematical Induction.  **Elementary Combinatorics:** Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with repetitions, Enumerating Permutation with Constrained repetitions.. | | |
| **UNIT-3** | | (12 Hours) |
| **Recurrence relations:** Generating functions of sequences, Calculating Coefficients of Generating Functions  **Recurrence Relations:** Solving recurrence relations by Substitution and generating functions, The methods of characteristic roots. | | |
| **UNIT-4** | | (12 Hours) |
| **Recurrence Relations:** solutions of Inhomogeneous recurrence relations.  **Relations:** Special properties of binary relations, Operations on relation. Ordering relations, Lattice, Paths and Closures, Directed Graphs and Adjacency Matrices. | | |
| **Text Books :** | Toe L.Mott, Abraham Kandel & Theodore P.Baker, “Discrete Mathematics for Computer Scientists & Mathematicians”, PHI 2ndedition, 2012. | |
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| **References :** | 1. C.L. Liu, “Elements of Discrete Mathematics”, McGraw-Hill Education, 2nd edition 2. Rosen, “Discrete Mathematics”. ”, McGraw-Hill Education, 8th edition. | |

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| **ENGINEERING CHEMISTRY LAB**  I B.Tech – II Semester (Code: 22CML201/CYL01) | | | | | | |
| Labs | : | | 3 Hours/Week | Continuous Assessment | : | 30 |
| Final Exam | : | | 3 Hours | Final Exam Marks | : | 70 |
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| **Pre-Requisite**:  None. | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | |
|  | With the principles of water characterization and treatment of water for industrial purposes and methods of producing water for potable purposes. | | | | | |
|  | To understand the thermodynamic concepts, energy changes, concept of corrosion & its control. | | | | | |
|  | With the conventional energy sources, solid, liquid and gaseous Fuels & knowledge of knocking and anti-knocking characteristics | | | | | |
|  | With aim to gain good knowledge of organic reactions, plastics, conducting polymers & biodegradable polymers. | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | |
| CO1 | Develop innovative methods to produce soft water for industrial use and able to solve the industrial problems | | | | | |
| CO2 | the students will be familiar with applications of polymers in domestic and engineering areas & the most recent surface characterization techniques | | | | | |
| CO3 | Have the capacity of classifying fuels, their calorific value determination and applying energy sources efficiently and economically for various needs. | | | | | |
| CO4 | Explain features, classification, applications of newer class materials like smart materials, refrocteries, abbrasives, lubriants and composite materials etc. | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | **POs** | | | | | | | | | | | | **PSOs** | | | | **CO** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | | **CO1** | 2 | - | - | - | - | - | - | - | 3 | 2 | - | - | 2 | - | - | | **CO2** | 2 | 2 | 2 | 2 | - | 2 | - | - | 3 | 2 | - | 1 | - | - | - | | **CO3** | 2 | 2 | 2 | 2 | - | 2 | - | - | 3 | 2 | - | 1 | 1 | - | - | | **CO4** | 2 | 2 | 2 | 2 | - | - | - | - | 3 | 2 | - | 1 | - | - | - | | | | | | | |
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| **LIST OF EXPERIMENTS** | | | | | | |
| 1. Introduction to Chemistry Lab (the teachers are expected to teach fundamentals like Calibration of Volumetric Apparatus, Primary, Secondary Solutions, Normality, Molarity, Molality etc. and error, accuracy, precision, theory of indicators, use of volumetric titrations). 2. **Volumetric Analysis:**   a. Estimation of Washing Soda.  b. Estimation of Active Chlorine Content in Bleaching Powder  c. Estimation of Mohr’s salt by permanganometry.  b. Estimation of given salt by using Ion-exchange resin using Dowex-50.   1. **Analysis of Water**:   a. Determination of Alkalinity of Tap water.  b. Determination of Total Hardness of ground water sample by EDTA method  c. Determination of Salinity of water sample.   1. **Estimation of properties of oil:**   a. Estimation of Acid Value  b. Estimation of Saponification value.   1. **Preparations:**   a. Preparation of Soap  b. Preparation of Urea-formaldehyde resin  c. Preparation of Phenyl benzoate. | | | | | | |
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| **Text Books:** | | 1. Practical Engineering Chemistry by K.Mukkanti, Etal, B.S. Publicaitons, Hyderabad, 2009. 2. Inorganic quantitative analysis, Vogel, 5th edition, Longman group Ltd. London, 1979. | | | | |
|  | |  | | | | |
| **References:** | | 1. Text Book of engineering chemistry by R.n. Goyal and HarrmendraGoel. 2. A text book on experiments and calculations- Engineering Chemistry. S.S. Dara. 3. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications. | | | | |

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| **PROBLEM SOLVING USING PROGRAMMING LAB**  I B.Tech – II Semester (Code: 22CML202/CSL01) | | | | | | | |
| Practical | | : | 3 Hours/Week | Continuous Assessment | : | 30 | |
| Final Exam | | : | 3 Hours | Final Exam Marks | : | 70 | |
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| **Pre-Requisite**: | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | |
|  | Understand basic concepts of C Programming such as: C-tokens, Operators, Input/output, Arithmetic rules. | | | | | | |
|  | Develop problem-solving skills to translate “English‟ described problems into Programs written using C language. | | | | | | |
|  | Use Conditional Branching, Looping, and Functions. | | | | | | |
|  | Apply pointers for parameter passing, referencing and differencing and linking data structures. | | | | | | |
|  | Manipulate variables and types to change the problem state, including numeric, character, array and pointer types, as well as the use of structures and unions, File. | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | |
| CO1 | Choose and Analyze the right data representation formats and algorithms to solve the problem. | | | | | | |
| CO2 | Use the comparisons and limitations of the various programming constructs and choose the right one for the task in hand. | | | | | | |
| CO3 | Write the program on a computer, edit, compile, debug, correct, recompile and run it. | | | | | | |
| CO4 | Identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task. | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | **POs** | | | | | | | | | | | | **PSOs** | | | | **CO** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | | **CO1** | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | 3 | 2 | | **CO2** | 2 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | 2 | 1 | | **CO3** | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - | - | 2 | 2 | | **CO4** | 2 | 1 | 2 | - | - | - | - | - | - | - | - | - | - | 2 | 1 | | | | | | | | |
| **LIST OF EXPERIMENTS** | | | | | | |
| 1. A program for electricity bill taking different categories of users, different slabs in each category. (Using nested if else statement).  |  |  |  | | --- | --- | --- | | **Domestic Customer:** | | | | **Consumption Units** | **Rate of Charges(Rs.)** | | | 0 – 200 | 0.50 per unit | | | 201 – 400 | 100 plus | 0.65 per unit | | 401 – 600 | 230 plus | 0.80 per unit | | 601 and above | 390 plus | 1.00 per unit | | **Commercial Customer:** | | | | **Consumption Units** | **Rate of Charges(Rs.)** | | | 0 – 50 | 0.50 per unit | | | 100 – 200 | 50 plus | 0.60 per unit | | 201 – 300 | 100 plus | 0.70 per unit | | 301 and above | 200 plus | 1. per unit |  1. Write a C program to evaluate the following (using loops):    1. 1 + x2/2! + x4 / 4!+ …upto ten terms    2. x +x3/3! + x5/5!+ … upto 7 digit accuracy 2. Write a C program to check whether the given number is    1. Prime or not.    2. Perfect or Abundant or Deficient. 3. Write a C program to display statistical parameters (using one – dimensional array).    1. Mean    2. Mode    3. Median    4. Variance. 4. Write a C program to read a list of numbers and perform the following operations    1. Print the list.    2. Delete duplicates from the list.    3. Reverse the list. 5. Write a C program to read a list of numbers and search for a given number using Binary search algorithm and if found display its index otherwise display the message “Element not found in the List”. 6. Write a C program to read two matrices and compute their sum and product. 7. A menu driven program with options (using array of character pointers).    1. To insert a student name    2. To delete astudent name    3. To print the names of students 8. Write a C program to read list of student names and perform the following operations    1. To print the list of names.    2. To sort them in ascending order.    3. To print the list after sorting. 9. Write a C program that consists of recursive functions to    1. Find factorial of a given number    2. Solve towers of Hanoi with three towers ( A, B & C) and three disks initially on tower A. 10. A Bookshop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book the sales person inputs the title and the author, and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed, if it is, then the system displays the book details and request for the number of copies required, if the requested copies are available the total cost of the requested copies is displayed otherwise the message “required copies not in stock” is displayed. Write a program for the above in structures with suitable functions. 11. Write a C program to read a data file of students’ records with fields ( Regno, Name, M1,M2,M3,M4,M5) and write the successful students data (percentage > 40% ) to a data file. | | | | | | |

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| **Computer Fundamentals Lab**  I B.Tech – I Semester (Code: 22CML203/CSL03) | | | | | |
| Practicals | : | 3 Hours/Week | Continuous Assessment | : | 30 |
| Final Exam | : | 3 Hours | Final Exam Marks | : | 70 |
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| **Pre-Requisite**: None. | | | | | |
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| **LIST OF EXPERIMENTS**  **Experiment 1: Computer Hardware Basics:** PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers. In addition, hardware and software level troubleshooting process, tips and tricks would be covered.  Every student should 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. Every student should disassemble and assemble the PC back to working condition.  **Experiment 2: Installation of Software:** Every student should individually install operating system like Linux or MS windows on the personal computer. The system should be configured as dual boot with both windows and Linux.  **Experiment 3: Hardware Troubleshooting:** Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition.  **Experiment 4: Software Troubleshooting:** Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition.  **Experiment 5: 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 how to access the websites and email.  **Experiment 6: 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. Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. Usage of search engines like Google, Yahoo, ask.com and others should be demonstrated by student.  **Experiment 7: Cyber Hygiene:** Students should learn about viruses on the internet and install antivirus software. Student should learn to customize the browsers to block pop ups, block active x downloads to avoid viruses and/or worms.  **Experiment 8: Drawing flowcharts (Raptor Tool):** Students should draw flowcharts for the problems validating an email id entered by user, printing first fifty numbers and preparing electricity bill.  **Experiment 9: Productivity tool: Microsoft (MS) office:** Importance of MS office, Details of the three tasks and features that should be covered in each, MS word – Accessing, overview of toolbars,  saving files, Using help and resources, rulers, format painter. Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.  **Experiment 10: Practice with MS Word** to create project certificate: Features to be covered: - Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colours, Inserting Header and Footer, Using Date and Time option in Word.  **Experiment 11: Orientation on Spread sheet:** Accessing, overview of toolbars, saving spreadsheet files, Using help and resources. Creating a Scheduler: - Gridlines, Format Cells, Summation, auto fill, Formatting Text  **Experiment 12: Creating Power Point:** Student should work on basic power point utilities and tools in Ms Office which help them create basic power point presentation. PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows,  Hyperlinks, Inserting Images, Tables and Charts. | | | | | |

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| **Text Books :** | 1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education. 2. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech. 3. Computer Fundamentals, l e, Anita Goel, Person Education. |
| **References :** | 1. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education. |

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| **ENVIRONMENTAL STUDIES**  I B. Tech. – II Semester (Code: 22CM206/MC01) | | | | | | | | |
| Lectures | | : | | 2 Hours/Week | Continuous Assessment | | : | 30 |
| Final Exam | | : | | 3 Hours | Final Exam Marks | | : |  |
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| **Pre-Requisite**: None. | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | |
|  | To develop an awareness, knowledge, and appreciation for the natural environment. | | | | | | | |
|  | To understand different types of ecosystems exist in nature. | | | | | | | |
|  | To know our biodiversity. | | | | | | | |
|  | To understand different types of pollutants present in Environment. | | | | | | | |
|  | Create awareness among the youth on environmental concerns important in the long-term interest of the society | | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | | |
| CO1 | Develop an appreciation for the local and natural history of the area. | | | | | | | |
| CO2 | Hope for the better future of environment in India which is based on many positive factors like Biodiversity, successive use of renewable energy resources and other resources, increasing number of people’s movements focusing on environment. | | | | | | | |
| CO3 | Know how to manage the harmful pollutants. | | | | | | | |
| CO4 | Gain the knowledge of Environment. | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | **POs** | | | | | | | | | | | | **PSOs** | | | | **CO** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | | **CO1** | - | - | - | 1 | - | 2 | 3 | - | - | 1 | - | 2 | - | - | - | | **CO2** | - | - | - | - | 2 | 2 | 3 | - | - | 1 | - | 2 | - | - | 1 | | **CO3** | - | - | - | - | - | - | 3 | - | - | 1 | 1 | 2 | 1 | - | - | | **CO4** | - | - | - | 1 | - | 2 | 3 | - | - | 1 | - | 2 | 1 | - | - | | | | | | | | | |
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| **UNIT-1** | | | | | | (8 Hours) | | |
| **Introduction:** Definition, Scope and Importance, Need for public awareness. Ecosystems: Definition, Structure and Functions of Ecosystems, types - Forest, Grassland, Desert, Aquatic (Marine, pond and estuaries).  **Biodiversity:** Definition and levels of Biodiversity; Values of Biodiversity - Consumptive, Productive, Social, Aesthetic, Ethical and Optional; Threats and Conservation of Biodiversity; Hot Spots of Biodiversity, Bio-geographical Classification of India, India as a mega diversity nation. Chipko movement case study | | | | | | | | |
| **UNIT-2** | | | | | | (8 Hours) | | |
| **Natural resources: Land**: Land as a resource, Causes and effects of land degradation - Soil erosion, Desertification. **Forest**: Use of forests, Causes and effects of deforestation, Afforestation, Mining - benefits and problems. **Water**: Uses, floods and drought, Dams - benefits and problems.  **Energy**: Importance of energy, Environmental Impacts of Renewable and Non-renewable energy resources. Silent Valley Project and Narmada BachaoAndolan case studies  **Sustainability:** Definition, Concept and Equitable use of resources for sustainable development; Rain water harvesting and Watershed management. Fieldwork on Rain water harvesting and Watershed management. | | | | | | | | |
| **UNIT-3** | | | | | | (8 Hours) | | |
| **Pollution**: Definition; Causes, effects and control of air, water and nuclear pollution; Chernobyl Nuclear Disaster case study; Solid Waste: urban, Industrial and hazardous wastes; Integrated waste management - 3R approach, composting and vermicomposting.  **Environmental acts**: Water and air (Prevention and Control of pollution) acts, Environmental protection act, Forest Conservation act. | | | | | | | | |
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| **UNIT-4** | | | | | | (8 Hours) | | |
| **Environmental issues:** Green House effect & Global warming, Ozone layer depletion, Acid rains, Green Revolution, Population Growth and environmental quality, Environmental Impact Assessment. Environmental Standards (ISO 14000, etc.)  **Case Studies:** Bhopal Tragedy, Mathura Refinery and TajMahal, and Ralegan Siddhi (Anna Hazare).  **Field work:** Visit to a local area to document environmental assets – Pond/Forest/Grassland. Visit to a local polluted site- Urban and industry/ Rural and Agriculture*.* | | | | | | | | |
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| **Text Books:** | | | 1. “Environmental Studies” by Benny Joseph, Tata McGraw-Hill Publishing Company Limited, New Delhi. 2. “Comprehensive environmental studies”- JP Sharma, Laxmi Publications. | | | | | |
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| **References:** | | | 1. Text Book of environmental Studies – ErachBharucha 2. “Environmental studies”, R.Rajagopalan, Oxford University Press. 3. “Introduction to Environmental Science”, Anjaneyulu Y, B S Publications 4. “Environmental Science”, 11th Edition – Thomson Series – By Jr. G. Tyler Miller. | | | | | |

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| **PROBABILITY AND STATISTICS**  **II B. Tech. III Semester 22CM301/MA03** | | | | | | | | | | | |
| Lectures | | | : | 2 Hours/Week | Tutorial | : | 1 Hour/Week | Practical | | : | 0 |
| CIE Marks | | | : | 30 | SEE Marks | : | 70 | Credits | | : | 3 |
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| **Pre-Requisite**: None | | | | | | | | | | | |
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| **Course Objectives:** Students will learn how to | | | | | | | | | | | |
|  | Apply the continuous probability densities to various problems in science and engineering. | | | | | | | | | | |
|  | Estimate the point and interval estimators of the mean, variance and proportion for the given Sample data and apply Z-test, t-test to various real-life problems | | | | | | | | | | |
|  | Apply various sample tests like F-test and χ2 -test for decision making regarding the  population based on sample data. | | | | | | | | | | |
|  | Compute the level of correlation, the best fit curve to the given data by the method of least squares and also perform ANOVA arising in the field of engineering. | | | | | | | | | | |
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| **Course Outcomes**: After studying this course, the students will be able to | | | | | | | | | | | |
| CO-1 | Apply discrete and continuous probability distributions to various problems arising in Engineering applications. | | | | | | | | | | |
| CO-2 | Perform Test of Hypothesis for a population parameter for single sample. | | | | | | | | | | |
| CO-3 | Perform Test of Hypothesis for population parameters for multiple samples. | | | | | | | | | | |
| CO-4 | Interpret the results of correlation, regression and one way ANOVA for the given data. | | | | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | | | | |
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| **UNIT-1** | | | | | | | | | (12 Hours) | | |
| Continuous Random Variables, Normal Distribution, Normal Approximation to the Binomial Distribution, Uniform Distribution, Gamma Distribution and its applications, Beta Distribution and its applications, Weibull distribution, Joint Distributions (Discrete), Joint Distributions (Continuous).  (Sections 5.1, 5.2, 5.3, 5.5,5.7, 5.8, 5.9, 5.10) | | | | | | | | | | | |
| **UNIT-2** | | | | | | | | | (12 Hours) | | |
| Populations and Samples, The sampling distribution of the mean (σ known), The sampling distribution of the mean (σ unknown), The sampling distribution of the variance, Point estimation, Interval estimation, Tests of Hypotheses, Null Hypothesis and Tests of hypotheses, Hypothesis concerning one mean.  (Sections 6.1, 6.2, 6.3, 6.4, 7.1, 7.2, 7.4, 7.5, 7.6) | | | | | | | | | | | |
| **UNIT-3** | | | | | | | | | (12 Hours) | | |
| Comparisons-Two independent Large samples, Comparisons-Two independent small samples, matched pairs comparisons, The estimation of variances, Hypotheses concerning one variance, Hypotheses concerning two variances.  (Sections 8.2, 8.3, 8.4, 9.1, 9.2, 9.3) . | | | | | | | | | | | |
| **UNIT-4** | | | | | | | | | (12 Hours) | | |
| Estimation of proportions, Hypotheses concerning one proportion, Hypotheses concerning several proportions. The method of least squares, curvilinear regression, multiple regression, correlation, Completely Randomized Designs.  (10.1, 10.2, 10.3, 11.1, 11.3, 11.4, 11.6, 12.1, 12.2) | | | | | | | | | | | |
| **Text Books :** | | Miller & Freund’s “Probability and Statistics for Engineers”, Richard A. Johnson, 8th Edition, PHI. | | | | | | | | | |
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| **References :** | | 1. R.E Walpole, R.H. Myers & S.L. Myers ‘Probability & Statistics for Engineers and Scientists’, 6th Edition, PHI. 2. Murray R Spiegel, John J.Schiller, R. AluSrinivasa, ‘Probability &Satistics’,   Schaum’s outline series. | | | | | | | | | |

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| **DATA STRUCTURES**  II B.Tech – III Semester(Code: 22CM302/CC03) | | | | | | | | | | | | | | | | | | | | |
| Lectures | : | 2 Hours /Week, 1 Hour Tutorial | | | | | | | Continuous Assessment | | | | | | | : | | 30 | |
| Final Exam | : | 3 Hours | | | | | | | Final Exam Marks | | | | | | | : | | 70 | |
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| **Pre-Requisite**: Problem Solving using Programming (22CM203) | | | | | | | | | | | | | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | | | | | | | | | | | | | |
|  | Understand the role of Data structures in structuring and analysis procedure of an algorithm. | | | | | | | | | | | | | | | | | | | |
|  | Learn the concept of Stack, Queue and various Sorting techniques. | | | | | | | | | | | | | | | | | | | |
|  | Understand the concept of Binary Tree, Binary Search Tree and AVL tree. | | | | | | | | | | | | | | | | | | | |
|  | Learn the concept of Hashing and Heap Data Structures. | | | | | | | | | | | | | | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | | | | | | | | | | | | | | |
| CO1 | Analyse the algorithms to determine the time & space complexity and manipulating data using array or list representation. | | | | | | | | | | | | | | | | | | | |
| CO2 | Implement the applications of Stack & Queue and analyze the various sorting techniques. | | | | | | | | | | | | | | | | | | | |
| CO3 | Construct and implement different tree algorithms like binary tree, BST and AVL tree. | | | | | | | | | | | | | | | | | | | |
| CO4 | Implement and analyze various hashing techniques and priority queues. | | | | | | | | | | | | | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | | | | | | | | | | | | | |
|  | **POs** | | | | | | | | | | | | | **PSOs** | | | | | | |
| **CO** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | | **9** | **10** | **11** | **12** | **1** | | | **2** | | **3** | |
| **CO1** | 3 | 2 | 2 | - | - | - | - | - | | - | - | - | - | - | | | 3 | | 2 | |
| **CO2** | 2 | 3 | 2 | - | - | - | - | - | | - | - | - | - | - | | | 2 | | 1 | |
| **CO3** | 2 | 2 | 1 | - | - | - | - | - | | - | - | - | - | - | | | 2 | | 2 | |
| **CO4** | 2 | 1 | 2 | - | - | - | - | - | | - | - | - | - | - | | | 2 | | 1 | |
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| **UNIT-1** | | | | | | | | | | | | | | (12 Hours) | | | | | | |
| **Algorithm Analysis**: Mathematical Background, Model, what to Analyze, Running Time Calculations.  **Lists**: Abstract Data Types, The List ADT, Singly Linked List ADT, Doubly Linked List ADT, Circular Linked List ADT, Polynomial ADT: addition, multiplication operations. | | | | | | | | | | | | | | | | | | | | |
| **UNIT-2** | | | | | | | | | | | | | | | (12 Hours) | | | | | |
| **Stacks and Queues**: The Stack ADT and its applications such as Infix to Postfix expression conversions, Evaluation of Postfix expressions. The Queue ADT, Queue Application-Radix sort.  **Basic Sorting Techniques**: Bubble sort, Selection sort, Insertion sort, Shell sort | | | | | | | | | | | | | | | | | | | | |
| **UNIT-3** | | | | | | | | | | | | | | | (12 Hours) | | | | | |
| **Trees**: Preliminaries, Binary Trees, Expression trees, The Search Tree ADT, Binary Search Trees, Implementations, AVL Trees-Single Rotations, Double rotations, Implementations. | | | | | | | | | | | | | | | | | | | | |
| **UNIT-4** | | | | | | | | | | | | | | | (12 Hours) | | | | | |
| **Hashing**: General Idea, Hash Function, Separate Chaining, Open Addressing.  **Priority Queues (Heaps)**: Model, Simple implementations, Binary Heap, Heap Sort. | | | | | | | | | | | | | | | | | | | | |
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| **Text Books:** | Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, Pearson Education , 2013, Second Edition, ISBN- 978-81-7758-358-8. | | | | | | | | | | | | | | | | | | | |
| **References:** | 1. Y.Langsam, M.J.Augeustein and A.M.Tenenbaum, “Data Structures Using C”, Pearson Education Asia, 2006, Second Edition, ISBN- 81-203-1177-9. 2. Richard F.Gilberg, Behrouz A. Forouzan, “Data Structures – A Pseudocode Approach with C”, Thomson Brooks / COLE, 1998, Second Edition, ISBN- 978-0-534-39080-8 3. Aho, J.E. Hopcroft and J.D. Ullman, “Data Structures andAlgorithms”, Pearson Education Asia, 1983, 1st edition, ISBN- 978-0201000238. | | | | | | | | | | | | | | | | | | | |

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| **OBJECT ORIENTED PROGRAMMING**  II B. Tech. – III Semester (Code: 22CM303)/CC04 | | | | | | | | |
| Lectures | | : | | 2 Hours /Week, 1 Hour Tutorial | Continuous Assessment | | : | 30 |
| Final Exam | | : | | 3 hours | Final Exam Marks | | : | 70 |
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| **Pre-Requisite**: None. | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | |
|  | Understand advantages of OO programming over procedural oriented programming, learn the basics of variables, operators, control statements, arrays, classes and objects. | | | | | | | |
|  | Understand, write and implement the following concepts: Inheritance, Interfaces, Packages, Strings and Collections. | | | | | | | |
|  | Understand and write programs on Exception Handling, I/O, and Multithreading. | | | | | | | |
|  | Understand and implement applications using Applets, AWT, Swings and Events. | | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | | |
| CO1 | Demonstrate OOP concepts, its advantages over structured programming. | | | | | | | |
| CO2 | Develop and implement Inheritance, polymorphism. | | | | | | | |
| CO3 | Analyze Exception Handling, Multithreading, I/O. | | | | | | | |
| CO4 | Create code for Event Handling, Applets, AWT and Swings. | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | |
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| **UNIT-1** | | | | | | (12 Hours) | | |
| **The History and Evolution of Java**  **An Overview of Java**  **Data Types, Variables and Arrays**  **Operators**  **Control Statements**  **Introducing Classes**  **A Closer Look at Methods and Classes** | | | | | | | | |
| **UNIT-2** | | | | | | (12 Hours) | | |
| **Inheritance**  **Packages and Interfaces**  **Strings:** String Constructors, Any 10 String class methods, StringBuffer class, Any 10 StringBuffer class methods, Introducing StringBuilder class.  **Type Wrappers:** Auto boxing/unboxing.  **Collections:** Collections Overview, Names of Collection Interfaces,  **Collection Classes**: LinkedList<String>, Array List<String> | | | | | | | | |
| **UNIT-3** | | | | | | (12 Hours) | | |
| **Exception Handling**  **Multithreaded Programming**  **I/O:** I/O Basics, Reading Console Input, Writing Console Output, The Print Writer class, Reading and Writing Files, Automatically Closing a File. | | | | | | | | |
| **UNIT-4** | | | | | | (12 Hours) | | |
| **The Applet Class:** Applet Architecture, An Applet Skeleton, Applet program to draw shapes, setting Color, Font using Graphics class  **Event Handling:**  **Introducing the AWT:** Window Fundamentals, **AWT components:** Label, Text Field, Text Area, Checkbox, Checkbox Group, Button, **Layout Managers:** Flow Layout, Grid Layout, and Border Layout.  **GUI Programming with Swing:** The Origins of Swing, Advantages of Swing over AWT, The MVC Connection, **Swing Components:** JLabel, JText Field, JText Area, JCheck box, JButton, JTabbed Pane, JTable, JTree, JCombo Box | | | | | | | | |
|  | | | | | | | | |
| **Text Books:** | | | “Java The Complete Reference”, 9th Edition, Herbert Schildt, TMH Publishing Company Ltd, New Delhi, 2014. | | | | | |
| **References:** | | | 1. “Big Java “, 4th Edition, Cay Horstman, John Wiley & Sons, 2009. 2. “Java How to Program (Early Objects)”, H. M. Dietel and P. J. Dietel, 11th edition Pearson Education, 2018. | | | | | |

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| **OPERATING SYSTEMS**  II B.Tech – III Semester(Code: 22CM304/CC05) | | | | | | | | | | | | | | | | | | |
| Lectures | : | 3 Hours /week | | | | | | | Continuous Assessment | | | | | | | : | 30 | |
| Final Exam | : | 3 Hours | | | | | | | Final Exam Marks | | | | | | | : | 70 | |
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| **Pre-Requisite**: None | | | | | | | | | | | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | | | | | | | | | | | |
|  | To learn the mechanism of OS to handle processes & Threads and their communication. | | | | | | | | | | | | | | | | | |
|  | To learn the algorithms involved in CPU scheduling. | | | | | | | | | | | | | | | | | |
|  | To gain knowledge on concepts that includes Dead locks, Main Memory and Virtual Memory. | | | | | | | | | | | | | | | | | |
|  | To know the concepts related to File Access Methods & Mass Storage structure. | | | | | | | | | | | | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | | | | | | | | | | | | |
| CO1 | Understand different structures, services of the operating system, the use of scheduling and operations on process & threads. | | | | | | | | | | | | | | | | | |
| CO2 | Develop various process scheduling algorithms for a given specification of CPU utilization, throughput, TAT, WT & RT. | | | | | | | | | | | | | | | | | |
| CO3 | Develop various Memory Organization Techniques for optimally allocate memory to process by increasing Memory Utilization & Access time. | | | | | | | | | | | | | | | | | |
| CO4 | Design & implement various file allocation methods & Disk Scheduling Algorithms. | | | | | | | | | | | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | | | | | | | | | | | |
|  | **POs** | | | | | | | | | | | | | **PSOs** | | | | |
| **CO** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | | **9** | **10** | **11** | **12** | **1** | | **2** | | **3** |
| **CO1** | 3 | 3 | 3 | - | - | - | - | - | | - | - | - | - | 3 | | - | | - |
| **CO2** | 3 | 3 | 3 | - | - | - | - | - | | - | - | - | - | 3 | | - | | - |
| **CO3** | 3 | 3 | 3 | - | - | - | - | - | | - | - | - | - | 3 | | - | | - |
| **CO4** | 3 | 3 | 3 | - | - | - | - |  | | - | - |  | - | 3 | | - | | - |
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| **UNIT-1** | | | | | | | | | | | | | | (12 Hours) | | | | |
| **Introduction:** What OSs Do, Computer System Operation, Storage structure, OS Structure, OS Operations.  **Operating-System Structures:** OS Services, User and operating system Interface, System Calls, Types of System Calls, System Programs, OS Design and Implementation, OS Structure.  **Processes:** Process Concept, Process Scheduling, Operations on Processes, Inter- process Communication.  **Threads**: Overview, Multicore Programming, Multithreading Models.  [Sections:1.1, 1.2.1, 1.2.2,1.4,1.5, 1.5.1,2.1, 2.2,2.3,2.4, 2.5, 2.6, 2.7,2.7.1,2.7.2,2.7.3,2.7.4  3.1, 3.2,3.3,3.4, 4.1,4.2,4.3] | | | | | | | | | | | | | | | | | | |
| **UNIT-2** | | | | | | | | | | | | | | | (12 Hours) | | | |
| **CPU Scheduling:** Basic Concepts, Scheduling Criteria, Scheduling Algorithms.  **Process Synchronization:** Background, The Critical-Section Problem, Peterson’s Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic problems of Synchronization, Monitors.  [ Sections : 6.1,6.2,6.3, 5.1,5.2,,5.3,5.4,5.5,5.6,5.7,5.8] | | | | | | | | | | | | | | | | | | |
| **UNIT-3** | | | | | | | | | | | | | | | (12 Hours) | | | |
| **Deadlocks:** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Avoidance, Detection and Recovery.  **Main Memory:** Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of Page Table.  **Virtual-Memory: Background**, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing, Other Considerations.  [Sections; 7.1,7.2,7.3,7.4,7.5,7.6,7.7,8.1,8.2,8.3,8.4,8.5,8.6,9.1, 9.2,9.3,9.4,9.5,9.6,9.9] | | | | | | | | | | | | | | | | | | |
| **UNIT-4** | | | | | | | | | | | | | | | (12 Hours) | | | |
| **File System Interface:** File concept, Access Methods, Directory and Disk Structure,  **File System Implementation**: File System Structures, Directory Implementation, Allocation Methods  **Protection**: Goals of Protection, Principles of Protection, Domain of Protection**-** Domain Structure, Access Matrix, Implementation of Access Matrix.  **Mass Storage Structure**: Over View, Disk Structure, Disk Scheduling, Disk Management, RAID levels  [Sections:10.1,10.2,10.4,10.5,10.7,11.1,11.2,11.3,11.5,12.1,12.3,12.4,14.1,14.2,14.3,14.3.1,14.4,14.5] | | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | | | |
| **Text Books:** | Silberschatz & Galvin, “Operating System Concepts”, 10th edition, John Wiley & Sons (Asia) Pvt.Ltd. **ISBN 9781118063330**. | | | | | | | | | | | | | | | | | |
| **References:** | 1. William Stallings, “Operating Systems –Internals and Design Principles”, 9/e, Pearson**. ISBN 9789352866717** 2. Charles Crowley, “Operating Systems: A Design-Oriented Approach”, Tata McGraw Hill Co., 2019 edition. **ISBN-9780074635513** 3. Andrew S.Tanenbaum, “Modern Operating Systems”, 4nd edition,2017 PHI.**ISBN-9781292061429** | | | | | | | | | | | | | | | | | |

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| **COMPUTER ORGANIZATION**  II B. Tech. – III Semester (Code: 22CM305/CC06) | | | | | | | | | | | | | | | | | | |
| Lectures | : | 3 Hours /week | | | | | | | Continuous Assessment | | | | | | | : | 30 | |
| Final Exam | : | 3 Hours | | | | | | | Final Exam Marks | | | | | | | : | 70 | |
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| **Pre-Requisite**: Digital logic design(20CB205) | | | | | | | | | | | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | | | | | | | | | | | |
|  | Represent the data, micro-operations, and hardware implementation of arithmetic, logic and shift unit. | | | | | | | | | | | | | | | | | |
|  | Know about the instruction codes and generation of control signals using hardwired and micro-programmed approaches. | | | | | | | | | | | | | | | | | |
|  | Learn about the different types of instructions and arithmetic operations. | | | | | | | | | | | | | | | | | |
|  | Understand the organization of the memory and I/O units. | | | | | | | | | | | | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | | | | | | | | | | | | |
| CO1 | Representation of the data, micro-operations, and implementation of hardware for arithmetic, logic and shift unit. | | | | | | | | | | | | | | | | | |
| CO2 | Understand the flow of execution of instruction by the CPU and design of the control unit using hardwired and micro-programmed approaches. | | | | | | | | | | | | | | | | | |
| CO3 | Study the instruction set of basic computer and draw the flowcharts of the arithmetic operations. | | | | | | | | | | | | | | | | | |
| CO4 | Understand the memory and I/O organizations. | | | | | | | | | | | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | | | | | | | | | | | |
|  | **POs** | | | | | | | | | | | | | **PSOs** | | | | |
| **CO** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | | **9** | **10** | **11** | **12** | **1** | | **2** | | **3** |
| **CO1** | 3 | - | 2 | - | - | - | - | - | | - | - | - | - | 3 | | - | | - |
| **CO2** | 3 | - | 2 | - | - | - | - | - | | - | - | - | - | 3 | | - | | - |
| **CO3** | 2 | - | 2 | - | - | - | - | - | | - | - | - | - | 3 | | - | | - |
| **CO4** | 2 | - | 2 | - | - | - | - | - | | - | - | - | - | 3 | | - | | - |
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| **UNIT-1** | | | | | | | | | | | | | | (11 Hours) | | | | |
| **DATA REPRESENTATION**: Data Types, Complements, Fixed-Point Representation, Floating-Point Representation.  **REGISTER TRANSFER LANGUAGE AND MICROOPERATIONS**: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro Operations, Logic micro operations, Shift Micro Operations, Arithmetic Logic Shift Unit. | | | | | | | | | | | | | | | | | | |
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| **UNIT-2** | | | | | | | | | | | | | | | (13 Hours) | | | |
| **BASIC COMPUTER ORGANIZATION AND DESIGN**: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Design of Accumulator Logic.  **MICRO PROGRAMMED CONTROL:** Control Memory, Address Sequencing, Microprogram Example, Design of Control Unit. | | | | | | | | | | | | | | | | | | |
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| **UNIT-3** | | | | | | | | | | | | | | | (12 Hours) | | | |
| **CENTRAL PROCESSING UNIT**: General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer vs Complex Instruction Set Computers.  **COMPUTER ARITHMETIC:** Addition and Subtraction, Multiplication Algorithms, Division Algorithms. | | | | | | | | | | | | | | | | | | |
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| **UNIT-4** | | | | | | | | | | | | | | | (12 Hours) | | | |
| **THE MEMORY SYSTEM**: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.  **INPUT-OUTPUT ORGANIZATION**: Peripheral Devices, Input-Output Interface, Modes of Transfer, Priority Interrupt, Direct Memory Access, Input-Output Processor. | | | | | | | | | | | | | | | | | | |
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| **Text Books:** | Computer System Architecture, M.MorrisMano, 3rdEdition, Pearson/PHI | | | | | | | | | | | | | | | | | |
| **References:** | 1. Computer Organization, Carl Hamacher, ZvonksVranesic, SafeaZaky, 5th Edition, McGraw Hill. 2. Computer Organization and Architecture, William Stallings, Sixth Edition, Pearson/PHI. | | | | | | | | | | | | | | | | | |

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| **PYTHON PROGRAMMING**  II B.Tech–III Semester (Code: 22CML301/SOC1) | | | | | | | | | | | | | | | | | | |
| Lectures/Lab | : | 5 Hours/Week (2T+3P) | | | | | | | Continuous Assessment | | | | | | | : | 30 | |
| Final Exam | : | 3 hours | | | | | | | Final Exam Marks | | | | | | | : | 70 | |
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| **Pre-Requisite**: None | | | | | | | | | | | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | | | | | | | | | | | |
|  | Understand and write code using the basics of Python, Statements, Expressions, Conditional Executions, and Functions. | | | | | | | | | | | | | | | | | |
|  | Write code for Iteration, Strings, File I/O. | | | | | | | | | | | | | | | | | |
|  | Write code in creating, usage of Lists, Dictionaries, and Tuples. | | | | | | | | | | | | | | | | | |
|  | Understand the concepts of Object Orientation, Databases and write code implementing them. | | | | | | | | | | | | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | | | | | | | | | | | | |
| CO1 | Write code using the basics of Python, Statements, Expressions, Conditional Executions, and Functions. | | | | | | | | | | | | | | | | | |
| CO2 | Write code for Iteration, Strings, File I/O. | | | | | | | | | | | | | | | | | |
| CO3 | Write code in creating, usage of Lists, Dictionaries, and Tuples. | | | | | | | | | | | | | | | | | |
| CO4 | Implement Object Orientation, execute Databases queries. | | | | | | | | | | | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | | | | | | | | | | | |
|  | **POs** | | | | | | | | | | | | | **PSOs** | | | | |
| **CO** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | | **9** | **10** | **11** | **12** | **1** | | **2** | | **3** |
| **CO1** | 3 | - | - | - | - | - | - | - | | - | - | - | 2 | 3 | | 3 | | 3 |
| **CO2** | 3 | - | - | - | - | - | - | - | | - | - | - | 2 | 3 | | 3 | | 3 |
| **CO3** | 3 | - | - | - | - | - | - | - | | - | - | - | 2 | 3 | | 3 | | 3 |
| **CO4** | 3 | - | - | - | - | - | - | - | | - | - | - | 2 | 3 | | 3 | | 3 |
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| **UNIT-1** | | | | | | | | | | | | | | (8hours) | | | | |
| **Introduction**: Overview, History of Python, Python Features, Environment Setup. Variables, expressions, and statements: values and types, variables, names and keywords, statements, operators and operands, expressions, order of operations, modulus operator, string operations, asking the user for input, comments, choosing mnemonic variable names.  **Conditional execution:** Boolean expressions, logical operators, conditional execution,  Alternative execution, chained conditionals, nested conditionals, catching exceptions using try and except, short-circuit evaluation of logical expressions.  Functions: function calls, built-in functions, type conversion functions, random numbers, math functions, adding new functions, definitions and uses, flow of execution, parameters and arguments, fruitful functions and void functions. | | | | | | | | | | | | | | | | | | |
| **UNIT-2** | | | | | | | | | | | | | | | (8hours) | | | |
| **Iteration:** updating variables, the while statement, infinite loops and break, finishing iterations with continue, definite loops using for, loop patterns.  **Strings:** string is a sequence, getting the length of a string using len, traversal through a string with a loop, string slices, strings are immutable, looping and counting, the in operator, string comparison, string methods, parsing strings, format operator.  Files I/O:persistence, opening files, text files and lines, reading files, searching through a file, letting the user choose the file name, using try except and open, writing files. | | | | | | | | | | | | | | | | | | |
| **UNIT-3** | | | | | | | | | | | | | | | (8hours) | | | |
| **Lists:** a list is a sequence, lists are mutable, traversing, operations, slices, methods, deleting elements, functions, strings, parsing lines, objects and values, aliasing, arguments.  **Dictionaries:** dictionary as a set of counters, dictionaries and files, looping and dictionaries, advanced text parsing.  **Tuples:** tuples are immutable, comparing tuples, tuple assignment, dictionaries and tuples, multiple assignment with dictionaries, the most common words, using tuples as keys in dictionaries, sequences. | | | | | | | | | | | | | | | | | | |
| **UNIT-4** | | | | | | | | | | | | | | | (8hours) | | | |
| **Object-Oriented Programming:** Managing Larger Programs, Using Objects, starting with Programs, Subdividing a Problem–Encapsulation, First Python Object, Classes as Types, Object Lifecycle, Many Instances, Inheritance.  **Using Databases and SQL:** Database concepts, Database Browser for SQLite, creating a database table, Structured Query Language summary, Basic data modeling, Programming with multiple tables, three kinds of keys, Using JOIN to retrieve data. | | | | | | | | | | | | | | | | | | |
| **LIST OF EXPERIMENTS** | | | | | | | | | | | | | | | | | | |
| 1. Write a python program to check if the number is positive or negative or zero and display an appropriate message.  2. Write a python program to take a string from user and count number of vowels  present and percentage of vowels in it.  3. Write a python program to find the most frequent words in a text file.  4. Write a Python Program to Find the Sum of first n Natural Numbers.  5. Write a python program to find the numbers which are divisible by 7 and multiple of 5 between 1500 and 2700.  6. Write a Python Program to solve Quadratic Equation.  7. Create a program that ask the user for a number and then prints out a list of all the divisors of that number.  8. Write a Python Program to Find HCF or GCD.  9. Write a Python Program to Find LCM.  10. Write a Python program to construct the following pattern, using a nested loop number.  1  22  333  4444  55555  666666  11. Write a Python Program to sort the given words in Alphabetic Order.  12. Write a Python function to create the HTML string with tags around the word(s).  13. Write a Python program to reverse words in a string.  14. Write a Python program to strip a set of characters from a string.  15. Write a python function to find the maximum and minimum of a list of numbers.  16. Write a Python Program to Find the Square Root.  17. Write a Python Program to Convert Decimal to Binary Using Recursion.  18. Write a python recursive function to a find the factorial of a given number.  19. Write a python program to find the longest word in each line of given file.  20. Write a Python program to combine each line from first file with the corresponding line in second file.  21. Write a Python program to read a random line from a file.  23. Write a Python program to split a list every Nth element.  Sample list: ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j', 'k', 'l', 'm', 'n']  Expected Output: [['a', 'd', 'g', 'j', 'm'], ['b', 'e', 'h', 'k', 'n'], ['c', 'f', 'i', 'l']]  24. Write a Python program to compute the similarity between two lists.  Sample data: ["red", "orange", "green", "blue", "white"], ["black", "yellow", "green", "blue"]  Expected Output:  Color1-Color2: ['white', 'orange', 'red'] Color2-Color1: ['black', 'yellow']  25. Write a Python program to replace the last element in a list with another list.  Sample data: [1, 3, 5, 7, 9, 10], [2, 4, 6,8] Expected Output: [1, 3, 5, 7, 9, 2, 4, 6, 8]  26. Write a Python program to find the repeated items of a tuple.  27. Write a Python program to convert a list with duplicates to a tuple without duplicates.  28. Write a Python program to reverse the elements of a tuple.  29. Write a Python program to replace last value of tuples in a list.  Sample list: [(10, 20, 40), (40, 50, 60), (70, 80, 90)]  Expected Output: [(10, 20, 100), (40, 50, 100), (70, 80, 100)]  31. Write a Python program to combine two dictionaries by adding values for common keys.  d1 = {'a': 100, 'b': 200, 'c':300}  d2 = {'a': 300, 'b': 200, 'd':400}  Sample output: Counter({'a': 400, 'b': 400, 'd': 400, 'c': 300})  33. Write a Python program to create and display all combinations of letters, selecting each letter from a different key in a dictionary.  Sample data : {'1':['a','b'], '2':['c','d']} Expected Output:  ac ad bc bd  34. Write a Python program to get the top three items in a shop.  Sample data: {'item1': 45.50, 'item2':35, 'item3': 41.30, 'item4':55, 'item5': 24} Expected Output:  item4 55 item1 45.5  item3 41.3  35. Write a Python program to match both key values in two dictionaries.  Sample dictionary: {'key1': 1, 'key2': 3, 'key3': 2}, {'key1': 1, 'key2': 2}  Expected output: key1: 1 is present in both x and y  36. Write a Python class named Rectangle constructed by a length and width and a method which will compute the area of a rectangle.  37. Write a Python class named Circle constructed by a radius and two methods which will compute the area and the perimeter of a circle.  38. Write a Python program to create a Single Linked List using classes.  39. Write a Python program to create a FIFO queue using classes.  40. Predict the output of following Python programs and write the justification. class X(object):  def \_\_init (self,a):  self.num = a  def doubleup(self):  self.num \*= 2  class Y(X):  def \_\_init (self,a): X. init (self, a)  def tripleup(self):  self.num \*= 3  obj = Y(4)  print(obj.num)  obj.doubleup()  print(obj.num)  obj.tripleup()  print(obj.num)  41. Predict the output of following Python programs and write the justification.  # Base or Super class class Person(object):  def \_\_init (self, name):  self.name = name  def getName(self):  return self.name  def isEmployee(self):  return False  # Inherited or Subclass (Note Person in bracket)  class Employee(Person):  def \_\_init (self, name, eid):  ''' In Python 3.0+, "super(). init (name)" also works'''  super(Employee, self). init (name)  self.empID = eid  def isEmployee(self):  return True  def getID(self):  return self.empID  # Driver code  emp = Employee("Geek1", "E101")  print(emp.getName(), emp.isEmployee(), emp.getID())  42. Create a employees database with the following attributes and insert rows. employee\_id, first\_name, last\_name, email, phone\_number, hire\_date, job\_id, salary, commission\_pct, manager\_id, department\_id  43. Write a query to get the highest, lowest, sum, and average salary of all employees.  44. Write a query to get the average salary for all departments employing more than 10 employees.  45. Write a query to find the names (first\_name, last\_name), the salary of the employees whose salary is greater than the average salary.  46. Write a query to get nth max salaries of employees. | | | | | | | | | | | | | | | | | | |
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| **Text Books:** | * + - 1. A Python Book: Beginning Python, Advanced Python, and Python   Exercises, Dave Kuhlman, Open Source MIT License.  2. Python for Data Analysis, Wes McKinney, O’ Reilly. | | | | | | | | | | | | | | | | | |
| **References:** | 1. Python Data Science Handbook-Essential Tools for Working with 2. Data Science from Scratch, JoelGrus, O’Reilly. | | | | | | | | | | | | | | | | | |

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| **PROBABILITY AND STATISTICS LAB**  III B.Tech – III Semester (Code: 22CML302) | | | | | | | | |
| Practical | | : | | 3 Hours/Week | Continuous Assessment | | : | 30 |
| Final Exam | | : | | 3 Hours | Final Exam Marks | | : | 70 |
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| **Pre-Requisite**: None. | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | |
|  | Learn the use of R for statistical programming and various parameters of descriptive statistics | | | | | | | |
|  | Understand the various types of Discrete and Continuous Probability Distributions. | | | | | | | |
|  | Know Populations Vs Samples and learn about hypothesis testing. | | | | | | | |
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| **Course Learning Outcomes**: Students will be able to | | | | | | | | |
| CLO-1 | Write programs in R to implement data manipulation functions and to solve various statistical problems. | | | | | | | |
| CLO-2 | Apply various built in functions in R to solve various probability and distributions like Normal, Binomial and Poisson distributions. | | | | | | | |
| CLO-3 | Understand Populations Vs Samples and know the importance of p –value in one sample t – test, two sample t-test and one-sample z-test in hypothesis testing. | | | | | | | |
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| **Mapping of Course Learning Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | **POs** | | | | | | | | | | | | **PSOs** | | | | **CLO** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | | **CLO-1** | 3 | 2 | 1 | 1 | 2 | 1 | - | 1 | - | - | - | 1 | 2 | 3 | 1 | | **CLO-2** | 3 | 2 | 1 | 1 | 2 | 1 | - | 1 | - | - | - | 1 | 2 | 3 | 1 | | **CLO-3** | 3 | 2 | 1 | 1 | 2 | 1 | - | 1 | - | - | - | 1 | 2 | 3 | 1 | | | | | | | | | |
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| **UNIT-1** | | | | | |  | | |
| **Introduction to R Programming:** Describing data, Viewing and Manipulating data, Plotting data, Reading external data.  **Descriptive Statistics:** Introduction, Qualitative Data, Quantitative Data, Population Vs Sample, Min, Max, Sum, Prod and Sort functions on Quantitative Data, Mean or Arithmetic Mean, Geometric Mean, Applications of Geometric Mean, Harmonic Mean, Median and Mode, Outliers, Quartiles and Quantiles, Variance and Standard Deviation, Correlations and Covariance.  **List Of Experiments**   |  |  | | --- | --- | | 1. | Write an R – Script to demonstrate the Concept of following Data Manipulation Functions.   1. filter( ) b) distinct( ) c) arrange( ) d) select( ) e) mutate ( ) & transmute ( )   f) rename( ) | | 2. | Write an R – Script to demonstrate the following Graphical representations.   1. Bar plot b) histogram c) scatter plot | | 3. | Write an R – Script to demonstrate the concept of Descriptive Statistics. | | | | | | | | | |
| **UNIT-2** | | | | | |  | | |
| **Probability Distributions**: Generate and visualize Discrete and continuous distributions using the statistical environment. Demonstration of CDF and PDF uniform and normal, binomial and poisson distributions.  **Densities of Random Variables:** Distributions in R, matching a density to Data.  **Binomial Distribution:** Study of binomial distribution, Plots of density and distribution functions. Normal approximation to the Binomial distribution.  **List of Experiments**   |  |  | | --- | --- | | 1. | Write an R – Script to demonstrate the concept of Normal Probability distribution. | | 2. | Write an R – Script to demonstrate the concept of Binomial Probability distribution. | | 3. | Write an R – Script to demonstrate the concept of Poisson Probability distribution. | | | | | | | | | |
| **UNIT-3** | | | | | |  | | |
| **Confidence Intervals**: Population Vs samples, Large sample Confidence Intervals, Simulating Datasets, Evaluating the Coverage of Confidence Intervals.  **Hypothesis Testing:** Tests of hypotheses about the mean when the variance is known. Computing the p-value. Explore the connection between the critical region, the test statistic and the p-value.  **List Of Experiments**   |  |  | | --- | --- | | 1. | Write an R – Script to demonstrate the concept of One Sample t-test and Two Sample t-test. | | 2. | Write an R – Script to demonstrate the concept of One Sample z-test. | | | | | | | | | |
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| **Text Books:** | | | 1. Maria Dolores Ugarte, Ana F. Militino, Alan T. Arnholt “Probability and Statistics with R”, 2nd edition on, CRC Press, 2016. 2. P. Dalgaard, Introductory Statistics with R, 2nd edition. (Springer 2008). | | | | | |
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| **References:** | | | 1. Michale Akritas, “Probability & Statistics with R for Engineers and Scientists”, 2nd edition on, CRC Press, 2016 | | | | | |

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| **DATA STRUCTURES LAB**  II B. Tech. – III Semester (Code: 22CML303/CC07) | | | | | | | |
| Labs | | : | | 3 Hours/Week | Continuous Assessment | : | 30 |
| Final Exam | | : | | 3 hours | Final Exam Marks | : | 70 |
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| **Pre-Requisite**: None. | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | |
|  | Understand and program basic data structures like arrays and linked lists with their applications. | | | | | | |
|  | Understand and Program data structures like stacks and queues with their applications. Understand and implement sorting algorithms. | | | | | | |
|  | Understand and program on trees, binary trees, binary search trees, avl trees, expression trees and their traversal methods. | | | | | | |
|  | Understand and program on priority queues, hashing and their mechanisms. Basic knowledge of graphs representations and traversing methods. | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | |
| CO1 | Understand the concept of Dynamic memory management, data types, algorithms, Big O notation. | | | | | | |
| CO2 | Understand basic data structures such as arrays, linked lists, stacks and queues. | | | | | | |
| CO3 | Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data. | | | | | | |
| CO4 | Solve problem involving trees and heaps, Describe the hash function and concepts of collision and its resolution methods | | | | | | |
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| **Mapping of Course Learning Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | |
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| **LIST OF EXPERIMENTS** | | | | | | | |
| 1. Write a program to perform the following operations on Array List   a). Creation, b). Insertion, c). Deletion, d). Search, e). Display.   1. Write a program that reads two lists of elements, prints them, reverses them, prints the reverse list, sort the lists, print the sorted lists, merges the list, prints merge list using array list. 2. Write a program to perform the following operations on Single Linked List.   a). Creation, b). Insertion, c). Deletion, d). Search, e). Display.   1. Write a program to perform the following operations on Doubly Linked List.   a). Creation, b). Insertion, c). Deletion, d). Search, e). Display.   1. Write a program to perform addition and multiplication of two polynomials using single Linked List. 2. Write a program to convert the given infix expression into postfix expression using stack. 3. Write a program to evaluate the postfix expression using stack. 4. Write a program that performs Radix sort on a given set of elements using queue. 5. Write a program to read n numbers in an array. Redisplay the array list with elements being sorted in ascending order using the following techniques   a). Bubble Sort, b). Selection Sort, c). Insertion Sort, d).Shell Sort.   1. Write a program to perform Binary Search tree operations and traversals. 2. Write a program to implement AVL tree that interactively allows   a). Insertion, b). Deletion, c). Find\_min, d). Find\_max.   1. Write a program to read n numbers in an array. Redisplay the arraylist with elements being sorted in ascending order using Heap Sort. | | | | | | | |
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| **Text Books:** | | | Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, Second Edition, Pearson Education | | | | |
| **References:** | | | * + - 1. Y.Langsam, M.J.Augeustein and A.M.Tenenbaum, “DataStructures Using C”, Pearson Education Asia, 2004.       2. Richard F.Gilberg, Behrouz A. Forouzan, “Data Structures – A Pseudocode Approach with C”, ThomsonBrooks / COLE, 1998. | | | | |

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| **OBJECT ORIENTED PROGRAMMING LAB**  II B.Tech – III Semester (Code: 22CML304/CC08) | | | | | | | |
| Labs | | : | | 3 Hours/Week | Continuous Assessment | : | 30 |
| Final Exam | | : | | 3 hours | Final Exam Marks | : | 70 |
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| **Pre-Requisite**: None. | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | |
|  | Understand advantages of OO programming over procedural oriented programming, learn the basics of variables, operators, control statements, arrays, classes and objects. | | | | | | |
|  | Understand, write and implement the following concepts: Inheritance, Interfaces, Packages, Strings and Collections. | | | | | | |
|  | Understand and write programs on Exception Handling, I/O, and Multithreading. | | | | | | |
|  | Understand and implement applications using Applets, AWT, Swings and Events. | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | |
| CO1 | Demonstrate OOP concepts, its advantages over structured programming. | | | | | | |
| CO2 | Develop and implement Inheritance, polymorphism. | | | | | | |
| CO3 | Analyze Exception Handling, Multithreading, I/O. | | | | | | |
| CO4 | Create code for Event Handling, Applets, AWT and Swings. | | | | | | |
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| **Mapping of Course Learning Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | **POs** | | | | | | | | | | | | **PSOs** | | | | **CO** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | | **CO1** | 3 | 3 | 3 | - | 3 | - | - | 2 | - | 2 |  | 3 | 3 | 3 | 3 | | **CO2** | 3 | 3 | 3 | - | 3 | - | - | 2 | - | 2 |  | 3 | 3 | 3 | 3 | | **CO3** | 3 | 3 | 3 | - | 3 | - | - | 2 | - | 2 |  | 3 | 3 | 3 | 3 | | **CO4** | 3 | 3 | 3 | - | 3 | - | - | 2 | - | 2 |  | 3 | 3 | 3 | 3 | | | | | | | | |
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| **LIST OF EXPERIMENTS** | | | | | | | |
| 1. Write a Java program to declare, initialize and accessing the elements of Single dimensional Arrays, Multidimensional Arrays. 2. Write a Java program to demonstrate recursion. 3. Write a Java program to demonstrate static member, static method and static block. 4. Write a Java program to demonstrate method overloading and method overriding using simple inheritance. 5. Write a Java program to demonstrate multiple inheritance using interfaces. 6. Write a Java program to demonstrate packages. 7. Write a Java program to demonstrate String class methods. 8. Write a Java program to create user defined exception class, use couple of built-in Exception classes. 9. Write a Java program to demonstrate inter-thread communication. 10. Write an Applet program to demonstrate passing parameters to Applet, Graphics, Color and Font classes. 11. Write a Java program to demonstrate handling Action events, Item events, Key events, Mouse events, Mouse Motion events. 12. Write a GUI application which uses the following AWT components Label, Text Field, Text Area, Checkbox, Checkbox Group, Button. 13. Write a GUI application using JTable, JTree, JCombo Box. | | | | | | | |
|  | | | | | | | |
| **Text Books:** | | | “Java The Complete Reference”, 9th Edition, Herbert Schildt, TMH Publishing Company Ltd, New Delhi, 2014. | | | | |
| **References:** | | | 1. “Big Java “, 4th Edition, Cay Horstman, John Wiley & Sons, 2009. 2. “Java How to Program (Early Objects)”, H. M. Dietel and P. J. Dietel, 11th edition Pearson Education, 2018. | | | | |

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| **PROFESSIONAL ETHICS & HUMAN VALUES**  II B. Tech. – III Semester (Code: 22CM306/MC02) | | | | | | | | |
| Lectures | | : | | 2 Hours/Week | Continuous Assessment | | : | 30 |
| Final Exam | | : | |  | Final Exam Marks | | : |  |
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| **Pre-Requisite**: None. | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | |
|  | Comprehend a specific set of behavior and values any professional must know and must abide by, including confidentiality, honesty and integrity. Understand engineering as social experimentation. | | | | | | | |
|  | Know, what are safety and Risk and understand the responsibilities and rights of an engineer such as collegiality, loyalty, bribes/gifts. | | | | | | | |
|  | Recognize global issues visualizing globalization, cross-cultural issues, computer ethics and also know about ethical audit | | | | | | | |
|  | Discuss case studies on Bhopal gas tragedy, Chernobyl and about codes of Institute of Engineers, ACM | | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | | |
| CO1 | Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field and the multiple ethical interests at stake in a real-world situation or practice | | | | | | | |
| CO2 | Articulate what makes a particular course of action ethically defensible, Assess their own ethical values and the social context of problems.Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data. | | | | | | | |
| CO3 | Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research | | | | | | | |
| CO4 | Paticipate in the discussion of the case studies like bhopal gas tragedy,Chernobyl disasters. | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | |
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| **UNIT-1** | | | | | | (12hours) | | |
| **Human Values**: Morals, Values and Ethics, Integrity, Work Ethics, Service and Learning, Civic Virtue, Respect for Others, Living Peacefully, Caring and Sharing, Honesty, Courage, Value Time, Cooperation, Commitment and Empathy, Spirituality, Character.  **Engineering Ethics**: History of Ethics, Engineering Ethics, Consensus and Controversy, Profession and Professionalism, Professional Roles of Engineers, Self Interest, Customs and Religion, Uses of Ethical Theories, Professional Ethics, Types of Inquiry, Kohlberg's Theory, Gilligan’s Argument, Heinz’s Dilemma.  **Engineering as Social Experimentation**: Comparison with Standard Experiments, Knowledge Gained, Conscientiousness, Relevant Information, Learning from the Past, Engineers as Managers, Consultants, and Leaders, Accountability, Roles of Codes, Codes and Experimental Nature of Engineering. | | | | | | | | |
| **UNIT-2** | | | | | | (12hours) | | |
| **Engineers' Responsibility for Safety and Risk**: Safety and Risk, Types of Risks, Safety and the Engineer, Designing for Safety, Risk-Benefit Analysis, Accidents.  **Responsibilities and Rights**: Collegiality, Two Senses of Loyalty, Obligations of Loyalty, Misguided Loyalty, Professionalism and Loyalty, Professional Rights, Professional Responsibilities, Conflict of Interest, Self-interest, Customs and Religion, Collective Bargaining, Confidentiality, Acceptance of Bribes/Gifts, Occupational Crimes, Whistle Blowing. | | | | | | | | |
| **UNIT-3** | | | | | | (12hours) | | |
| **Global Issues**: Globalization, Cross-cultural Issues, Environmental Ethics, Computer Ethics, Weapons Development, Ethics and Research, Analyzing Ethical Problems in Research, Intellectual Property Rights (IPRs).  **Ethical Audit:** Aspects of Project Realization, Ethical Audit Procedure, The Decision Makers, Variety of Interests, Formulation of the Brief, The Audit Statement, The Audit Reviews. | | | | | | | | |
| **UNIT-4** | | | | | | (12hours) | | |
| **Case Studies**: Bhopal Gas Tragedy, The Chernobyl Disaster. **Appendix 1**: Institution of Engineers (India): Sample Codes of Ethics. **Appendix 2**: ACM Code of Ethics and Professional Conduct. | | | | | | | | |
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| **Text Books:** | | | “Professional Ethics & Human Values”, M.GovindaRajan, S.Natarajan, V.S.SenthilKumar, PHI Publications 2013. | | | | | |
| **References:** | | | “Ethics in Engineering”, Mike W Martin, Ronald Schinzinger, TMH Publications. | | | | | |

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| **Artificial Intelligence**  (Professional Elective – I)  II B. Tech – IV Semester(Code:22CM401/PE1A) | | | | | | | | | | | | | | | | | | | | |
| Lectures | | : | 4 Hours /week | | | | | | | Continuous Assessment | | | | | | | : | 30 | | |
| Final Exam | | : | 3 Hours | | | | | | | Final Exam Marks | | | | | | | : | 70 | | |
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| **Pre-Requisite**: Data Structures(22CM302), Design and Analysis of Algorithms (22CM404), Discrete Mathematics (22CM206) | | | | | | | | | | | | | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | | | | | | | | | | | | | |
| * understand the fundamental concepts of artificial intelligence, and their environment, various Search techniques * understand knowledge representation using predicate logic and rules * understand the planning techniques. * understand how to design and solve Learning techniques and Expert systems. | | | | | | | | | | | | | | | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | | | | | | | | | | | | | | |
| CO1 | Comprehend the underlying ideas of artificial intelligence, as well as their environment and different search methods. | | | | | | | | | | | | | | | | | | | |
| CO2 | Acquire the skills to describe knowledge using rules and predicate logic. | | | | | | | | | | | | | | | | | | | |
| CO3 | Comprehend the planning methods. | | | | | | | | | | | | | | | | | | | |
| CO4 | Comprehend the design and resolution of Expert and Learning systems. | | | | | | | | | | | | | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | | | | | | | | | | | | | |
|  | **PO’s** | | | | | | | | | | | | | | | **PSO’s** | | | | |
| **CO** | **1** | | **2** | **3** | **4** | **5** | **6** | **7** | **8** | | **9** | **10** | **11** | **12** | **1** | | **2** | | **3** |
| **CO1** | 3 | | 3 | 3 | - | - | - | - | - | | - | - | - | 3 | 3 | | 3 | | 3 |
| **CO2** | 3 | | 3 | 3 | - | - | - | - | - | | - | - | - | 3 | 3 | | 3 | | 3 |
| **CO3** | 3 | | 3 | 3 | - | - | - | - | - | | - | - | - | 3 | 3 | | 3 | | 3 |
| **CO4** | 3 | | 3 | 3 | - | - | - | - | - | | - | - | - | 3 | 3 | | 3 | | 3 |
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| **UNIT-1** | | | | | | | | | | | | | | | | 12 Hours | | | | |
| **Introduction to AI:** The Foundations of AI, The History of AI, The State of the Art.  **Intelligent Agents:** Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.  **Problem Solving by Search**: Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions. | | | | | | | | | | | | | | | | | | | | |
| **UNIT-2** | | | | | | | | | | | | | | | | 12 Hours | | | | |
| **Beyond Classical Search**: Local Search Algorithms and Optimization Problems, Searching with Non- Deterministic Actions.  **Adversarial Search**: Games, Optimal Decisions in Games, Alpha–Beta Pruning,  **Constraint Satisfaction Problems**: Defining Constraint Satisfaction Problems,  Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems. | | | | | | | | | | | | | | | | | | | | |

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| **UNIT-3** | | 12 Hours |
| **Logical Agents**: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic.  **First-Order Logic**: Representation Revisited, Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. | | |
| **UNIT-4** | | 12 Hours |
| **Inference in First-Order Logic:** Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.  **Knowledge Representation:** Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.  **Automated Planning:** Definition of Classical Planning, Algorithms for Classical Planning. | | |
|  | | |
| **Text Books :** | 1. Stuart Russel and Peter Norvig, Artificial Intelligence – A Modern Approach, 3rd Edition, Pearson Education/ PHI.. 2. Elaine Rich & Kevin Knight, Artificial Intelligence, 3rd Edition, (TMH). | |
|  |  | |
| **References :** | 1. Patrick Henry Winston. Artificial Intelligence. Pearson Education, 3 edition, 2007. ISBN 81317 15051 2. Saroj Kaushik. Artificial Intelligence. CENGAGE Learning, 1 edition,   2020. ISBN 9788131510995. | |

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| **WEB TECHNOLOGIES**  II B. Tech. – IV Semester (Code: 22CM402/CC09) | | | | | | | | |
| Lectures | | : | 3 Hours/Week | | Continuous Assessment | | : | 30 |
| Final Exam | | : | 3 hours | | Final Exam Marks | | : | 70 |
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| **Pre-Requisite**: None. | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | |
|  | Know elements and tags of HTML and apply Styles using Cascading Style Sheets. | | | | | | | |
|  | Know basics of Java Script, Functions, Events, Objects and Working with browser objects. | | | | | | | |
|  | Know basics of XML, DOM and advanced features of XML. | | | | | | | |
|  | To convert XML documents into other formats and XSLT. | | | | | | | |
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| **Course Outcomes**: Students will be able to: | | | | | | | | |
| CO1 | Analyze a web page and identify its elements and attributes | | | | | | | |
| CO2 | Create web pages using XHTML and Cascading Styles sheets. | | | | | | | |
| CO3 | Build dynamic web pages using JavaScript (client side programming). Students will be able to write a well formed / valid XML documents | | | | | | | |
| CO4 | Understand Web server and its working. Design and implement a client server internet application that accommodates specific requirements and constraints. | | | | | | | |
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| **Mapping of Course Learning Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | |
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| **UNIT-1** | | | | | | (12 hours) | | |
| **HTML5:** Fundamentals of HTML, Working with Text, Organizing Text in HTML, Working with Links and URLs, Creating Tables, Working with Images, Colors, and Canvas, Working with Forms. | | | | | | | | |
| **UNIT-2** | | | | | | (12 hours) | | |
| **CSS:** Overview of CSS, Backgrounds and Color Gradients in CSS, Fonts and Text Styles, Creating Boxes and Columns Using CSS, Displaying, Positioning, and Floating an Element, List Styles, Table Layouts.  **Dynamic HTML:** Overview of JavaScript, JavaScript Functions, Events, Image Maps, and Animations. | | | | | | | | |
| **UNIT-3** | | | | | | (12 hours) | | |
| **Dynamic HTML (Cont..):**JavaScript Objects, Working with Browser Objects, Working with Document Object.  **Document Object Model:** Understanding DOM Nodes, Understanding DOM Levels, Understanding DOM Interfaces- Node, Document, Element, Attribute. | | | | | | | | |
| **UNIT-4** | | | | | | (12 hours) | | |
| **XML:** Working with Basics of XML, Implementing Advanced Features of XML, Working with XSLT.  **AJAX:** Overview of AJAX, Asynchronous Data Transfer with XML Http Request, Implementing AJAX Frameworks, Working with jQuery. | | | | | | | | |
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| **Text Books:** | | | | KogentLearningSolutionsInc.,HTML5BlackBook:CoversCSS3,Javascript, XML, XHTML, Ajax, PHP and Jquery | | | | |
| **References:** | | | | 1. Harvey M.Deitel and Paul J. Deitel, “Internet &World Wide Web How to Program”, 4/e, Pearson Education. 2. Jason Cranford Teague, “Visual Quick Start Guide CSS DHTML & AJAX”, 4e, Pearson Education. 3. Tom Nerino Doli smith, “Java Script & AJAX for the web”, Pearson Education2007. 4. Joshua Elchorn, “Understanding AJAX”,PrenticeHall2006. | | | | |

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| **DATABASE MANAGEMENT SYSTEM**  II B. Tech. – IV Semester (Code: 22CM403/CC10) | | | | | | | | |
| Lectures | | | : | 3 Hours/Week | Continuous Assessment | | : | 30 |
| Final Exam | | | : | 3 hours | Final Exam Marks | | : | 70 |
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| **Pre-Requisite**: None. | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | |
|  | Familiarize with fundamental concepts of database and various database architectures and Design relations for Relational databases using conceptual data modeling. | | | | | | | |
|  | Implement formal relational operations in relational algebra and SQL. | | | | | | | |
|  | Identify the Indexing types and normalization process for relational databases | | | | | | | |
|  | Use mechanisms for the development of multi user database applications. | | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | | |
| CO1 | Ability to apply knowledge of database design methodology which give a good formal foundation in relational data model and Understand and apply the principles of data modeling using ER Model. | | | | | | | |
| CO2 | Familiar with relational DB theory and will able to write relational algebra expressions, Relational Calculus and SQL.for query | | | | | | | |
| CO3 | Design database schema and Identify and solve the redundancy problem in database tables using normalization. | | | | | | | |
| CO4 | Understand transaction processing, concurrency control and recovery techniques. | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | |
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| **UNIT-1** | | | | | | (12 hours) | | |
| **Databases and Database Users:** Introduction - An Example, Characteristics of the Database Approach, Actorson the Scene, Workers behind the Scene, Advantages of Using the DBMS Approach.  **Database System Concepts and Architecture :** DataModels, Schemas and Instances ,Three-SchemaArchitecture and Data Independence, Database Languages and Interfaces, The Database System Environment, Centralized and Client/Server Architectures for DBMSs.  **Data Modeling Using the Entity-Relationship (ER) Model :** Using High-Level Conceptual Data Models forDatabase Design, An Example Database Application, Entity Types, Entity Sets, Attributes, and Keys - Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, Refining the ER Design for the COMPANY Database - ER Diagrams, Naming Conventions, and Design Issues | | | | | | | | |
| **UNIT-2** | | | | | | (12 hours) | | |
| **The Relational Algebra and Relational Calculus** : Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION, The Tuple Relational Calculus, The Domain Relational Calculus.  **Schema Definition, Constraints, Queries, and Views** : SQL Data Definition and Data Types, Specifying Constraints in SQL, Schema Change Statements in SQL, Basic Queries in SQL,INSERT, DELETE, and UPDATE Statements in SQL , Views (Virtual Tables) in SQL | | | | | | | | |
| **UNIT-3** | | | | | | (12 hours) | | |
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| **Indexing Structures for Files:** Types of Single-Level Ordered Indexes, Multilevel Indexes - Dynamic Multilevel Indexes Using B+-Trees.  **Functional Dependencies and Normalization for Relational Databases:** Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys - General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form.  **Relational Database Design Algorithms and Further Dependencies:**Properties of Relational Decompositions -Lossless Join Decomposition and Dependency Preserving Decomposition, Multi-valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form. | | | | | | | | |
| **UNIT-4** | | | | | | (12 hours) | | |
| **Introduction to Transaction Processing Concepts and Theory:** Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability  **Concurrency Control Techniques:** Two-Phase Locking Techniques for Concurrency Control, Concurrency Control Based on Timestamp Ordering,Validation (Optimistic) Concurrency Control Techniques, Multiple Granularity.  **Database Recovery Techniques :**Recovery Techniques Based on Deferred Update, Recovery Techniques Based on Immediate Update, Shadow Paging. | | | | | | | | |
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| **Text Books:** | | Fundamentals of Database Systems, Ramez Elmasri and Navathe Pearson Education, 6thedition | | | | | | |
|  | |  | | | | | | |
| **References:** | | 1. Introduction to Database Systems, C.J. Date Pearson Education 2. Database Management Systems, Raghu Rama krishnan, Johannes Gehrke, TATA McGraw Hill3rdEdition   3. Database System Concepts, Silberschatz, Korth, McGraw hill,5thedition | | | | | | |

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| **DESIGN AND ANALYSIS OF ALGORITHMS**  II B. Tech. – IV Semester (Code: 22CM404/CC11) | | | | | | | | |
| Lectures | | : | | 3 Hours/Week, 1 Hour Tutorial | Continuous Assessment | | : | 30 |
| Final Exam | | : | | 3 hours | Final Exam Marks | | : | 70 |
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| **Pre-Requisite**: Data Structures (20CB302) | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | |
|  | Understand about designing and effectiveness of an algorithm, and applying of Master Theorem to find the complexity. | | | | | | | |
|  | Strengthen divide and conquer paradigms andknow the optimal solution finding with the greedy method. | | | | | | | |
|  | Acquaintance of algorithm design strategies of Dynamic programming and easy know the major graph algorithms and their analyses. | | | | | | | |
|  | Get the ability to backtracking,branch with bound values and NP problems. | | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | | |
| CO1 | Analyze the performance of algorithms through various strategies and apply the Master theorem to estimate the complexity of divide-and-conquer algorithms. | | | | | | | |
| CO2 | Apply the divide-and-conquer and greedy techniques to solve problems and perform complexity analysis. | | | | | | | |
| CO3 | Articulate on graph problems and identify the applicability of the dynamic-programming paradigm for designing solutions to problems. | | | | | | | |
| CO4 | Find all possible solutions for combinatorial and optimixation problems using Backtracking and Branch and Bound algorithms and also categorize the P and NP complex problems. | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | **POs** | | | | | | | | | | | | **PSOs** | | | | **CO** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | | **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 | - | | | | | | | | | |
|  | | | | | | | | |
| **UNIT-1** | | | | | | (12 hours) | | |
| **Introduction**: Algorithm, Pseudo code for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation-Bigoh-notation, Omega notation, Theta notation and Little oh notation, Probabilistic analysis, Amortized analysis.  **Master Theorem**: Introduction, Generic Form- Case1, Case2, Case3, Inadmissible equations, Application to common algorithms. | | | | | | | | |
| **UNIT-2** | | | | | | (12 hours) | | |
| **Divide and conquer**: General method, applications-Quicksort, Merge sort, Stassen’s matrix multiplication.  **Greedy method**: General method, applications-Job sequencing with deadlines, Fractional knapsack problem, Minimum cost spanning trees-Prims, Kruskal, Single source shortest path problem- Dijkstra. | | | | | | | | |
| **UNIT-3** | | | | | | (12 hours) | | |
| **Dynamic Programming:** General method, applications-0/1 knapsack problem, Travelling salesperson problem, Longest common sequence algorithm, Multi stage graphs using Forward& Backward approach, Reliability design.  **Graph Applications**: Graph traversals – Depth first, Breadth first, Bio Connected Components, Strongly Connected Components. | | | | | | | | |
| **UNIT-4** | | | | | | (12 hours) | | |
| **Backtracking:** General method, applications-n-queen problem, sum of subsets problem. Branch and Bound: General method, applications- 0/1 knapsack problem-LC Branch and Bound solution.  **NP-Hard and NP-Complete problems:** Basic concepts, non-deterministic algorithms, NP-Hardand NP Complete classes, Cook’s theorem. | | | | | | | | |
|  | | | | | | | | |
| **Text Books:** | | | E. Horowitz, S.Sahniand S. Rajasekaran, “Fundamentals of Computer Algorithms” ,GalgotiaPublication. | | | | | |
| **References:** | | | 1. T. H. Cormen, Leiserson, Rivestand Stein, “Introduction of Computer Algorithm”, PHI. 2. SaraBasse, A.V.Gelder, “Computer Algorithms”, Addison Wesley. | | | | | |

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| **TECHNICAL ENGLISH**  II B.Tech – IV Semester (Code: 22CM405/EL02) | | | | | | | | |
| Lectures | | : | | 3 Hours/Week | Continuous Assessment | | : | 30 |
| Final Exam | | : | | 3 hours | Final Exam Marks | | : | 70 |
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| **Pre-Requisite**: None. | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | |
|  | At enhancing the vocabulary competency of the students | | | | | | | |
|  | To enhance the understanding of the elements of grammar | | | | | | | |
|  | To enable the students to use proper spelling, grammar in constructing the sentences | | | | | | | |
|  | To enhance the learner’s ability to communicate accurately | | | | | | | |
|  | | | | | | | | |
| **Course Outcomes**: Students will be able to | | | | | | | | |
| CO1 | To comprehend the importance, barriers and strategies of listening skills in English. | | | | | | | |
| CO2 | To illustrate and impart practice Phonemic symbols, stress and intonation. | | | | | | | |
| CO3 | To practice oral skills and receive feedback on learners’ performance. | | | | | | | |
| CO4 | To practice language in various contexts through pair work, role plays, group work and dialogue conversations | | | | | | | |
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| **Mapping of Course Learning Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | **POs** | | | | | | | | | | | | **PSOs** | | | | **CO** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | | **CO1** | - | - | - | - | - | - | - | 2 | 2 | 3 | 2 | 2 | - | 2 | - | | **CO2** | - | - | - | - | - | - | - | 2 | 2 | 3 | 2 | 2 | - | 2 | - | | **CO3** | - | - | - | - | - | - | - | 2 | 2 | 3 | 2 | 2 | - | 2 | - | | **CO4** | - | - | - | - | - | - | - | 2 | 2 | 3 | 2 | 2 | - | 2 | - | | | | | | | | | |
|  | | | | | | | | |
| **UNIT-1** | | | | | | (12 hours) | | |
| 1.1 Vocabulary Development: Familiarizing Idioms &Phrases  1.2 Grammar for Academic Writing: Making Requests  1.3 Language Development: Using Transition & Link words  1.4 Technical Writing: Letter Writing &Email Writing | | | | | | | | |
| **UNIT-2** | | | | | | (12 hours) | | |
| 2.1 Vocabulary Development: Analogous words, Gender Sensitive language  2.2 Grammar for Academic Writing: Tenses: Simple Past /Present Perfect, The Future: Predicting &Proposing  2.3 Language Development: Cloze tests  2.4 Technical Writing: Technical Reports | | | | | | | | |
| **UNIT-3** | | | | | | (12 hours) | | |
| 3.1 Vocabulary Development: Abbreviations &Acronyms  3.2 Grammar for Academic Writing: Describing(People/Things/Circumstances) : Adjectival &Adverbial groups  3.3 Language Development: Transcoding (Channel conversion from chart to text)  3.4 Technical Writing: Circular, Memos, Minutes of Meeting | | | | | | | | |
| **UNIT-4** | | | | | | (12 hours) | | |
| 4.1 Vocabulary Development: Corporate vocabulary  4.2 Grammar for Academic Writing: Inversions &Emphasis  4.3 Language Development: Reading Comprehension  4.4 Technical Writing: Resume Preparation | | | | | | | | |
|  | | | | | | | | |
| **References:** | | | 1. Communication Skills, Sanjay Kumar & Pushpa Latha. Oxford University Press:2011. 2. Technical Communication Principles and Practice. Oxford University Press:2014. 3. Advanced Language Practice, Michael Vince. Macmillan Publishers:2003. 4. Objective English (Third Edition), Edgar Thorpe & Showick. Pearson Education:2009 5. English Grammar: A University Course (Second Edition), Angela Downing Philip Locke, Routledge Taylor &Francis Group 2016 | | | | | |

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| **Advanced Python Programming**  II B. Tech – III Semester **(Code: 22CML401/SOC2)** | | | | | | | | | | | | | | | | | | |
| Lectures | : | 5 Hours /week (2T + 3P) | | | | | | | Continuous Assessment | | | | | | | : | 30 | |
| Final Exam | : | 3 Hours | | | | | | | Final Exam Marks | | | | | | | : | 70 | |
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| Pre-Requisite: Python Programming | | | | | | | | | | | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | | | | | | | | | | | |
|  | Write Python code for Modules, Packages & Database Connectivity. | | | | | | | | | | | | | | | | | |
|  | Write Python code for NumPy. | | | | | | | | | | | | | | | | | |
|  | Write Python code for Pandas. | | | | | | | | | | | | | | | | | |
|  | Write Python code for Data Visualizations. | | | | | | | | | | | | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | | | | | | | | | | | | |
| CO1 | Understand Modules, Packages & Database Connectivity. | | | | | | | | | | | | | | | | | |
| CO2 | Demonstrate Array operations using NumPy. | | | | | | | | | | | | | | | | | |
| CO3 | Demonstrate Data analysis and Data Wrangling using pandas. | | | | | | | | | | | | | | | | | |
| CO4 | Develop different types of Data Visualizations using matplotlib and Seaborn. | | | | | | | | | | | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | | | | | | | | | | | |
|  | **PO’s** | | | | | | | | | | | | | **PSO’s** | | | | |
| **CO** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | | **9** | **10** | **11** | **12** | **1** | | **2** | | **3** |
| **CO1** | 1 | 1 | 1 | 1 | 3 | - | - | - | | - | 1 | 2 | 2 | 2 | | 1 | | 1 |
| **CO2** | 2 | 3 | 2 | 2 | 3 | - | - | - | | - | 1 | 2 | 2 | 1 | | 2 | | 1 |
| **CO3** | 1 | 3 | 2 | 2 | 3 | - | - | - | | - | 1 | 2 | 2 | 2 | | 1 | | 2 |
| **CO4** | 1 | 2 | 2 | 2 | 3 | - | - | - | | - | - | 2 | 2 | 2 | | 1 | | 2 |
|  | | | | | | | | | | | | | | | | | | |
| **UNIT-1** | | | | | | | | | | | | | | ( 7 Hours) | | | | |
| **Modules and Packages:** Introduction python module, creating module, using the module, accessing from module, creating package, package initialization, importing from packages, different ways to import modules and packages, creating sub packages and importing.  **Database Connectivity & Operations**: Introduction to **Python SQLite3** DB module, using **SQLite3 to**  create insert, retrieve, delete, update and drop table operations on tables. | | | | | | | | | | | | | | | | | | |
| **UNIT-2** | | | | | | | | | | | | | | ( 7 Hours) | | | | |
| **NumPy Module**: Introduction to NumPy, A Multidimensional Array Object, Creating ndarrays ,Data Types for ndarrays, Operations between Arrays and Scalars, Basic Indexing and Slicing, Boolean Indexing, Fancy Indexing, Data Processing Using Arrays, Expressing Conditional Logic as Array Operations, Methods for Boolean Arrays , Sorting , Unique. | | | | | | | | | | | | | | | | | | |
| **UNIT-3** | | | | | | | | | | | | | | | (7 Hours) | | | |

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| **Pandas Module:** Introduction to pandas, Pandas Series, Pandas DataFrames, creating DataFrame, reading from csv files & Excel files, reading from json files, data cleaning, cleaning wrong format, cleaning wrong data, data correlations, pandas for plotting, displaying plots.  **Data Wrangling:** Combining and Merging Data Sets, Database style Data Frame Merges, Merging on Index, Concatenating Along an Axis, Combining Data with Overlap, Reshaping and Pivoting, Reshaping with Hierarchical Indexing, Data Transformation, Removing Duplicates, Replacing Values. | | | | | |
| **UNIT-4** | | | | (7 Hours) | |
| **Plotting and Visualization using Matplotlib**: Introduction to Matplotlib, Figures and Subplots, Colors, Markers, and Line Styles, Ticks, Labels, and Legends, Annotations and Drawing on a Subplot, Saving Plots to File, Line Plots, Bar Plots, Histograms and Density Plots, Scatter Plots, Pie chart using Matplotlib.  **Plotting and Visualization using Seaborn:** Introduction to Seaborn, Plotting using Scatter Plot, Strip Plot, Swarm Plot, Count Plot, Box Plot, Pair Plot, Cat Plot, lmplot Plot, DistPlot. | | | | | |
| **LIST OF EXPERIMENTS** | | | | | |
| 1. **Implement Modules and packages in Python**    1. Write a Python program to Create a Module to use a Module.    2. Write a Python program to Rename a Module.    3. Write a Python program to import specific names from a module without importing the module as a whole.    4. Write a Python program to list all the functions (or variable names) in a module.    5. Write a Python program to create and import packages    6. Write a Python program to create and import subpackages 2. **Database Connectivity & Operations**: Python SQLite3. 3. Write a Python program to demonstrate database operations such as **create, insert, select, & where in below Student Table.** 4. Write a Python program to demonstrate database operations such **as update, delete, & drop table in below Student Table.**   **STUDENT TABLE**   * 1. Write a python program to create the below Employee table.   2. Write a python program to sort employee names in the Employee table.   3. Write a python program using **Aggregate functions** (MIN, MAX, SUM and AVG) for below table.   **EMPLOYEE TABLE** | | | | | |
|  | **Emp\_ID** | **Emp\_Name** | **Dept** | **Salary** |  |
| 400 | Suresh | Physics | 40000 |
| 401 | Jaya Lakshmi | Chemistry | 50000 |
| 402 | Durgesh | Maths | 50000 |
| 403 | Sai | Physics | 45000 |
| 404 | Pallavi | English | 48000 |

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| **Name** | **Branch** | **Address** |
| Naresh | IT | Hyderabad |
| Venkat | CSE | Bapatla |
| Rajesh | AIML | Guntur |
| Vinay | CBDS | Tenali |
| Bose | CIVIL | Ongole |

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| 1. **NumPy**    1. Develop a Python Program to create & split arrays using NumPy module.    2. Develop a Python Program to test all aggregate functions in NumPy module.    3. Develop a Python Program to generate a matrix of random numbers within range and print its Transpose. 2. **NumPy**    1. Develop a Python Program that calculates variance, co variance, correlation by taking sample statistical data.    2. Develop a python program to find rank, determinant, and trace of a matrix. 3. **Pandas**    1. Develop a python program to implement Pandas Series with labels and dictionary.    2. Develop a program to creating a Pandas DataFrame using dictionary and 2-D array.    3. Develop a program which make use of following Panda’s methods.   i) describe () ii) head() iii) tail() iv) info()   * 1. Develop a program for Preprocessing of Dataframe.  1. **Pandas**    1. Develop a python program of group by() and pivot() method.    2. Demonstrate pandas Merging, Joining and Concatenating.    3. Write code to read data from text file, CSV file, Excel file and JSON file into a Dataframe. Print the overview of data and slice data using different indexing/slicing methods.    4. Convert a Dataframe to .csv, .json, .xml, .txt and .xlsx files. 2. **Using Matplotlib package, draw the following and customize them.**   1) Scatter Plot 2) Bar Plot 3) Pie Chart 4) Histogram 5) Box Plot   1. **Using Seaborn package, draw the following.**    1. Scatter Plot 2) Strip Plot 3) Swarm Plot 4) Count Plot 5) Box Plot. 2. **Using Seaborn package, draw the following**.    1. Pair Plot 2) Cat Plot 3) Count Plot 4) Implot Plot 5) DistPlot. | |
| **Text Books:** | 1) Wes McKinney, “Python for Data Analysis”, O’Reilly, ISBN:978-1-449-31979- 3, 1st edition, October 2012. |
| 2) Rachel Schutt & O’neil, “Doing Data Science”, O’Reilly, ISBN:978-1-449- 35865-5, 1st edition, October 2013. |
| 3) Problem solving and python programming fundamentals and application: NumPy, Pandas and Matplotlib. Harsha Bhasin. |
| **References:** | 1) Joel Grus, “Data Science from Scratch: First Principles with Python”, O’Reilly Media, 2015 |
| Matt Harrison, “Learning the Pandas Library: Python Tools for Data Munging, Analysis, and Visualization, O'Reilly, 2016. |

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| **Artificial Intelligence Lab**  **II B.Tech – IV Semester (Code: 22CML402)** | | | | | | | |
| Labs | | : | | 3 Hours/Week | Continuous Assessment | : | 30 |
| Final Exam | | : | | 3 hours | Final Exam Marks | : | 70 |
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| **Pre-Requisite**: None. | | | | | | | |
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| **Course Objectives:** The main objectives of this course are: | | | | | | | |
|  | 1. Demonstrate various Python packages that are used for solving AI problems | | | | | | |
|  | 2. Illustrate AI problems using informed and uninformed search techniques. | | | | | | |
|  | 3. Discuss computational problems using AI techniques | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | |
| CO1 | Solve the given problems using Python. | | | | | | |
| CO2 | Apply heuristic search techniques for solving simple AI problems. | | | | | | |
| CO3 | Implement solutions to problems using uninformed search techniques. | | | | | | |
| CO4 | Develop solutions for the given real world problems. | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | |
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| **LIST OF EXPERIMENTS** | | | | | | | |
| 1. Write a Program to Implement Breadth First Search using Python. 2. Write a Program to Implement Depth First Search using Python. 3. Write a program to implement Hill Climbing Algorithm 4. Write a program to implement A\* Algorithm 5. Write a Program to Implement Tic-Tac-Toe game using Python. 6. Write a Program to Implement 8-Puzzle problem using Python. 7. Write a Program to Implement Water-Jug problem using Python. 8. Write a Program to Implement Travelling Salesman Problem using Python. 9. Write a Program to Implement Tower of Hanoi using Python. 10. Write a Program to Implement Monkey Banana Problem using Python. 11. Write a Program to Implement Alpha-Beta Pruning using Python. 12. Write a Program to Implement 8-Queens Problem using Python. | | | | | | | |
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| **Text Books:** | | | 1. Artificial Intelligence - A Modern Approach, Stuart Russell and Peter Norvig, Fourth Edition, Pearson Education | | | | |
| **References:** | | | Reference Books: 1. Artificial Intelligence, E. Rich and K. Knight,3rd Edn.,(TMH) 2. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, 3rd Edn., PearsonEducation. 3. A First Course in Artificial Intelligence, Deepak Khemani, Tata Mc-GrahHill. 4. Artificial Intelligence and Expert systems – Patterson, Pearson Education. 5. Artificial Intelligence, SarojKaushik, CENGAGE Learning | | | | |

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| **WEB TECHNOLOGIES LAB**  II B.Tech – IV Semester (Code: 22CML403/CC12) | | | | | | | |
| Labs | | : | | 3 Hours/Week | Continuous Assessment | : | 30 |
| Final Exam | | : | | 3 hours | Final Exam Marks | : | 70 |
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| **Pre-Requisite**: None. | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | |
|  | Know elements and tags of HTML and apply Styles using Cascading Style Sheets. | | | | | | |
|  | Know basics of Java Script, Functions, Events, Objects and Working with browser objects. | | | | | | |
|  | Know basics of XML, DOM and advanced features of XML. | | | | | | |
|  | To convert XML documents into other formats and XSLT. | | | | | | |
|  | | | | | | | |
| **Course Outcomes**: Students will be able to | | | | | | | |
| CO1 | Analyze a web page and identify its elements and attributes | | | | | | |
| CO2 | Create web pages using XHTML and Cascading Styles sheets. | | | | | | |
| CO3 | Build dynamic web pages using JavaScript (client side programming). Students will be able to write a well formed / valid XML documents | | | | | | |
| CO4 | Understand Web server and its working. Design and implement a client-server internet application that accommodates specific requirements and constraints. | | | | | | |
|  | | | | | | | |
| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | |
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| **LIST OF EXPERIMENTS** | | | | | | | |
| 1. Write HTML5 document to design a webpage. (Using all fundamental elements, Organizing text, Links, URLs and Tables).  2. Write HTML5 document to design a webpage. (Using Images, Colors, Canvas & Forms).  3. Write codes for different types of styles in CSS3.  4. Write java scripts covering Function, Arrays and Events.  5. Demonstrate JavaScript objects.  6. Demonstrate browser objects.  7. Demonstrate Document Object Model for an HTML document.  8. Write well-formed and valid XML documents.  9. Write code for converting XML document to HTML using XSLT.  10. Build a webpage using JQuery and its components. | | | | | | | |
|  | | | | | | | |
| **Text Books:** | | | Kogent Learning Solutions Inc.,HTML5 BlackBook: Covers CSS3, Javascript, XML, XHTML, Ajax, PHP and Jquery. | | | | |
| **References:** | | | 1. Harvey M. Deitel and Paul J.Deitel, “Internet &World Wide Web How to Program”, 4/e, Pearson Education. 2. Joshua Elchorn, “Understanding AJAX”, Prentice Hall 2006. | | | | |

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| **RDBMS Lab**  II B.Tech – IV Semester(Code: 22CML404/CC13) | | | | | | |
| Labs | | : | 3 Hours/Week | Continuous Assessment | : | 30 |
| Final Exam | | : | 3 hours | Final Exam Marks | : | 70 |
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| **Pre-Requisite**: None. | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | |
|  | Analyze the student on database languages. | | | | | |
|  | Interpret the Knowledge on database design. | | | | | |
|  | Determine the knowledge on key constraints and Normalization. | | | | | |
|  | Determine the knowledge on procedures and functions. | | | | | |
|  | | | | | | |
| **Course Outcomes**: Students will be able to | | | | | | |
| CO1 | Design database by using ER Diagrams | | | | | |
| CO2 | Implement DDL, DML, DCL Commands using SQL. | | | | | |
| CO3 | Apply key constrains to get a normalized database. | | | | | |
| CO4 | Implement procedures and functions using PL/SQL | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | **POs** | | | | | | | | | | | | **PSOs** | | | | **CO** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | | **CO1** | 3 | 3 | 3 | 3 | 3 | - | - | 2 | - | 2 | - | 3 | 3 | 3 | 3 | | **CO2** | 3 | 3 | 3 | 3 | 3 | - | - | 2 | - | 2 | - | 3 | 3 | 3 | 3 | | **CO3** | 3 | 3 | 3 | 3 | 3 | - | - | 2 | - | 2 | - | 3 | 3 | 3 | 3 | | **CO4** | 3 | 3 | 3 | 3 | 3 | - | - | 2 | - | 2 | - | 3 | 3 | 3 | 3 | | | | | | | |
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| **LIST OF EXPERIMENTS** | | | | | | |
| **Experiment 1: Working with ER Diagram**  Example: ER Diagram for Sailors Database  Entities:   1. Sailor 2. Boat Relationship: Reserves Primary Key Atributes: 3. SID (Sailor Entity) 4. BID (Boat Entity)   **Experiment 2: Working with DDL, DML, DCL and Key Constraints**  Creation, Altering and Dropping of Tables and Inserting Rows into a Table (Use Constraints While Creating Tables) Examples Using Select Command.  **Experiment 3: Working with Queries and Nested QUERIES**  Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints  **Expriment 4: Working with Queries USING Aggregate Operators & views**  Queries using Aggregate Functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and Dropping of Views  **Experiment 5: Working with Conversion Functions & String Functions**  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  **Experiment 6: Working with LOOPS using PL/SQL**  Program Development using WHILE LOOPS, FOR LOOPS, Nested Loops using ERROR Handling.  **Experiment 7: Working with Functions Using PL/SQL**  Program Development using Creation of Stored Functions, Invoke Functions in SQL Statements and Write Complex Functions.  **Experiment 8: Working with Stored Procedures**  Programs Development using Creation of Procedures, Passing Parameters IN and OUT of  PROCEDURES  **Experiment 9: Working with CURSORS**  Develop Programs using Features Parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of Clause and CURSOR Variables.  **Experiment 10: Working with Triggers using PL/SQL**  Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers | | | | | | |
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| **Text Books:** | | Oracle PL/SQL by Example, Benjamin Rosenzweig, Elena Silvestrova, Pearson Education 3rdEd  Oracle Database Logic PL/SQL Programming, ScottUrman, TataMc-Graw Hill.  SQL and PL/SQL for Oracle 10g, Black Book, Dr.P.S.Deshpande | | | | |
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| **Machine Learning**  III B. Tech. – V Semester (Code: 22CM501) | | | | | | | | |
| Lectures | | | : | 3 Hours/Week | Continuous Assessment | | : | 30 |
| Final Exam | | | : | 3 Hours | Final Exam Marks | | : | 70 |
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| **Pre-Requisite**: **Basic Calculus and Probability** | | | | | | | | |
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| **Course Objectives:** | | | | | | | | |
|  | 1.a Use python based machine learning libraries.  1.b Learn implementation of linear regression models. | | | | | | | |
|  | 2.a Comprehend decision tree learning algorithm.  2.b Apply neural networks and learn from real world data. | | | | | | | |
|  | 3.a Understand generative classifiers.  3.b Analyze discriminative classifiers. | | | | | | | |
|  | 4.a Understand Bmputational learning theory.  4.b Comprehend instance based learning.  4.c Analyze unsupervised learning algorithms. | | | | | | | |
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| **Course Outcomes**: Students will be able to: | | | | | | | | |
| CO1 | Use python based machine learning libraries.  Learn implementation of linear regression models. | | | | | | | |
| CO2 | Comprehend decision tree learning algorithm.  Apply neural networks and learn from real world data | | | | | | | |
| CO3 | Understand generative classifiers.  Analyze discriminative classifiers. | | | | | | | |
| CO4 | Understand computational learning theory.  Comprehend instance based learning.  Analyze unsupervised learning algorithms. | | | | | | | |
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| **UNIT-1** | | | | | | (12 Hours) | | |
| **Introduction:** Introduction to machine learning, Essential Python Libraries: Scikit-learn, Jupyter Notebook, NumPy, matplotlib, Pandas. A First Application: Classifying iris species using Sci-kit learn.  **Linear Regression:** Simple linear regression. Batch gradient decent algorithm, Stochastic gradient descent algorithm, Multiple linear regression**,** Locally weighted linear regression. | | | | | | | | |
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| **UNIT-2** | | | | | | (12 Hours) | | |
| **Decision Tree Learning:** Decision Tree representation, Decision Tree learning, hypothesis space search in Decision Tree learning, inductive bias in Decision Tree learning and issues in Decision Tree learning.  **Artificial Neural Networks:** Neural Network representations, Perceptron, Perceptron Training rule, Gradient Descent and the delta rule, Multilayer Networks and the Back propagation algorithm and remarks on the Back propagation algorithm. | | | | | | | | |
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| **UNIT-3** | | | | | | (12 Hours) | | |
| **Generative Classifiers:** Learning classiﬁers based on Bayes Rule, Naïve Bayes Algorithm, Conditional Independence, Derivation of Naïve Bayes Algorithm, Naïve Bayes for discrete-valued Inputs, Naïve Bayes for continuous inputs.  **Discriminative Classifiers::** Logistic Regression, Estimating Parameters for Logistic Regression, Regularization in Logistic Regression | | | | | | | | |
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| **UNIT-4** | | | | | | (12 Hours) | | |
| **Computational learning theory**: Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis spaces.  **Instance Based Learning**: Introduction, k-Nearest Neighbor learning.  **Unsupervised Learning**: K-means clustering algorithm, Gaussian mixture model, EM algorithm. | | | | | | | | |
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| Text Books : | | 1. Introduction to Machine Learning with Python by Andreas C. Mueller and Sarah Guido by O’Reilly Media.(Unit-1) 2. Lecture Notes by Mr. Andrew Ng, Stanford University <https://see.stanford.edu/materials/aimlcs229/cs229-notes1.pdf(Unit-2)> 3. Tom M. Mitchell, “Machine Learning”, First Edition, Mc. Graw Hill Publishing. (including draft chapters of second edition) | | | | | | |
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| **References :** | | Lecture Notes by Mr. Andrew Ng, Stanford University https://see.stanford.edu/materials/aimlcs229/cs229-notes1.pdf | | | | | | |

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| **COMPUTER NETWORKS**  III B. Tech. – V Semester (Code: 22CM502)/ CC15 | | | | | | | | |
| Lectures | | | : | 3 Hours/Week | Continuous Assessment | | : | 30 |
| Final Exam | | | : | 3 hours | Final Exam Marks | | : | 70 |
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| **Pre-Requisite**: Operating Systems (22CM304) | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | |
|  | Understand the basic concepts of data communication, layered model, protocols and OSI&TCP layers | | | | | | | |
|  | Understand the basic concepts of Data Link control, Network Layer Design Issues, Routing Algorithms & Congestion. | | | | | | | |
|  | Understand the basic concepts of Quality of service, Network Layer & Transport Layer | | | | | | | |
|  | Understand the basic concepts of TCP, UDP & Application Layer | | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | | |
| CO1 | Able to learn types of communications, topologies, OSI, TCP/IP protocol architectures along with error detection and correction mechanisms and also the working of data link layer | | | | | | | |
| CO2 | Able to learn types of communications, topologies, OSI, TCP/IP protocol architectures along with error detection and correction mechanisms and also the working of data link layer | | | | | | | |
| CO3 | Able to know the transport layer issues, establishment of remote procedure calls and TCP segment header. | | | | | | | |
| CO4 | Able to learn the working of TCP and UDP and differennt application layer issues. | | | | | | | |
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| **Mapping of Course Learning Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | |
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| **UNIT-1** | | | | | | (12 Hours) | | |
| **Data Communications & Networking Overview:** A Communications Model, Data Communications, Data Communication Networking.  **Protocol Architecture:** The Need for a Protocol Architecture, A Simple Protocol Architecture, OSI, The TCP/IP Protocol Architecture.  **Digital Data Communication Techniques:** Asynchronous & Synchronous Transmission, Types of Errors, Error Detection, Error Correction. | | | | | | | | |
| **UNIT-2** | | | | | | (12 Hours) | | |
| **Data Link Control:** Flow Control, Error Control.  **Network Layer:**Network Layer Design Issues: Store-and-Forward Packet Switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection-Oriented Service, Comparison of Virtual-Circuit & Datagram Subnets.  **Routing Algorithms:** The Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing.  **Congestion Control Algorithms:** General Principles of Congestion Control, Congestion Prevention Policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram Subnets, Load Shedding, Jitter Control. | | | | | | | | |
| **UNIT-3** | | | | | | (12 Hours) | | |
| **Quality of Service:** Requirements, Techniques for Achieving Good Quality of Service The Network Layer in the Internet: The IP Protocol, IP Addresses, Internet Control Protocols. The **Transport Layer, The Transport Service:** Services Provided to the Upper Layers, Transport Service Primitives, Berkeley sockets  **Elements of Transport Protocols:** Addressing, Connection Establishment, Connection Release, Flow Control and Buffering, Multiplexing, Crash Recovery. | | | | | | | | |
| **UNIT-4** | | | | | | (12 Hours) | | |
| **The Internet Transport Protocol (UDP):** Introduction to UDP, Remote Procedure Call, The Real-Time Transport Protocol.  **The Internet Transport Protocols (TCP):** Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, Modeling TCP Connection Management, TCP Transmission Policy, TCP Congestion Control, TCP Timer Management.  **Application Layer:**The Domain Name System (DNS): The DNS Name Space, Resource Records, Name Servers. | | | | | | | | |
| **Text Books:** | | 1. BehrouzA.Forouzan,“DataCommunicationsandNetworking”,4thedition, TMH. 2. Tanenbaum,“ComputerNetworks”,5thEdition,PearsonEducation,2011 | | | | | | |
| **References:** | | 1. WayneTomasi,“IntroductiontoDataCommunicationsandNetworking”,PHI. 2. BehrouzA.Forouzan,“DataCommunicationsandNetworking”,Fourthedition,TMH 3. God Bole,“DataCommunications&Networking”,TMH. 4. Kurose & Ross, “COMPUTER NETWORKS– A Top-down approach featuring the Internet”, Pearson Education,AlbertoLeon,Garciak. 5. LeonGartia,IndraWidjaja,“CommunicationNetworksFundamentalConceptsandKeyArchitectures”,TMH. 6. NaderF.Mir,“ComputerandCommunicationNetworks”,PHI. | | | | | | |

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| **SOFTWARE ENGINEERING**  III B.Tech – V Semester (Code: 22CM503) | | | | | | | | | | | | | | | | | | | | | | |
| Lectures | | : | | | 3 Hours/Week, | | | | | | | | Continuous Assessment | | | | | | : | | 30 | |
| Final Exam | | : | | | 3 Hours | | | | | | | | Final Exam Marks | | | | | | : | | 70 | |
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| **Pre-Requisite**: None. | | | | | | | | | | | | | | | | | | | | | | |
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| **Course Objectives:** The student will be able to | | | | | | | | | | | | | | | | | | | | | | |
|  | Understand different process models of Software Engineering and | | | | | | | | | | | | | | | | | | | | | |
|  | Understand Agile Software Development. How to collect requirements from client and how to analyze the collected requirements. | | | | | | | | | | | | | | | | | | | | | |
|  | Understand how to design and implement the Software Product or Project. | | | | | | | | | | | | | | | | | | | | | |
|  | Understand the concepts of Testing and Measuring the software project or Product. | | | | | | | | | | | | | | | | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | | | | | | | | | | | | | | | | |
| CO1 | Understand different generic process models. | | | | | | | | | | | | | | | | | | | | | |
| CO2 | Understand agile process models. Develop different analysis models for the software project. | | | | | | | | | | | | | | | | | | | | | |
| CO3 | Develop different design models for the software project. | | | | | | | | | | | | | | | | | | | | | |
| CO4 | Understand different testing strategies, software metrics and measures. | | | | | | | | | | | | | | | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | | | | | | | | | | | | | | | |
|  | **POs** | | | | | | | | | | | | | | | | **PSOs** | | | | | |
| **CO** | **1** | | | **2** | | **3** | **4** | **5** | **6** | **7** | **8** | **9** | | **10** | **11** | **12** | **1** | | | **2** | | **3** |
| **CO1** | 3 | | | 3 | | 3 | - | 3 | - | - | - | - | | - | - | 3 | 3 | | | 2 | | 3 |
| **CO2** | 3 | | | 3 | | 3 | - | 3 | - | - | - | - | | - | - | 3 | 3 | | | 2 | | 3 |
| **CO3** | 3 | | | 3 | | 3 | - | 3 | - | - | - | - | | - | - | 3 | 3 | | | 2 | | 3 |
| **CO4** | 3 | | | 3 | | 3 | - | 3 | - | - | - | - | | - | - | 3 | 3 | | | 2 | | 3 |
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| **UNIT-1** | | | | | | | | | | | | | | | | | | (12 Hours) | | | | |
| **INTRODUCTION TO SOFTWARE ENGINEERING**: The Evolving Role of Software, Software, the Changing Nature of Software, Legacy Software, Software Myths.  **A GENERIC VIEW OF PROCESS**: Software Engineering - A Layered Technology, a Process Framework, the CMMI, Process Patterns, Process Assessment, Personal and Team Process Models, Product and Process.  **PROCESS MODELS**: Prescriptive Models, the Waterfall Model, Incremental Process Models, Evolutionary Models, the Unified Process. | | | | | | | | | | | | | | | | | | | | | | |
| **UNIT-2** | | | | | | | | | | | | | | | | | | (12 Hours) | | | | |
| **AN AGILE VIEW OF PROCESS**: What Is Agility? , What Is an Agile Process? , Agile Process Models.  **REQUIREMENTS ENGINEERING**: A Bridge To Design and Construction, Requirements Engineering Tasks, Initiating the Requirements Engineering Process, Eliciting Requirements, Developing Use-cases, Building the Analysis Model, Negotiating Requirements, Validating Requirements.  **BUILDING THE ANALYSIS MODEL**: Requirements Analysis, Analysis Modeling Approaches, Data Modeling Concepts, Flow-Oriented Modeling, Class Based Modeling Creating a Behavioral Model. | | | | | | | | | | | | | | | | | | | | | | |
| **UNIT-3** | | | | | | | | | | | | | | | | | | (12 Hours) | | | | |
| **DESIGN ENGINEERING**: Design within the Context of Software Engineering, Design Process and Design Quality, Design Concepts The Design Model, Pattern Based Software Design.  **CREATING AN ARCHITECTURAL** **DESIGN**: Software Architecture, Data Design, Architectural Styles and Patterns, Architectural Design, Assessing Alternative Architectural Designs.  **MODELING COMPONENT-LEVEL DESIGN**: What Is a Component? , Designing Class-Based Components, Conducting Component-Level Design, Designing Conventional Components.  **PERFORMING USER INTERFACE DESIGN**: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation. | | | | | | | | | | | | | | | | | | | | | | |
| **UNIT-4** | | | | | | | | | | | | | | | | | | (12 Hours) | | | | |
| **SOFTWARE PROCESS AND PROJECT METRICS**: Introduction: Metrics Process and Project Domains, Software Measurement, Metrics for Software Quality, Integrating Metrics with Process.  **SOFTWARE QUALITY ASSURANCE**: Quality Concepts, Quality Movement, SQA, Software Reviews, Formal Technical Reviews, Formal Approaches to SQA, Software Reliability, ISO 9000 Quality Standards, SQA Plan.  **SOFTWARE TESTING STRATEGIES**: Strategic Approach, Strategic Issues, Test strategies for Conventional Software, White box testing, Black Box testing, Test strategies for Object Oriented Software, Validation Testing, System Testing, The Art of Debugging. | | | | | | | | | | | | | | | | | | | | | | |
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| **Text Books:** | | | Roger S.Pressman, “Software Engineering- A Practitioner's Approach”, **McGraw Hill** , 2014, 8th. **McGraw Hill** ISBN- **978-0078022128** | | | | | | | | | | | | | | | | | | | |
| **References:** | | | 1. K.K. Aggarwal & Yogesh Singh, “Software Engineering”, New Age International, 2008, Third Edition,. ISBN- **978-8122423600** 2. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Springer, 2005, Second Edition. ISBN- 978-0-387-20881-7 3. Ian Sommerville, “Software Engineering”, Pearson Education, 2017, 10th Edition. ISBN-13: ‎ 978-9332582699 4. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, “Fundamentals of Software Engineering”, PHI, 2002, Second Edition. ISBN - ‎ 978-8120322424 5. RajibMall, “Fundamentals of Software Engineering”, PHI, 2018, 5thEdition, PHI. ISBN- ‎ 978-9388028028 | | | | | | | | | | | | | | | | | | | |

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| **DATAWAREHOUSING AND DATA MINING**  III B.Tech – V Semester (Code: 22CM504/PE01) | | | | | | | | | | | | | | | | | | |
| Lectures | : | 3 Hours /week | | | | | | | Continuous Assessment | | | | | | | : | 30 | |
| Final Exam | : | 3 Hours | | | | | | | Final Exam Marks | | | | | | | : | 70 | |
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| **Pre-Requisite**: Database Management Systems (18DS403) and basic mathematics | | | | | | | | | | | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | | | | | | | | | | | |
|  | Identify the scope and necessity of Data Warehousing & Mining for the society. | | | | | | | | | | | | | | | | | |
|  | Understand importance of data, data preprocessing techniques to solve the real time problems. | | | | | | | | | | | | | | | | | |
|  | Understand and implement classical models and algorithms in data warehouses and data mining. | | | | | | | | | | | | | | | | | |
|  | Develop skill in selecting the appropriate data mining algorithm for solving practical problems. | | | | | | | | | | | | | | | | | |
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| **Course Learning Outcomes**: Students will be able to | | | | | | | | | | | | | | | | | | |
| CO1 | Understand scope and necessity of Data Warehousing & Mining for the society. | | | | | | | | | | | | | | | | | |
| CO2 | Understand, implement preprocessing techniques and classification models and develop skills in selecting appropriate preprocessing and classification algorithms. | | | | | | | | | | | | | | | | | |
| CO3 | Understand, implement classical models and develop skills in selecting appropriate association rule mining algorithms. | | | | | | | | | | | | | | | | | |
| CO4 | Understand, implement clustering models and develop skills in analyzing appropriate clustering algorithms to solve real time problems. | | | | | | | | | | | | | | | | | |
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| **Mapping of Course Learning Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | | | | | | | | | | | |
|  | **POs** | | | | | | | | | | | | | **PSOs** | | | | |
| **CO** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | | **9** | **10** | **11** | **12** | **1** | | **2** | | **3** |
| **CO1** | 3 | 3 | 3 | 3 | 3 | - | - | - | | - | - | - | 2 | 3 | | 3 | | 2 |
| **CO2** | 3 | 3 | 3 | 3 | 3 | - | - | - | | - | - | - | 2 | 3 | | 3 | | 2 |
| **CO3** | 3 | 3 | 3 | 3 | 3 | - | - | - | | - | - | - | 2 | 3 | | 3 | | 2 |
| **CO4** | 3 | 3 | 3 | 3 | 3 | - | - | - | | - | - | - | 2 | 3 | | 3 | | 2 |
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| **UNIT-1** | | | | | | | | | | | | | | (12 Hours) | | | | |
| **Data Mining:** Introduction, Kinds of Data, Data Mining Functionalities, Classification of DataMining Systems, Major Issues in Data Mining  **Data Pre-processing:** Importance of Data Process, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation | | | | | | | | | | | | | | | | | | |
| **UNIT-2** | | | | | | | | | | | | | | | (12 Hours) | | | |
| **Data Warehouse and OLAP Technology:** Introduction, A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation from Data Warehousing to Data Mining.  **Data Cube Computation and Data Generalization:** Efficient Methods for Data Cube Computation, Further Development of Data Cube and OLAP Technology, Attribute-Oriented Induction An Alternative Method for Data Generalization and Concept Description. | | | | | | | | | | | | | | | | | | |
| **UNIT-3** | | | | | | | | | | | | | | | (12 Hours) | | | |
| **Mining Frequent Patterns, Associations, and Correlations**: Basic Concepts and a Road Map, Efficient and Scalable Frequent Item-set Mining Methods, Mining Various Kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining. | | | | | | | | | | | | | | | | | | |
| **UNIT-4** | | | | | | | | | | | | | | | (12 Hours) | | | |
| **Cluster Analysis**: Introduction, Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods- k-Means and k-Medoids, Hierarchical Methods- Agglomerative and Divisive Hierarchical Clustering, Density-Based Methods- DBSCAN, Grid- Based Methods- STING, Outlier Analysis. | | | | | | | | | | | | | | | | | | |
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| **Text Books:** | Jiawei Han Micheline Kamber – “Data Mining Concepts & Techniques”, 2nd ed., Morgan Kaufmann Publishers. | | | | | | | | | | | | | | | | | |
|  |  | | | | | | | | | | | | | | | | | |
| **References:** | * + - 1. “Data Warehousing in the real world – A Practical guide for Building decision support systems”, Sam Anahory, Dennis Murray, Pearson Education.       2. “Data Mining (Introductory and Advances Topics)”, Margaret H. Dunham, Pearson Education. | | | | | | | | | | | | | | | | | |

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| **DATA HANDLING AND VISUALIZATION**  III B.Tech – V Semester (Code: 22CM505/JO1A) | | | | | | | | | | | | | | | | | | |
| Lectures | : | 3 Hours /week | | | | | | | Continuous Assessment | | | | | | | : | 30 | |
| Final Exam | : | 3 Hours | | | | | | | Final Exam Marks | | | | | | | : | 70 | |
|  | | | | | | | | | | | | | | | | | | |
| **Pre-Requisite**: None | | | | | | | | | | | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | | | | | | | | | | | |
|  | Comprehend the prevalence of data and evolution of data visualization | | | | | | | | | | | | | | | | | |
|  | Handle data from various sources. | | | | | | | | | | | | | | | | | |
|  | Process data and missing values | | | | | | | | | | | | | | | | | |
|  | Plot various types of charts, graphs for data visualization | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | | | |
| **Course Outcomes**: Students will be able to | | | | | | | | | | | | | | | | | | |
| CO1 | Understand eras of data evolution and GESTALT’s principles of visual perception. | | | | | | | | | | | | | | | | | |
| CO2 | Reading data from different data file formats using Python, Pandas package. | | | | | | | | | | | | | | | | | |
| CO3 | Perform filtering, reshaping, merging, sub-setting and filling null values using Pandas. | | | | | | | | | | | | | | | | | |
| CO4 | Draw scatter plot, pie charts, bar charts, bubble charts, distplots, swamplots, … using matplotlib, plotly and Seaborn. | | | | | | | | | | | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | | | | | | | | | | | |
|  | **POs** | | | | | | | | | | | | | **PSOs** | | | | |
| **CO** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | | **9** | **10** | **11** | **12** | **1** | | **2** | | **3** |
| **CO1** | 1 | 1 | 3 | - | 3 | - | - | - | | - | - | - | 1 | 3 | | 3 | | 3 |
| **CO2** | 1 | 1 | 3 | - | 3 | - | - | - | | - | - | - | 1 | 3 | | 3 | | 3 |
| **CO3** | 1 | 1 | 3 | - | 3 | - | - | - | | - | - | - | 1 | 3 | | 3 | | 3 |
| **CO4** | 1 | 1 | 3 | - | 3 | - | - | - | | - | - | - | 1 | 3 | | 3 | | 3 |
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| **UNIT-1** | | | | | | | | | | | | | | (12 Hours) | | | | |
| **Introduction to Data Visualization** - What is Data Visualization?, Evolution of Data Visualization, Why do We Need Data Visualization?, Difference between Data Visualization and Infographics, Principles of Gestalt’s Theory of Visual Perception, Advantages of Data Visualization, Benefits of Data Visualization  **Types of Digital Data** - What is in Store?, Classification of Digital Data, Structured versus Unstructured Data | | | | | | | | | | | | | | | | | | |
| **UNIT-2** | | | | | | | | | | | | | | | (12 Hours) | | | |
| **Reading Data from Varied Data Sources into Python DataFrame -** Read from Excel Data Source, Read Data from .csv, Load a Python Dictionary into a DataFrame, Reading JSON data into a Pandas DataFrame, Reading Data from Microsoft Access Database, Reading Data from .txt File, Reading Data from XML File  **Pros and Cons of Charts** - Pie Chart, Tree Map, Heat Map, Scatter Plot, Histogram, Word Cloud, Box Plot  **Good Chart Designs -** Mistakes That Can Be Avoided, Less Is More, Tables versus Charts | | | | | | | | | | | | | | | | | | |
| **UNIT-3** | | | | | | | | | | | | | | | (12 Hours) | | | |
| **Data Wrangling in Python -** Pandas Data Manipulation**,** Dealing with Missing Values**,** Date Reshaping**,** Filtering Data**,** Merging Data**,** Subsetting DataFrames in Pandas**,** Reshaping the Data and Pivot Tables**,** Backfill**,** Forward Fill  **Functions in Python Pandas**- Pandas DataFrame Functions | | | | | | | | | | | | | | | | | | |
| **UNIT-4** | | | | | | | | | | | | | | | (12 Hours) | | | |
| **Matplotlib for Data Visualization** - Exploratory Data Analysis using Python, Matplotlib  **Plotly for Data Visualization** - Plotly Python Package  **Seaborn for Data Visualization** - Seaborn Plots Using “iris” Dataset, Seaborn Plots Using “Superstore” Dataset, Seaborn Plots Using “OLYMPIC” Dataset, Seaborn Plots Using “Passengers Flights” Dataset. | | | | | | | | | | | | | | | | | | |
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| **Text Books:** | Reimagining Data Visualization Using Python by Seema Acharya, Wiley india Publication 2021. | | | | | | | | | | | | | | | | | |
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| **References:** |  | | | | | | | | | | | | | | | | | |

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| **SOFT SKILLS LAB**  III B.Tech – V Semester(Code: 22CML501/SOC3) | | | | | | | |
| Lectures/Labs | | : | | 3 Hours/Week (1T+2P) | Continuous Assessment | : | 30 |
| Final Exam | | : | | 3 Hours | Final Exam Marks | : | 70 |
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| **Pre-Requisite**: None | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | |
|  | To make the engineering students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice. | | | | | | |
|  | To know the importance of interpersonal and intrapersonal skills in an employability setting. | | | | | | |
|  | Actively participate in group discussions / interviews and prepare & deliver Presentations. | | | | | | |
|  | Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, stress management and leadership quality. | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | |
| CO1 | Use appropriate body language in social and professional contexts. | | | | | | |
| CO2 | Demonstrate different strategies in presenting themselves in professional contexts. | | | | | | |
| CO3 | Analyze and develop their own strategies of facing the interviews successfully. | | | | | | |
| CO4 | Develop team coordinating skills as well leadership qualities. | | | | | | |
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| **LIST OF EXPERIMENTS** | | | | | | | |
| **1. Body Language & Identity Management**  a. Facial Expressions – Kinesics - Occulesics  b. Haptics - Proxemics  c. Para Linguistics  d. Appearance  e. Identity Management Communication  **2**. **Emotional Intelligence & Life Skills**  a. Self Awareness through Johari Window and SWOC analysis  b. Self Motivation  c. Empathy  d. Assertiveness & Managing Stress  e. Positive Attitude  f. Time Management  g. Goal Setting: Short term, Long Term, Vision, Mission.  **3.** **Business Presentations**  a. Preparing effective Presentations Power Point Presentations  b. Power Point Presentations  c. Using Visual Aids  d. Mock Presentations  **4.** **Employability Skills**  a. Group Discussion  b. Team Building and Leadership Qualities  c. Interview Skills | | | | | | | |
|  | | | | | | | |
| **References :** | | | 1. Personality Development and Soft skills (Second Edition), Barun K. Mithra. Oxford University Press: 2016 2. The Definitive Book of Body Language, Allan & Barbara. Pease International:2004 3. Working with Emotional Intelligence, Daniel Goleman. Bloomsbury:1998 4. English for Jobseekers, Lina Mukhopadhyay. Cambridge University Press:2013 5. The 7 Habits of Highly Effective People, Stephen R.Covey. St. Martin’s Press:2014 | | | | |

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| **Machine Learning Lab**  III B. Tech. –V Semester (Code: 22CML502) | | | | | | | |
| Practicals | | : | | 3 Hours/Week | Continuous Assessment | : | 30 |
| Final Exam | | : | | 3 hours | Final Exam Marks | : | 70 |
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| **Pre-Requisite**: Python Programming | | | | | | | |
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| **Course Objectives:** | | | | | | | |
|  | 1.a Use python based machine learning libraries.  1.b Learn implementation of linear regression models. | | | | | | |
|  | 2.a Implement decision tree learning algorithm.  2.b Implement neural networks and learn from real world data. | | | | | | |
|  | 3.a Implement generative classifiers.  3.b Implement discriminative classifiers. | | | | | | |
|  | 4.a Implement computational learning theory.  4.b Implement instance based learning.  4.c Implement unsupervised learning algorithms. | | | | | | |
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| **Course Outcomes**: Students will be able to: | | | | | | | |
| CO1 | Use python based machine learning libraries.  Learn implementation of linear regression models. | | | | | | |
| CO2 | Implement decision tree learning algorithm.  Implement neural networks and learn from real world data. | | | | | | |
| CO3 | Implement generative classifiers.  Implement discriminative classifiers. | | | | | | |
| CO4 | Implement computational learning theory.  Implement instance based learning.  Implement unsupervised learning algorithms. | | | | | | |
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| **LIST OF EXPERIMENTS** | | | | | | | |
| 1. Write a program to implement the linear regression using stochastic gradient descent approach of training for a sample training data set stored as a .CSV file. 2. Write a program to implement the linear regression using Batch gradient descent approach of training for a sample training data set stored as a .CSV file. 3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample. 4. Build an perceptron training model to learn linearly separable datasets and test the same using appropriate data sets. 5. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets. 6. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets. 7. Write a program to implement the Logistic regression for a sample training data set stored as a .CSV file and test the same using appropriate data sets 8. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. 9. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. | | | | | | | |
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| **Text Books :** | | | 1. Introduction to Machine Learning with Python by Andreas C. Mueller and Sarah Guido by O’Reilly Media.(Unit-1) 2. Lecture Notes by Mr. Andrew Ng, Stanford University <https://see.stanford.edu/materials/aimlcs229/cs229-notes1.pdf(Unit-2)> 3. Tom M. Mitchell, “Machine Learning”, First Edition, Mc. Graw Hill Publishing. (including draft chapters of second edition) | | | | |
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| **References :** | | | Lecture Notes by Mr. Andrew Ng, Stanford University https://see.stanford.edu/materials/aimlcs229/cs229-notes1.pdf | | | | |

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| **DATA HANDLING AND VISUALIZATION LAB**  III B.Tech – V Semester(Code: 22CML503/JO1B) | | | | | | | | | | | | | | | | | | | | | |
| Lab | | : | | | 3 Hours/Week | | | | | | | | Continuous Assessment | | | | | : | | 30 | |
| Final Exam | | : | | | 3 Hours | | | | | | | | Final Exam Marks | | | | | : | | 70 | |
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| **Pre-Requisite**: None. | | | | | | | | | | | | | | | | | | | | | |
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| **Course Objectives:** The student will be able to | | | | | | | | | | | | | | | | | | | | | |
|  | Comprehend the prevalence of data and evolution of data visualization | | | | | | | | | | | | | | | | | | | | |
|  | Handle data from various sources. | | | | | | | | | | | | | | | | | | | | |
|  | Process data and missing values | | | | | | | | | | | | | | | | | | | | |
|  | Plot various types of charts, graphs for data visualization | | | | | | | | | | | | | | | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | | | | | | | | | | | | | | | |
| CO1 | Understand eras of data evolution and GESTALT’s principles of visual perception. | | | | | | | | | | | | | | | | | | | | |
| CO2 | Reading data from different data file formats using Python, Pandas package. | | | | | | | | | | | | | | | | | | | | |
| CO3 | Perform filtering, reshaping, merging, sub-setting and filling null values using Pandas. | | | | | | | | | | | | | | | | | | | | |
| CO4 | Draw scatter plot, pie charts, bar charts, bubble charts, distplots, swamplots, … using matplotlib, plotly and Seaborn. | | | | | | | | | | | | | | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | | | | | | | | | | | | | | |
|  | **POs** | | | | | | | | | | | | | | | | **PSOs** | | | | |
| **CO** | **1** | | | **2** | | **3** | **4** | **5** | **6** | **7** | **8** | **9** | | **10** | **11** | **12** | **1** | | **2** | | **3** |
| **CO1** | 1 | | | 1 | | 3 | - | 3 | - | - | - | - | | - | - | 1 | 3 | | 3 | | 3 |
| **CO2** | 1 | | | 1 | | 3 | - | 3 | - | - | - | - | | - | - | 1 | 3 | | 3 | | 3 |
| **CO3** | 1 | | | 1 | | 3 | - | 3 | - | - | - | - | | - | - | 1 | 3 | | 3 | | 3 |
| **CO4** | 1 | | | 1 | | 3 | - | 3 | - | - | - | - | | - | - | 1 | 3 | | 3 | | 3 |
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| **LIST OF EXPERIMENTS** | | | | | | | | | | | | | | | | | | | | | |
| |  | | --- | | **Tool Required: Python with Pandas, Matplotlib, Plotly and Seaborn**  **LIST OF EXPERIMENTS**   1. Write code to read data from text file, CSV file, Excel file and JSON file into a dataframe. Print the overview of data and slice data using different indexing/slicing methods. 2. Write code to read data with null values from a source file and process null values in various ways of filling and dropping null values. 3. a) Create multiple series objects and create a dataframe with column names and indexing from series objects. Use different parameters of DataFrame method.   b) Write code to read data from a XML file and Microsoft Access Database.   1. Read data into a dataframe and apply Groupby, aggragation, nested groups, looping over groups operations. 2. Using Matplotlib package, draw the following.   a) Scatter Plot b) Bar Plot c) Pie Chart d) Histogram e) Box Plot   1. Using Matplotlib package, draw the following.   a) Treemap b) Heat Map c) Waterfall Chart d) Bubble Chart   1. Using plotly package, draw the following.   a) Scatter Plot b) Bar Plot c) Pie Chart d) Histogram e) Box Plot   1. Using plotly package, draw the following.   a) Word Cloud b) Treemap c) Choropleth Chart d) Area Chart e) Bubble chart f) Violin Plot   1. Using Seaborn package, draw the following.   a) Scatter Plot b) Strip Plot c) Swarm Plot d) Count Plot e) Box Plot.   1. Using Seaborn package, draw the following.   a) Pair Plot b) Cat Plot c) Count Plot d) Implot Plot e) DistPlot.  **Case Study** : Perform Exploratory Data Analysis on a dataset of your choice. | | | | | | | | | | | | | | | | | | | | | | |
| **Text Books:** | | | Reimagining Data Visualization Using Python by Seema Acharya, Wiley india Publication 2021. | | | | | | | | | | | | | | | | | | |
| **References:** | | |  | | | | | | | | | | | | | | | | | | |

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| **ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE**  III B. Tech. – V Semester (Code: 22CM506/MC03) | | | | | | | | |
| Lectures | | | : | 2 Hours/Week | Continuous Assessment | | : | 30 |
| Final Exam | | | : | -- | Final Exam Marks | | : | -- |
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| **Pre-Requisite**: None | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | |
|  | Generalize the effect of precolonial and colonial period on Indian Traditional Knowledge System, traditional Medicine | | | | | | | |
|  | Discover the knowledge of ITK in Production, Construction, Physics, Chemistry, Architecture and Vastu | | | | | | | |
|  | Discriminate the contribution of India in Mathematics, Astronomy & Astrology | | | | | | | |
|  | Propose the importance of Yoga in holistic living | | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | | |
| CO1 | Understand the concept of Indian Traditional knowledge and its importance | | | | | | | |
| CO2 | Compare the Indian traditional knowledge Systems with Other Global systems. | | | | | | | |
| CO3 | Understand the concept of yoga and its correlations to science. | | | | | | | |
| CO4 | Study various case studies related to traditional knowledge. | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | |
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| **UNIT-1** | | | | | | (8 Hours) | | |
| **Historical Background: TKS during the Pre-colonial and Colonial Period**  **Indian Traditional Knowledge System**  **Traditional Medicine:** Ayurveda, Simple Definition, Origin, The Great Three Classics of Ayurveda, The Branches of Ayurveda, Basic Concepts of Ayurveda, Purusha/Prakruti, Manifestation of Creation, Mental Constitution, Vata, Pitta and Kapha: The Three Doshas | | | | | | | | |
| **UNIT-2** | | | | | | (8 Hours) | | |
| **Traditional Production and Construction Technology:** Social Conditions and Technological Progress, The Impetus for Metallurgy, Social Needs and Technological Applications, State Support of Technology, India and the Industrial Revolution.  **History of Physics and Chemistry:** Philosophy and Physical Science, Optics and Sound, The Laws of Motion, The Five Basic Physical Elements, Indian Ideas about Atomic Physics.  **Traditional Art and Architecture and Vastu Shashtra:** The Principles of Vastu are simple | | | | | | | | |
| **UNIT-3** | | | | | | (8 Hours) | | |
| **Origin of Mathematics:** The Decimal System in Harappa, Panini and Formal Scientific Notation, The Indian Numeral System, Emergence of Calculus, The Spread of Indian Mathematics, The Concept of Zero.  **Astronomy and Astrology**  **TKS and the Indian Union:** Protection and the Legislative Frameworks in India, Comment, Sui Generis System, Trade Secrets and Know-how, Geographical Indications Bill, Protection of Plan varieties and Farmers Rights Bill, Rights of Communities, Monitoring Information on Patent Applications World-wide. | | | | | | | | |
| **UNIT-4** | | | | | | (8 Hours) | | |
| **Common Yoga Protocol:** Introduction, What is Yoga? Brief History and Development of Yoga, The fundamentals of Yoga,  **General Guidelines for Yoga Practice:** Before the practice, During the Practice, After the Practice, Food for Thought, How Yoga can Help.  **Invocation,** **2. Sadilaja/Cālana Kriyās /Loosening Practices**,  **Yogāsanas:**  **Standing Postures:** **Tāḍāsana** (Palm Tree Posture), **Vṛkṣāsana** (The Tree Posture), **Pāda-Hastāsana** (The Hands to Feet Posture), **Ardha Cakrāsana** (The Half Wheel Posture), **Trikonāsana** (The Triangle Posture)  **Sitting Postures: Bhadrāsana** (The Firm/Auspicious Posture), **Vajrāsana** (Thunderbolt Posture), **Usṭrāsana** (Camel Posture), **Śaśankāsana** (The Hare Posture), **Vakrāsana** (The Spinal Twist Posture),  **Kapālabhāti 5. Prānāyāma: naḍīśodhana or anuloma viloma prānāyāma** (Alternate Nostril Breathing), **Śītalī Prāṇāyāma, Bhrāmarī Prāṇāyāma** (Bhrāmarī Recaka) **6. Dhyāna 7. *Sankalpa* 8. Śantih pātha** | | | | | | | | |
|  | | | | | | | | |
| **Text Books:** | | 1. Traditional Knowledge System in India, Amit Jha, 2009  2. Common YOGA Protocol, Ministry of Ayush | | | | | | |
|  | |  | | | | | | |
| **References:** | | Traditional Knowledge System & Technology in India, Basanta Kumar Mohanta, Vipin Kumar Singh, 2012 | | | | | | |

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| **NATURAL LANGUAGE PROCESSING**  III B. Tech. – VI Semester (Code:22CM603) | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lectures | | | | | : | | 3 Hours/Week | | | | | | Continuous Assessment | | | | | | | : | | 30 | | | |
| Final Exam | | | | | : | | 3 hours | | | | | | Final Exam Marks | | | | | | | : | | 70 | | | |
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| Pre-Requisite: MACHINE LEARNING (22CM501) | | | | | | | | | | | | | | | | | | | | | | | | | |
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| Course Objectives: This course is designed to enable students to : | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | | Get familiarized with the concepts and techniques of Natural language Processing for analyzing words based on Morphology and CORPUS. | | | | | | | | | | | | | | | | | | | | | | | |
|  | | Make them understand the concepts of morphology, syntax, semantics and pragmatics of the language and that they are able to give the appropriate examples that will illustrate the above mentioned concepts. | | | | | | | | | | | | | | | | | | | | | | | |
|  | | Recognize the significance of pragmatics for natural language understanding. | | | | | | | | | | | | | | | | | | | | | | | |
|  | | Be capable to describe the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing. | | | | | | | | | | | | | | | | | | | | | | | |
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| **Course Outcomes: Students who successfully complete this course will be able to:** | | | | | | | | | | | | | | | | | | | | | | | | | |
| CO1 | | | Apply the principles and Processing of Natural Languages using computers and  Create CORPUS linguistics based on digestive approach | | | | | | | | | | | | | | | | | | | | | | |
| CO2 | | | Analyze the syntax, semantics, and pragmatics of a statement written in a natural language and perform POS tagging for a given natural language | | | | | | | | | | | | | | | | | | | | | | |
| CO3 | | | Demonstrate the techniques for text-based processing of natural language with respect to morphology. | | | | | | | | | | | | | | | | | | | | | | |
| CO4 | | | Elaborate the feature engineering techniques needed for real time implementation of various natural language applications | | | | | | | | | | | | | | | | | | | | | | |
| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | | | | | | | | | | | | | | | | | | |
|  |  | | | **PO’s** | | | | | | | | | | | | | | | | | **PSO’s** | | |  | |
| **CO** | | | **1** | | **2** | | **3** | **4** | **5** | **6** | **7** | | **8** | **9** | **10** | **11** | **12** | | | **1** | **2** | **3** |
| **CO1** | | | - | | 2 | | 2 | 3 | 3 | - | - | | - | - | - | - | 2 | | | 2 | 3 | 3 |
| **CO2** | | | - | | 2 | | 2 | 3 | 3 | - | - | | - | - | - | - | 2 | | | 3 | 3 | 3 |
| **CO3** | | | - | | 2 | | 2 | 3 | 3 | - | - | | - | - | - | - | 2 | | | 3 | 3 | 3 |
| **CO4** | | | - | | 2 | | 2 | 3 | 3 | - | - | | - | - | - | - | 2 | | | 3 | 3 | 3 |
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| UNIT-1 | | | | | | | | | | | | | | | | | | | (13 Hours) | | | | | | |
| **Basics of NLP:** - Evolution of Human Language, Text Mining, Need of Text Mining, Text Mining & Natural Language Processing, Basic Structure of a NLP Application, Understanding basic applications, Advantages of togetherness-NLP and Python.  **Corpus Analysis**: - What is a corpus? Why do we need a corpus? Understanding corpus analysis, Understanding types of data attributes, Exploring different file formats for corpora. | | | | | | | | | | | | | | | | | | | | | | | | | |
| UNIT-2 | | | | | | | | | | | | | | | | | | | (11 Hours) | | | | | | |
| **Understanding the Structure of a Sentence**: - Understanding components of NLP, Natural language understanding, Defining context-free grammar, Morphological analysis, Syntactic analysis, Semantic Analysis, Ambiguity, Handling Ambiguity, Discourse integration, Pragmatic analysis. | | | | | | | | | | | | | | | | | | | | | | | | | |
| UNIT-3 | | | | | | | | | | | | | | | | | | | (12 Hours) | | | | | |
| **Preprocessing**: - Handling corpus-raw, Handling corpus-raw sentences, Basic preprocessing, Practical and customized preprocessing. | | | | | | | | | | | | | | | | | | | | | | | | |
| UNIT-4 | | | | | | | | | | | | | | | | | | | (12 Hours) | | | | | |
| **Feature Engineering and NLP Algorithms:-** Understanding feature engineering, Basic feature of NLP, Basic statistical feature of NLP, Advantages of features engineering, Challenges of features engineering. | | | | | | | | | | | | | | | | | | | | | | | | |
| Text Books : | | | | Python Natural Language Processing (Packt Publishers) Author: Jalaj  Thanaki | | | | | | | | | | | | | | | | | | | | |
| References : | | | | Natural Language Processing (Oxford Publishers) Author: Tanvir  Siddiqui | | | | | | | | | | | | | | | | | | | | |

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| **BLOCKCHAIN TECHNOLOGIES**  Professional Elective (22CM604/PE2) | | | | | |
| Lectures: | | **3** Hours / Week | Continuous Internal Assessment: | **30** Marks | |
| Final Exam: | | **3** hours | Semester End Exam: | **70** Marks | |
| **Prerequisites:** | |  | | | |
| **Course Objectives:** The student will be able to | | | | | |
|  | | Identify the scope and necessity of Block Chain in Cryptocurrency. | | | |
|  | | Understand about Bitcoin and other Digital Currency types and Bitcoin Programming | | | |
|  | | Understand about Hyperledger, Ethereum virtual machine (EVM). | | | |
|  | | Identify Blockchain-Outside of Currencies, IOT and Benefits and Limitations. | | | |
| **Course Outcomes**: The student will be able to | | | | | |
| CO1 | | Understand Structure of a Block, The Genesis Block, Linking Blocks in the Blockchain. Knowing Tiers of blockchain technology, Types of blockchain, and Features and Applications of a blockchain technology. | | | |
| CO2 | | Understanding Bitcoin definition, Transactions and transaction life cycle, transaction structure. Identify Types of transaction, Bitcoin network, Mining. Understanding Bitcoin payments, Alternative Coins, Bitcoin installation, Bitcoin programming and the command-line interface, Bitcoin limitations, Privacy and anonymity. | | | |
| CO3 | | Analyze Hyperledger. Identify Ten Steps of Blockchain application. Knowing Ethereum, Identify Message call transaction Elements of the Ethereum blockchain, Understanding Ethereum virtual machine (EVM) Execution environment, Ethereum Introduction, Ethereum blockchain, The consensus mechanism, The world state Transactions. | | | |
| CO4 | | Identify the Blockchain-Outside of Currencies, Internet of Things,Benefits and limitations of blockchain. | | | |
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| **UNIT-I** | | | | | 12 HOURS |
| **Block Chain 101** - Distributed Systems, The History of blockchain, Introduction to blockchain, Types of block chain, CAP theorem and blockchain, Benefits and limitations of blockchain,  **Decentralization** - Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Blockchain and full eco system decentralization, Smart contract, Decentralized Organizations, decentralized autonomous organizations, Decentralized autonomous corporations, Decentralized autonomous societies, Decentralized applications, Platforms for Decentralization. | | | | | |
| **UNIT-II** | | | | | 12 HOURS |
| **Cryptography and Technical Foundations** - Introduction, Cryptographic primitives, Asymmetric Cryptography, Public and Private-keys – RSA, Discrete logarithm problem, Cryptographic primitives, Hash functions-Merkle trees, Patricia trees.  **Bitcoin** - Bitcoin, Transactions, Blockchain. | | | | | |
| **UNIT-III** | | | | | 12 HOURS |
| **Alternative Coins** – Bitcoin limitations - Privacy and anonymity, Extended protocols on top of bitcoin, Development of altcoins.  **Smart Contracts** - History, Definition, Ricardian Contracts.  **Ethereum 101** - Introduction, Ethereum blockchain, Elements of the Ethereum blockchain. | | | | | |
| **UNIT-IV** | | | | | 12 HOURS |
| **Hyperledger** - Projects, Hyperledger as a Protocol, Fabric, Hyperledger Fabric, Sawtooth lake-PoET, Transaction families, Consensus in Sawtooth.  **Alternative Blockchain** - Blockchains. | | | | | |
| **Text Book(s):** | 1. Mastering Blockchain, Packet Publishing by Imran Bashir | | | | |
| **References:** | 1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos 2. Blockchain by Melanie Swa, O‘Reilly 3. Hyperledger Fabric -https:/[/www.h](http://www.hyperledger.org/projects/fabric)y[perledger.org/projects/fabric](http://www.hyperledger.org/projects/fabric)Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits https:/[/www.r](http://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/c)e[dbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/c](http://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/c) rse0401.html | | | | |

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| **Mobile Application Development & Security**  Job Oriented Elective (22CM605/JO2A) | | | | | | | | |
| Lectures | | | : | 3 Hours/Week | Continuous Assessment | | : | 30 |
| Final Exam | | | : | 3 hours | Final Exam Marks | | : | 70 |
| **Pre-Requisite**: Java Programming | | | | | | | | |
| **Course Objectives:** | | | | | | | | |
|  | Understand the Android Application Architecture and Working. | | | | | | | |
|  | Understand how to develop android applications and internal working of applications | | | | | | | |
|  | Understand different types of layouts, animations, activities, Intents in Android apps. | | | | | | | |
|  | Able to understand common mobile application security vulnerabilities. | | | | | | | |
| **Course Outcomes**: Students will be able to: | | | | | | | | |
| CO1 | Able to understand and develop basic android applications. | | | | | | | |
| CO2 | Able to understand the internal working of the Android Applications | | | | | | | |
| CO3 | Able to understand different types of layouts, animations, activities, Intents in Android apps. | | | | | | | |
| CO4 | Able to understand common mobile application security vulnerabilities | | | | | | | |
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| **UNIT-1** | | | | | | 12 HOURS | | |
| **Hello, Android**:- ANDROID: AN OPEN PLATFORM FOR MOBILE DEVELOPMENT, Android SDK Features, Introducing the Development Framework  **Getting Started**:- What You Need to Begin, Creating Your First Android Application, Types of Android Applications | | | | | | | | |
| **UNIT-2** | | | | | | 12 HOURS | | |
| **Creating Applications and Activities**:- What Makes an Android Application?, Introducing the Application Manifest File, Externalizing Resources, The Android Application Lifecycle, A Closer Look at Android Activities, Creating Activities, The Activity Lifecycle, Activity States.  **Building User Interfaces**:- Fundamental Android UI Design, Android User Interface Fundamentals, Introducing Layouts, Introducing Fragments. | | | | | | | | |
| **UNIT-3** | | | | | | 12 HOURS | | |
| **Intents and Broadcast Receivers**:- Introducing Intents, Creating Intent Filters and Broadcast Receivers  **Saving State and Preferences:-** Creating and Saving Shared Preferences , Retrieving Shared Preferences Persisting the Application Instance State. | | | | | | | | |
| **UNIT-4** | | | | | | 12 HOURS | | |
| Top Issues Facing Mobile Devices, Types of Security threats in mobile application, Tips for Secure Mobile Application Development, Securing Mobile services, Security Testing for Mobile Apps | | | | | | | | |
| **Text Books :** | | 1. Professional Android 4 Application Development‖, Reto Meier, John Wiley & Sons, Inc. | | | | | | |
| **References :** | | 1. Android Programming The Big Nerd Ranch Guide‖, Brian Hardy & Bill Phillips, Big Nerd Ranch, Inc. 2. Head First: Android Development‖, Dawn Griffiths & David Griffiths, O‘Reilly Publications. | | | | | | |

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| **DevOps**  III B.Tech – VI Semester (Code:22CML601/SO5) | | | | |
| Lectures : | | **1** HOURS / Week, Practical: **2** | Continuous Internal Assessment : | **30** Marks |
| Final Exam : | | **3** hours | Semester End Exam : | **70** Marks |
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| **Pre-Requisite**: Web Technologies Laboratory. | | | | |
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| **Course Outcomes**: Students will be able to: | | | | |
|  | Identify components of Devops environment | | | |
|  | Describe Software development models and architectures of DevOps | | | |
|  | Apply different project management, integration, testing and code deployment tool | | | |
|  | Investigate different DevOps Software development models | | | |
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| **UNIT-I** | | | | 12 HOURS |
| **Introduction to DevOps:** Waterfall model, Limitations of Waterfall model, Agile methodology, Limitations of Agile method, Waterfall vs Agile, definition of DevOps, DevOps Stakeholders, DevOps goals, DevOps life cycle.  **DevOps stages:** Version Control, Continuous Integration, Continuous Delivery, Continuous Deployment, Continuous Monitoring**.** | | | | |
| **UNIT-II** | | | | 12 HOURS |
| **Version Control with Git:** introduction, Version Control System and types, difference between Centralized Version Control and Distributed Version Control, Git basics, Git features, installing Git, Git essentials, common commands in Git, Working with remote repositories. | | | | |
| **UNIT-III** | | | | 12 HOURS |
| **Continuous Integration using Jenkins:** Introduction-Understanding Continuous Integration, introduction about Jenkins, Build Cycle, Jenkins Architecture, installation, Jenkin management, Adding a slave node to Jenkins, Building Delivery Pipeline, Pipeline as a Code, and Continuous Testing with Selenium. | | | | |
| **UNIT-IV** | | | | 12 HOURS |
| **Continuous Deployment:** Containerization with Docker, Containerization using Kubernetes, Ecosystem and Networking, Configuration Management with Puppet, Configuration Management with Ansible, Continuous Monitoring with Nagios. | | | | |
| **Text Book(s) :** | | 1. Gene Kim, Jez Humble, Patrick Debois and John willis,”The DevOps Handbook”, IT Revolution Press, LLC. 2016. | | |
| **References :** | | 1. Jennifer Davis & Ryn Daniels, “Effective DevOps” Oreilly publications, 1/e, 2018. 2. Jez humble, David Farley “Continuous Delivery”, Addison –Wesley, 2010. 3. Gene Kim, Kevin Bher, George Spafford , “The Phonex Project”, IT Revolution, 2018. | | |

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| **Mobile Application Security Lab**  Job Oriented Elective (Code: 22CML604/JO2B) | | | | | | | |
| Practicals | | : | | 3 Hours/Week | Continuous Assessment | : | 30 |
| Final Exam | | : | | 3 hours | Final Exam Marks | : | 70 |
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| **Pre-Requisite**: : Java Programming | | | | | | | |
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| **Course Objectives:** | | | | | | | |
|  | Understand the Android Application Architecture and Working. | | | | | | |
|  | Understand how to develop android applications and internal working of applications | | | | | | |
|  | Understand different types of layouts, animations, activities, Intents in Android apps. | | | | | | |
|  | Understand to develop applications with SQLite database support to read, write, update and delete data. | | | | | | |
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| **Course Outcomes**: Students will be able to: | | | | | | | |
| CO1 | Able to understand and develop basic android applications. | | | | | | |
| CO2 | Able to understand the internal working of the Android Applications | | | | | | |
| CO3 | Able to understand different types of layouts, animations, activities, Intents in Android apps. | | | | | | |
| CO4 | Able to understand and develop the applications with SQLite database to read, write, update and delete data. | | | | | | |
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| **LIST OF EXPERIMENTS** | | | | | | | |
| * Design an Android application to display hello world? * Design an Android application to create interactive user interface? * Design an Android application to create and start activity? * Design an Android application to demonstrate different types of layouts? * Design an Android application to demonstrate animation? * Develop standard calculator application to perform basic calculator operations like addition, subtraction, multiplication and division? * Design an Android application to demonstrate fragments? * Design an Android application to demonstrate fragment lifecycle? * Design an Android application to demonstrate implicit Intent? * Design an Android application to demonstrate explicit intent? * Design an Android application to demonstrate shared preferences? * Design an Android application to demonstrate SQLite database? | | | | | | | |
|  | | | | | | | |
| **Text Books :** | | | 1. Professional Android 4 Application Development‖, Reto Meier, John Wiley & Sons, Inc. | | | | |
|  | | |  | | | | |
| **References :** | | | 1. Android Programming The Big Nerd Ranch Guide‖, Brian Hardy & Bill Phillips, Big Nerd Ranch, Inc. 2. Head First: Android Development‖, Dawn Griffiths & David Griffiths, O‘Reilly Publications. | | | | |

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| **INDIA CONSTITUTION**  III B.Tech – VI Semester (Code:22CM606/MC03) | | | | | | | | |
| Lectures | | | : | 2 Hours/Week | Continuous Assessment | | : | 30 |
| Final Exam | | | : |  | Final Exam Marks | | : |  |
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| **Pre-Requisite**: | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | |
|  | Able to understand the importance of the constitution in a Democratic Society. | | | | | | | |
|  | Understand the Fundamental Rights and make the best use of them and the duties of a citizen and discharge his duties and became a good citizen. | | | | | | | |
|  | Know about Judicial supremacy and Independence of judiciary and fight for his legitimate Rights through court of law. | | | | | | | |
|  | Participate in nation building activities and be away from destructive outfits and in the democratic process of governance. | | | | | | | |
|  | | | | | | | | |
| **Course Outcomes**: Students will be able to | | | | | | | | |
| CO1 | Able to understand the importance of the constitution in a Democratic Society. | | | | | | | |
| CO2 | Understand the Fundamental Rights and make the best use of them and the duties of a citizen and discharge his duties and became a good citizen. | | | | | | | |
| CO3 | Know about Judicial supremacy and Independence of judiciary and fight for his legitimate Rights through court of law. | | | | | | | |
| CO4 | Participate in nation building activities and be away from destructive outfits and in the democratic process of governance. | | | | | | | |
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| **UNIT-1** | | | | | | (12 hours) | | |
| Meaning of the constitution law and constitutionalism, Historical perspective of the Constitution of India, Salient features and characteristics of the constitution of India, Scheme of fundamental rights. | | | | | | | | |
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| **UNIT-2** | | | | | | (11 hours) | | |
| The scheme of the fundamental duties and its legal status, The Directive principles of state policy- its importance and implementation, Federal structure and distribution of legislative and financial powers between the union and the states, Parliamentary form of government of India – the constitution powers and status of the president of India. | | | | | | | | |
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| **UNIT-3** | | | | | | (12 hours) | | |
| Amendment of constitutional powers and procedure, The historical perspectives of the constitutional amendments in India, Emergency provisions: National Emergency, President Rule, Financial Emergency, Local Self Government – constitutional scheme in India | | | | | | | | |
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| **UNIT-4** | | | | | | (12 hours) | | |
| Scheme of the Fundamental Right to Equality, Scheme of the Fundamental Right to certain Freedom under Article 19, Scope of the Right to Life and Personal Liberty under Article 21. | | | | | | | | |
|  | | | | | | | | |
| **Text Books :** | | 1. Introduction to constitution of India, D.D.Basu, Lexisnexis 2. The constitution of India, P. M. Bhakshi, Universal law publishing | | | | | | |

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| **Social Network Analysis**  IV B.Tech – VII Semester (Code: 22CM701/PE3) | | | | | | | | | | | | | | | | | | | | | | |
| Lectures | | | | : | | 3 Hours/Week | | | | | | | Continuous Assessment | | | | | | : | | 30 | |
| Final Exam | | | | : | | 3 hours | | | | | | | Final Exam Marks | | | | | | : | | 70 | |
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| **Pre-Requisite**:  Python programming, Probability and Statistics, Machine Learning | | | | | | | | | | | | | | | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | | | | | | | | | | | | | | | |
|  | Understanding the motivations behind the study of social network analysis | | | | | | | | | | | | | | | | | | | | | |
|  | Relate the physical society with the online social network and understand how one shapes the other. | | | | | | | | | | | | | | | | | | | | | |
|  | Interpret the historical development of social network analysis research | | | | | | | | | | | | | | | | | | | | | |
|  | Classify the hierarchy of social structure and the terminologies needed to model the structure. | | | | | | | | | | | | | | | | | | | | | |
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| **Course Outcomes**: Students will be able to: | | | | | | | | | | | | | | | | | | | | | | |
| CO1 | Discuss the Networks Society and Network Measures. | | | | | | | | | | | | | | | | | | | | | |
| CO2 | Demonstrate the Network Growth Models and Link Analysis. | | | | | | | | | | | | | | | | | | | | | |
| CO3 | Classify the Community Structure in Networks. | | | | | | | | | | | | | | | | | | | | | |
| CO4 | Demonstrate the Behavior of Social Network Effects. | | | | | | | | | | | | | | | | | | | | | |
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| Mapping of Course Learning Outcomes with Program Outcomes & Program Specific Outcomes | | | | | | | | | | | | | | | | | | | | | | |
|  | **PO’s** | | | | | | | | | | | | | | | | **PSO’s** | | | | | |
| **CO** | **1** | **2** | | | **3** | | **4** | **5** | **6** | **7** | **8** | **9** | | **10** | **11** | **12** | **1** | | | **2** | | **3** |
| **CO1** | 1 | 1 | | | - | | 2 | - | 2 | - | - | - | | - | - | - | 1 | | | - | | - |
| **CO2** | 1 | 2 | | | - | | 2 | 1 | - | 1 | 1 | - | | - | - | - | 1 | | | 1 | | - |
| **CO3** | 2 | 2 | | | - | | 1 | 1 | 1 | 1 | - | - | | - | - | - | 1 | | | - | | 1 |
| **CO4** | 2 | 2 | | | - | | 1 | 1 | 1 | 1 | - | - | | - | - | - | 1 | | | 2 | | 1 |
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| **UNIT-1** | | | | | | | | | | | | | | | | | | (12 Hours) | | | | |
| **Networks and Society**: What is Social Network Analysis?, Why do We Study Social Networks, Applications of Social Network Analysis, Preliminaries, Three Levels of Social Network Analysis, Historical Development, Graph Visualization Tools**.** | | | | | | | | | | | | | | | | | | | | | | |
| **Network Measures:** Network Basics, Node Centrality, Assortativity, Transitivity and Reciprocity, Similarity, Degeneracy. | | | | | | | | | | | | | | | | | | | | | | |
| **UNIT-2** | | | | | | | | | | | | | | | | | | (12 Hours) | | | | |
| **Network Growth Models:** Properties of Real-World Networks, Random Network Model, Ring Lattice Network Model, Watts–Strogatz Model, Preferential Attachment Model, Price’s Model, Local-world Network Growth Model, Network Model with Accelerating Growth, and Aging in Preferential Attachment. | | | | | | | | | | | | | | | | | | | | | | |
| **Link Analysis:** Applications of Link Analysis, Signed Networks, Strong and Weak Ties, Link Analysis Algorithms, Page Rank, Personalised Page Rank, DivRank, SimRank, PathSIM | | | | | | | | | | | | | | | | | | | | | | |
| **UNIT-3** | | | | | | | | | | | | | | | | | | (12 Hours) | | | | |
| **Community Structure in Networks:** Applications of Community Detection , Types of Communities, Community Detection Methods, Disjoint Community Detection, Overlapping Community Detection, Local Community Detection, Community Detection vs Community Search,Evaluation of Community Detection Methods | | | | | | | | | | | | | | | | | | | | | | |
| **Link Prediction:** Applications of Link Prediction,Temporal Changes in a Network ,Problem , Evaluating Link Prediction Methods, Heuristic Models, Probabilistic Models, Supervised Random Walk, Information-theoretic Model, Latest Trends in Link Prediction, | | | | | | | | | | | | | | | | | | | | | | |
| **UNIT-4** | | | | | | | | | | | | | | | | | | (12 Hours) | | | | |
| **Cascade Behaviours and Network Effects**: Preliminaries and Important Terminologies, Cascade Models, Case Study – The “Indignados” Movement, Probabilistic Cascades,Epidemic Models, Independent Cascade Models, Anomaly Detection in Networks, Graph Representation Learning | | | | | | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | | | | | | | |
| **Text Books :** | | | 1.Social Network Analysis, Tanmoy Chakraborty, Wiley, 2021 | | | | | | | | | | | | | | | | | | | |
|  | | | 2.Network Science, Albert-Lazzlo Barabas | | | | | | | | | | | | | | | | | | | |
| **References :** | | | Social Network Analysis: Methods and Applications, Stanley Wasserman, Katherine Faus | | | | | | | | | | | | | | | | | | | |

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| **Artificial Neural Networks and Deep Learning**  Professional Elective – IV  IV B. Tech. – VII Semester (Code: 22CM702/PE4A) | | | | | | | | | | | | | | | | | | |
| Lectures | | : | 3 Hours /week | | | | | | | Continuous Assessment | | | | | | : | 30 | |
| Final Exam | | : | 3 Hours | | | | | | | Final Exam Marks | | | | | | : | 70 | |
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| **Pre-Requisite**: Machine Learning (20CS602) | | | | | | | | | | | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | | | | | | | | | | | |
| * Design an ANN model for identifying complex decision boundaries * Design a CNN model for Computer Vision applications. * Apply sequence models to natural language processing tasks. * Model the structure in the existing data to generate new data samples. | | | | | | | | | | | | | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | | | | | | | | | | | | |
| CO1 | Design and implement a Neural Network for classification. | | | | | | | | | | | | | | | | | |
| CO2 | Create a Convolutional Neural Network for image classification. | | | | | | | | | | | | | | | | | |
| CO3 | Model a Recurrent Neural Network and Long Short Term Memory Network for text processing. | | | | | | | | | | | | | | | | | |
| CO4 | Design and implement an Encoder and Decoder model. | | | | | | | | | | | | | | | | | |
| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | | | | | | | | | | | |
|  | **POs** | | | | | | | | | | | | | | **PSOs** | | | |
| **CO** | 1 | | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | 9 | 10 | 11 | 12 | 1 | 2 | | 3 |
| **CO1** | 3 | | 3 | 3 | 3 | 3 | - | - | - | | - | - | - | 2 | 3 | 3 | | 3 |
| **CO2** | 3 | | 3 | 3 | 3 | 3 | - | - | - | | - | - | - | 2 | 3 | 3 | | 3 |
| **CO3** | 3 | | 3 | 3 | 3 | 3 | - | - | - | | - | - | - | 2 | 3 | 3 | | 3 |
| **CO4** | 3 | | 3 | 3 | 3 | 3 | - | - | - | | - | - | - | 2 | 3 | 3 | | 3 |
|  | | | | | | | | | | | | | | | | | | |
| **UNIT-1** | | | | | | | | | | | | | | | 12 Hours | | | |
| **Artificial Neural Networks** : Sigmoid neuron, Feedforward neural networks, activation functions, backpropagation algorithm, loss functions, Gradient Descent - Stochastic Gradient Descent (SGD), Mini Batch Stochastic Gradient Descent (MB-SGD), Optimization methods - SGD with momentum, Adaptive Gradient (AdaGrad), RMSprop, Adam, Regularization - dropout. Demonstration of ANN using TensorFlow. | | | | | | | | | | | | | | | | | | |
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| **UNIT-2** | | | | | | | | | | | | | | | 12 Hours | | | |
| **Convolutional Neural Networks** : Convolution, filters, stride, padding, feature maps, Architecture of CNNs - input layer, convolutional layers, activation functions, pooling layers, fully connected layers, output layer, training, transfer learning, image classification. TensorFlow demonstration. | | | | | | | | | | | | | | | | | | |
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| **UNIT-3** | | | | | | | | | | | | | | | 12 Hours | | | |
| **Sequence Models** : Introduction to Sequence Modeling, word embeddings, Recurrent Neural Networks (RNNs) - Basic architecture of RNNs, Language model and sequence generation, Sentiment analysis using TensorFlow, Long Short-Term Memory (LSTM). | | | | | | | | | | | | | | | | | | |

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| **UNIT-4** | | 12 Hours |
| **Generative Models** : Autoencoders, Architecture and training of autoencoders for unsupervised representation learning, Variational Autoencoders (VAEs), The encoder-decoder framework and the reparameterization for generating new samples. | | |
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| **Text Books:** | 1. Francois Chollet, Deep Learning with Python, Manning publishers, O’Reilly publishers, First Edition, ISBN- 9781617294433 2. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, Third Edition, ISBN- 9355421982 | |
|  |  | |
| **References:** | 1. Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, First Edition, ISBN- 978-0262035613. 2. Neural Networks and Deep Learning, Michael Nielsen, online free-book.   **Video Lecture Series:**   1. Deep Learning Course-106106184, Part-1, NPTEL, Prof. Mitesh M. Kapra 2. Deep Learning Course- 106106201, Part-2, NPTEL, Prof. Mitesh M. Kapra 3. Deep Learning Course -106105215, NPTEL, Prof. Prabir Kumar Biswas 4. CS230 - Deep Learning - Stanford University. 5. 6.S191 - Introduction to Deep Learning – MIT. 6. CS224N - Natural Language Processing with Deep Learning - Stanford University. | |

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| **Big Data Analytics**  IV B. Tech. – VII Semester (Code: 22CM703/JO3A) | | | | | | | | | | | | | | | | | | | | | | |
| Lectures | | | | : | | 3 Hours/Week | | | | | | | Continuous Assessment | | | | | | : | | 30 | |
| Final Exam | | | | : | | 3 hours | | | | | | | Final Exam Marks | | | | | | : | | 70 | |
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| **Pre-Requisite**: | | | | | | | | | | | | | | | | | | | | | | |
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| **Course Objectives:** | | | | | | | | | | | | | | | | | | | | | | |
|  | Understanding Big data, Hadoop and Hadoop Distributed File System. | | | | | | | | | | | | | | | | | | | | | |
|  | Understanding YARN (Yet Another Resource Node), Map Reduce mechanism. | | | | | | | | | | | | | | | | | | | | | |
|  | Understanding PIG, HIVE. | | | | | | | | | | | | | | | | | | | | | |
|  | Understanding SQOOP, SPARK. | | | | | | | | | | | | | | | | | | | | | |
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| **Course Outcomes**: Students will be able to: | | | | | | | | | | | | | | | | | | | | | | |
| CO1 | Discuss the challenges of Big Data using Hadoop. | | | | | | | | | | | | | | | | | | | | | |
| CO2 | Apply data modeling techniques to large data sets using map reduce programs. | | | | | | | | | | | | | | | | | | | | | |
| CO3 | Examine the use of Pig and Hive Framework to work with big data. | | | | | | | | | | | | | | | | | | | | | |
| CO4 | Examine the use of spark and Sqoop Framework to work with big data. | | | | | | | | | | | | | | | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | | | | | | | | | | | | | | | |
|  | **PO’s** | | | | | | | | | | | | | | | | **PSO’s** | | | | | |
| **CO** | **1** | **2** | | | **3** | | **4** | **5** | **6** | **7** | **8** | **9** | | **10** | **11** | **12** | **1** | | | **2** | | **3** |
| **CO1** | 3 | 3 | | | 3 | | 3 | 3 | - | - | - | - | | - | - | - | 3 | | | 3 | | 3 |
| **CO2** | 3 | 3 | | | 3 | | 3 | 3 | - | - | - | - | | - | - | - | 3 | | | 3 | | 3 |
| **CO3** | 3 | 3 | | | 3 | | 3 | 3 | - | - | - | - | | - | - | - | 3 | | | 3 | | 3 |
| **CO4** | 3 | 3 | | | 3 | | 3 | 3 | - | - | - | - | | - | - | - | 3 | | | 3 | | 3 |
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| **UNIT-1** | | | | | | | | | | | | | | | | | | (12 Hours) | | | | |
| Big Data Analytics: Introduction to Big Data Analytics, Characteristics of Big Data, Sources of Big Data, Applications of Big Data. | | | | | | | | | | | | | | | | | | | | | | |
| HADOOP: Introduction to Hadoop, Hadoop components, Configuration of Hadoop,  The Hadoop Distributed File System: The design of HDFS,HDFS concepts, The command line interpreter , Basic File system operations, Hadoop File System, Interfaces Data flow, parallel copying with distcp. | | | | | | | | | | | | | | | | | | | | | | |
| **UNIT-2** | | | | | | | | | | | | | | | | | | (12 Hours) | | | | |
| YARN: Anatomy of YARN application run, YARN compared to Map Reduce 1, Scheduling in YARN. | | | | | | | | | | | | | | | | | | | | | | |
| How Map Reduce Works: Anatomy of Map Reduce job run, Failures, Shuffle and sort, Task execution. Map Reduce Features-Counters, sorting, joins side data distribution, Writing map reduce programs, deploying map reduce programs on Hadoop Cluster. | | | | | | | | | | | | | | | | | | | | | | |
| **UNIT-3** | | | | | | | | | | | | | | | | | | (12 Hours) | | | | |
| Installing and Running Pig-Execution Types, Running Pig Programs, Grunt, Pig Latin Editors, An Example, Comparison with Databases, Pig Latin-Structure, Statements, Expressions, Types, Schemas, Functions, Macros, User-Defined Functions-A Filter UDF, An Eval UDF, Data Processing Operators- Loading and Storing Data, Filtering Data, Grouping and Joining Data, Sorting Data, Combining and Splitting Data, Pig in Practice-Parallelism, Anonymous Relations, Parameter Substitution. | | | | | | | | | | | | | | | | | | | | | | |
| Installing Hive, The Hive Shell, An example, Running Hive, Configuring Hive, Hive Services, The Meta store, Comparison with traditional databases, Schema on Read versus Schema on Write, Update, transactions and Indexes, SQL on Hadoop alternatives, HiveQL, Data types, Operators and functions, Tables, Querying Data-sorting and aggregating, MapReduce Script, joins, Sub queries, Views. | | | | | | | | | | | | | | | | | | | | | | |
| **UNIT-4** | | | | | | | | | | | | | | | | | | (12 Hours) | | | | |
| Spark: Installing spark, an example spark application, jobs, stages, tasks, a scalastand alone application, anatomy of spark job run, job submission, DAG construction, task scheduling, task execution, execution cluster managers, spark on YARN. | | | | | | | | | | | | | | | | | | | | | | |
| Sqoop: Getting Sqoop, Sqoop Connectors, A Sample Import, Text and Binary File Formats, Generated Code, Additional Serialization Systems, Imports: A Deeper Look, Controlling the Import, Imports and Consistency. | | | | | | | | | | | | | | | | | | | | | | |
| **Text Books :** | | | HADOOP “The Definitive Guide”, Tom White, O’Reilly Publications, 4th Edition. Black Book on Big Data, Dreamtech Publications. | | | | | | | | | | | | | | | | | | | |
|  | | |  | | | | | | | | | | | | | | | | | | | |
| **References :** | | | Hadoop in Action, Hadoop Beginner’s Guide,Optimizing Hadoop for MapReduce, Scaling Big Data with Hadoop and Solr. | | | | | | | | | | | | | | | | | | | |

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| **Digital Forensics**  Open Elective  IV B. Tech. – VII Semester (Code: 22CM704/OE) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lectures | | | | : | | 3 Hours/Week | | | | | | | Continuous Assessment | | | | | | | | | : | | 30 | | | |
| Final Exam | | | | : | | 3 hours | | | | | | | Final Exam Marks | | | | | | | | | : | | 70 | | | |
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| **Pre-Requisite**: CN, DBMS | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| * Identify different techniques of data acquisition in Digital Forensics, Prepare for investigation process * Analyze Crime & Incident Scenes using Windows Forensics, Process Log & Event analysis * Investigate Network, Wireless & Web attacks, * Process E-mail, Mobile Device attack incidents. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CO1 | | Identify different techniques of data acquisition in Digital Forensics, Prepare for investigation process | | | | | | | | | | | | | | | | | | | | | | | | | |
| CO2 | | Analyze Crime & Incident Scenes using Windows Forensics, Process Log & Event analysis | | | | | | | | | | | | | | | | | | | | | | | | | |
| CO3 | | Investigate Network, Wireless & Web attacks, | | | | | | | | | | | | | | | | | | | | | | | | | |
| CO4 | | Process E-mail, Mobile Device attack incidents. | | | | | | | | | | | | | | | | | | | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  |  | | | | **PO’s** | | | | | | | | | | | | | | | **PSO’s** | | | | | |  | |
| **CO** | | | | **1** | | **2** | **3** | **4** | **5** | **6** | **7** | | **8** | **9** | **10** | **11** | | **12** | **1** | | | **2** | | **3** |  | |
| **CO1** | | | | 2 | | 1 | 1 | 3 | 3 | 3 | - | | 2 | 1 | - | - | | 1 | 3 | | | 2 | | 2 |  | |
| **CO2** | | | | 2 | | 1 | 1 | 3 | 3 | 3 | - | | 2 | 1 | - | - | | 1 | 3 | | | 2 | | 2 |  | |
| **CO3** | | | | 2 | | 1 | 1 | 3 | 3 | 3 | - | | 2 | 1 | - | - | | 1 | 3 | | | 2 | | 2 |  | |
| **CO4** | | | | 2 | | 1 | 1 | 3 | 3 | 3 | - | | 2 | 1 | 2 | - | | 1 | 3 | | | 2 | | 2 |  | |
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| **UNIT-1** | | | | | | | | | | | | | | | | | | | | | (12 hours) | | | | | | |
| **Introduction To Digital Forensic:** Introduction, Evolution Of Computer Forensics, Stages Of Computer Forensics Process, Benefits Of Computer Forensics, Uses Of Computer Forensics, Objectives Of Computer Forensics, Role Of Forensics Investigator, Forensics Readiness **Computer Forensics Investigation Process:** Introduction To Computer Crime Investigation, Assess The Situation, Acquire The Data, Analyze The Data, Report The Investigation  **Digital Evidence And First Responder Procedure:** Digital Evidence, First Responder Toolkit, Issues Facing Computer Forensics, Types Of Investigation, Techniques Of Digital Forensics | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **UNIT-2** | | | | | | | | | | | | | | | | | | | | | (12 hours) | | | | | | |
| **Windows Forensics:** Introduction, Recovering Deleted Files And Partitions, More About Recovering Lost Files/Data  **Logs & Event Analysis And Password Cracking:** Introduction, Windows Registry, Windows Event Log File, Windows Password Storage, Application Passwords Crackers | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **UNIT-3** | | | | | | | | | | | | | | | | | | | | | (12 hours) | | | | | | |
| **Network Forensics:** Introduction, Network Components And Their Forensics Importance, OSI, Forensics Information From Network, Log Analysis, Forensics Tools  **Wireless Attacks**: Introduction, Wireless Fidelty (Wi-Fi)(802.11), Wireless Security, Wireless Attacks Detection Techniques, Wireless Intrusion Detection Systems  Investigating Web Attacks: Introduction, Types Of Web Attacks, Web Attack Forensics, Web Application Forensics Tools | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **UNIT-4** | | | | | | | | | | | | | | | | | | (12 hours) | | | | | | | | |
| **Investigating Email Attacks:** Introduction, Email Attacks And Crimes, Privacy In Emails, Email Forensics, Email Forensic Tools  **Mobile Device Forensics:** Introduction, Challenges In Mobile Forensics, Mobile Communication, Evidences In A Mobile Device, Mobile Forensic Process, Forensic Acquisition Tools | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Text Books:** | | | 1. Dr. Jeetedra Pande, Dr. Ajay Prasad, Uttarakhand Open University, 2016. | | | | | | | | | | | | | | | | | | | | | | | |
| **Reference Books:** | | | 1. The basics of digital Forensics (Latest Edition) – The primer for getting started in digital forensics by John Sammons – Elsevier Syngress Imprint 2. Cybersecurity – Understanding of cybercrimes, computer forensics and Legal perspectives by Nina Godbole and Sunit Belapure – Wiley India Publication | | | | | | | | | | | | | | | | | | | | | | | |
| **e-Learning Resources:** | | | 1. https://nptel.ac.in/ 2. https://[www.coursera.org/](http://www.coursera.org/) 3. Ministry of Electronics and Information Technology (MeitY) – Govt of India – Information Security Project – https://[www.infosecawareness.in/](http://www.infosecawareness.in/) | | | | | | | | | | | | | | | | | | | | | | | |

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| **INDUSTRIAL MANAGEMENT & ENTREPRENEURSHIP DEVELOPMENT**  **IV B.Tech – VIII Semester (Code:22CM705/ME05)** | | | | | | | | |
| Lectures | | | : | 3 Hours/Week | Continuous Assessment | | : | 30 |
| Final Exam | | | : | 3 hours | Final Exam Marks | | : | 70 |
|  | | | | | | | | |
| **Pre-Requisite**: Computer Networks (20CB502) | | | | | | | | |
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| **Course Objectives:** Students will be able to | | | | | | | | |
|  | To provide students an insight into the concepts of general, scientific management and various forms of business organizations alongwith awareness about various organization structures | | | | | | | |
|  | It aims to provide the students with an understanding of basics of human resource management, marketing management. | | | | | | | |
|  | To make the students to understandinventory control concepts, fundamentals of TQM, and supply chain management. | | | | | | | |
|  | To provide an understanding of financial management andrealize the importance of Entrepreneurship. | | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | | |
| CO1 | Describe the various functions of the management. Learn various forms and structures of business organizations. | | | | | | | |
| CO2 | Understand how resources to be planned and also understand various motivation theories, leadership styles and marketing management. | | | | | | | |
| CO3 | Develop knowledge about inventory control. Gain the knowledge on Total quality management and understand supply chain management. | | | | | | | |
| CO4 | Grasp complete knowledge on importance of entrepreneurship and ability to understand capital and various types of capital. | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | |
| |  | **PO’s** | | | | | | | | | | | | **PSO’s** | | | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **CO** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | | **CO1** | - | - | - | - | - | - | - | - | - | - | 3 | 3 | 2 | - | - | | **CO2** | - | - | - | - | - | - | - | - | - | - | 3 | 3 | 2 | - | - | | **CO3** | - | - | - | - | - | - | - | - | - | - | 3 | 3 | 2 | - | - | | **CO4** | 2 | 3 | 2 | 3 | - | - | - | - | - | - | 3 | 3 | 2 | - | - | | | | | | | | | |
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| **UNIT-1** | | | | | | 13 Hours | | |
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| **General management:** Management definition, Functions of Management and Principles of Management.  **Forms of Business Organization:** Salient features of Sole Proprietorship, Partnership, Joint Stock Company, Private Limited and Public Limited companies; Merits and Demerits of above types  **Marketing Management:** Functions of Marketing, Concepts of Selling and Marketing, Marketing mix (4 Ps); Advertising and sales promotion; Product life cycle. | | | | | | | | |
| **UNIT-2** | | | | | | 13 Hours | | |
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| **Production Management:** Types of production systems, Productivity vs. Production, Production planning and control.  **Materials Management:** Inventory Control, Basic EOQ model, ABC analysis.  Quality Control: Control Charts: chart, R chart, P chart, C chart, Acceptance sampling. | | | | | | | | |
| **UNIT-3** | | | | | | 13 Hours | | |
| **Financial Management:** Functions of finance, Types of Capital-Fixed and Working Capital, Break Even Analysis.  Depreciation: Straight line method of depreciation, declining balance method and the Sum of Years digits method of Depreciation.  **Personnel Management:** Functions of personnel management, human resource planning, recruitment, selection, placement, training and development and performance appraisal. Motivation theories, leadership styles | | | | | | | | |
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| **UNIT-4** | | | | | | 13 Hours | | |
| **Entrepreneurship Development:** Introduction, Entrepreneurial characteristics, Functions of an Entrepreneur; Factors affecting entrepreneurship; Role of communication in entrepreneurship; Entrepreneurial Development-Objectives, Need of Training for enterprises; Finance for the enterprises; Product, Process and Plant Design- Product analysis and Product Design process. Steps in process design and Plant Design. | | | | | | | | |
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| **Text Books :** | | 1. Industrial Engineering and Operations Management, S.K.Sharma, Savita Sharma and Tushar Sharma.  2. Industrial Engineering and Production Management, Mahajan.  3. Management Science, A.R.Aryasri | | | | | | |
|  | |  | | | | | | |
| **References :** | | 1. Operations Management, Joseph G Monks. 2. Marketing Management, Philip Kotler. 3. The Essence of Small Business, Barrow colin. | | | | | | |

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| **Big Data Analytics Lab**  (Job Oriented Elective Lab – 3)  IV B. Tech. – VII Semester (Code: 22CML702/JOL3B) | | | | | | | | | | | | | | | | | | |
| Practicals : | | 3 Periods / Week | | | | | | Continuous Internal Assessment : | | | | | | | | | 30 | |
| Final Exam : | | 3 hours | | | | | | Semester End Exam : | | | | | | | | | 70 | |
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| **Course Outcomes**: Students will be able to | | | | | | | | | | | | | | | | | | |
| * Understand the concepts of Data mining and Big Data Analytics * Apply machine learning algorithms for data analytics * Analyze various text categorization algorithms * Use Technology and tools to solve the Big Data Analytics problems | | | | | | | | | | | | | | | | | | |
| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | | | | | | | | | | | |
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|  | **PO’s** | | | | | | | | | | | | | | **PSO’s** | | | |
| **CO** | **1** | | **2** | **3** | **4** | **5** | **6** | | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | | **3** |
| **CO1** | 3 | | 3 | 3 | 3 | 3 | - | | - | 2 | - | 2 | - | 3 | 3 | 3 | | 3 |
| **CO2** | 3 | | 3 | 3 | 3 | 3 | - | | - | 2 | - | 2 | - | 3 | 3 | 3 | | 3 |
| **CO3** | 3 | | 3 | 3 | 3 | 3 | - | | - | 2 | - | 2 | - | 3 | 3 | 3 | | 3 |
| **CO4** | 3 | | 3 | 3 | 3 | 3 | - | | - | 2 | - | 2 | - | 3 | 3 | 3 | | 3 |
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| **LIST OF EXPERIMENTS** | | | | | | | | | | | | | | | | | | |
| 1. Write the steps for installation of Hadoop. 2. Write commands to interact with HDFS interface. 3. Write a Map Reduce program for Word Count Example. 4. Write a Map Reduce program for Card Count data set. 5. Write the steps for installation of Pig. 6. Write the word count script using Pig Latin. 7. Illustrate the basic Pig Latin concepts with help of any dataset. 8. Write the steps for installing Hive. 9. Illustrate the creation, loading & complete select statements in Hive. 10. Write the script how data will be transfer using Sqoop. | | | | | | | | | | | | | | | | | | |
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| **Text Book(s):** | | 1. HADOOP “The Definitive Guide”, Tom White, O’Reilly Publications, 4th Edition. | | | | | | | | | | | | | | | | |

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| **Project Work**  IV B.Tech – VIII Semester (Code: 22CM801/PW01) | | | | | | | | | | | | | | | | | | |
| Practicals : | | | -- | | | | | Continuous Internal Assessment : | | | | | | | | 30 | | |
| Final Exam : | | | -- | | | | | Semester End Exam : | | | | | | | | 70 | | |
|  | | | | | | | | | | | | | | | | | | |
| Pre-Requisite: None. | | | | | | | | | | | | | | | | | | |
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| **Course Outcomes**: At the end of the course, students will be able to | | | | | | | | | | | | | | | | | | |
| CO1 | Identify the real time problem related to domain knowledge and outline a solution for the problem. | | | | | | | | | | | | | | | | | |
| CO2 | Acquire practical knowledge related to preparation of project. | | | | | | | | | | | | | | | | | |
| CO3 | Report the outcomes of the project by means of verbal and written presentation | | | | | | | | | | | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | | | | | | | | | | | |
|  | **PO’s** | | | | | | | | | | | | | | **PSO’s** | | | |
| **CO** | **1** | **2** | | **3** | **4** | **5** | **6** | | **7** | **8** | **9** | **10** | **11** | **12** | **1** | | **2** | **3** |
| **CO1** | 3 | 3 | | 3 | 3 | 3 | 3 | | 3 | 3 | 3 | 3 | - | 3 | 3 | | 3 | 3 |
| **CO2** | 3 | 3 | | 3 | 3 | 2 | 3 | | 3 | 3 | 3 | 3 | - | 3 | 3 | | 3 | 3 |
| **CO3** | 3 | 3 | | 3 | 3 | 2 | 3 | | 3 | 3 | 3 | 3 | - | 3 | 3 | | 3 | 3 |
| The Project work shall be carried out by a batch consisting not more than four students for one semester. It should help the students to comprehend and apply different theories and technologies that they have learnt through and are learning. It should lead to a substantial result as a comparative study, a new application of the technologies available or some extension to the works carried out by some researcher and published in referred journals. Each batch must carry out the analysis, design, implementation and testing of the entire project basing on the Software Engineering principles. There shall be a total of four reviews made by the batch regarding:   1. 0th Review: The idea/concept which forms the basis for their project shall be presented to the guide, concerned in charge and classmates and shall get the approval for Continuation. 2. 1st Review : The analysis and design carried out. 3. 2nd Review : The implementation and the testing done. 4. 3rd Review: Over all Presentation of the work carried out and the results found out for the valuation under the internal Assessment.   A comprehensive report on the lines of IEEE Format is to be submitted at the end of the semester, which is certified by the concerned guide and the HOD.  There shall be an external guide appointed by the Principal/Controller of Examiner to make an assessment and to carry out the Viva-Voce examination. | | | | | | | | | | | | | | | | | | |

**List of Subjects offered under Honors in Cyber Security**

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| **Code** | **List of HONOR Courses** | **Mode** |
| A | Advanced Data Structures | Class Room |
| B | Advanced Computer Architecture | Class Room |
| C | Graph Theory | Class Room |
| D | Numerical Optimization. | Class Room |
| E | Advanced Database Systems | Class Room |
| F | Real Time Operating Systems | Class Room |
| G | Parallel Algorithms | Class Room |
| H | Web Semantics | Class Room |
| I | Secure Computation | Class Room |
| J | Firewall & VPN Security | Class Room |
| K | Network Security & Cyber Laws | Class Room |
| L | Cyberspace Operations and Design | Class Room |
| M | Web Semantics | Class Room |
| N | Security Governance, Risk and compliance |  |
| O | Perception & Computer Vision |  |
| P | Secure Software Design & Enterprise Computing |  |

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| **ADVANCED DATA STRUCTURES**  Honer Course (Code: A) | | | | | | | |
| Lectures | | : | 4 Hours/Week | Continuous Assessment | | : | 30 |
| Final Exam | | : | 3 hours | Final Exam Marks | | : | 70 |
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| **Pre-Requisite**: Data Structures | | | | | | | |
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| **UNIT-1** | | | | | (12 Hours) | | |
| Efficient Binary Search Trees: - Red-Black Trees, Splay Trees, 2-3 Trees – Properties, Rotations, Insertion, Deletion. | | | | | | | |
| **UNIT-2** | | | | | (12 Hours) | | |
| Advanced Hashing: - Double Hashing, Rehashing, Extendible Hashing.  Priority Queues: - Binomial heaps, Symmetric Min-Max Heaps, Fibonacci Heaps – Structure of Fibonacci heaps, Mergeable-heap operations, decreasing a key and deleting a node, Bounding the maximum degree. | | | | | | | |
| **UNIT-3** | | | | | (12 Hours) | | |
| Dictionaries: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries. Data Structures for Disjoint Set: - Disjoint-set operations, Linked-list representation of disjoint sets, Disjoint-set forests, Analysis of union by rank with path compression. | | | | | | | |
| **UNIT-4** | | | | | (12 Hours) | | |
| String Matching- The naive string-matching algorithm, The Rabin-Karp algorithm, The Knuth-Morris-Pratt algorithm. | | | | | | | |
| **Text Books :** | 1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, Second Edition, Pearson Education.  2. Cormen, Leiserson, Rivest and Stein, “Introduction of Computer Algorithm”, PHI. | | | | | | |
|  |  | | | | | | |
| **References :** | 1. Langsam, Augeustein and Tenenbaum, “Data Structures Using C”, Pearson Education Asia.  2. Horowitz, Sahniand, Rajasekaran,“Fundamentals of Computer Algorithms”, Galgotia Publication. | | | | | | |

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| **ADVANCED COMPUTER ARCHITECTURE**  Honer Course (Code: B) | | | | | | | |
| Lectures | | : | 4 Hours/Week | Continuous Assessment | | : | 30 |
| Final Exam | | : | 3 hours | Final Exam Marks | | : | 70 |
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| **Pre-Requisite**: | | | | | | | |
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| **UNIT-1** | | | | | (15 Hours) | | |
| Parallel Computer Models: The state of computing, Classification of parallel computers, Multiprocessors and Multi computers, Multi-vector and SIMD computers.  Program and network properties: Conditions of parallelism, Data and resource Dependencies, Hardware and Software parallelism, Program partitioning and scheduling, Grain Size and latency, Program flow mechanisms, Control flow versus data flow, Data flow Architecture, Demand driven mechanisms, Comparisons of flow mechanisms.  System Interconnect Architectures: Network properties and routing, Static interconnection Networks, Dynamic interconnection Networks, Hierarchical bus systems, Crossbar switch and multiport memory, Multistage and combining network. | | | | | | | |
| **UNIT-2** | | | | | (15 Hours) | | |
| Principles of Scalable Performance: Performance Metrics and Measures: Parallelism Profile in Programs, Efficiency, Utilization and Quality, Standard Performance Measures, Speedup Performance Laws: Amdahl’s law for fixed load, Gustafson’s law for scaled problems, Memory Bounded Speedup Model.  Pipelining: Linear pipeline processor, nonlinear pipeline processor, Instruction pipeline Design- Instruction Execution Phases, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch Handling techniques, Arithmetic Pipeline Design: Computer Arithmetic principles, Static Arithmetic pipeline, Multifunctional arithmetic pipelines. | | | | | | | |
| **UNIT-3** | | | | | (15 Hours) | | |
| MULTI Processors: Multiprocessor System Interconnect: Hierarchical Bus Systems, Crossbar Switch and Multiport Memory, Multistage and Combining Networks, Cache Coherence and Synchronization Mechanisms: The Cache Coherence problem, Snoopy Bus Protocols, Directory Based Protocols, Hardware Synchronization Mechanisms, Message-passing Mechanism: Message Routing Schemes, Deadlock and Virtual Channels, Flow Control Strategies, Multicast Routing Algorithms.  Scalable, Multithreaded and Dataflow Architectures: Latency-Hiding Techniques, Principles of Multithreading, Scalable and Multithreaded Architectures. | | | | | | | |
| **UNIT-4** | | | | | (15 Hours) | | |
| Thread Based Parallelism: Introduction, Using the python threading model, How to define a Thread, How to determine a current Thread, How to use a thread in subclass, Thread Synchronization with Lock and RLock, Thread Synchronization with RLock, Thread Synchronization with Semaphores, Thread Synchronization with a Condition, Thread Synchronization with an Event, Using a with Statement, Thread Communication with a Queue, Evaluating the performance of Multithreaded applications.  Process Based Parallelism: Introduction, How to spawn a process, How to name a Process, How to run a Process in the background, How to kill a process, How to use a process in subclass, how to exchange objects between processes, How to synchronize the Processes, How to manage a state between Processes, How to use a Process pool, Using the mpi4py python module, Point-to-Point to Communications, Avoiding Dedalock problems, Collective communication using Broadcast, Collective Communication using a Scatter, Collective Communication using Gather, Collective Communication using Alltoall, The reduce operation, How to Optimize an Operation. | | | | | | | |
| **Text Books :** | 1. Kai Hwang, “Advanced Computer Architecture”, TMH.  2. “Python Parallel Programming cookbook”, Giancarlo Zaccone, Packt Publishing. | | | | | | |
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| **References :** | 1. D.A. Patterson and J.L.Hennessy, “Computer organization and Design”, Morgan Kaufmann, 2nd Edition.  2. V.Rajaram & C.S.R.Murthy, “Parallel Computer”, PHI.  3. Barry Wilkinson and Michael Allen, “Parallel Programming”, Pearson Education.  4. Parallel Programming with Python, Jan Palach, Packt Publishing | | | | | | |

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| **GRAPH THEORY**  Honer Course (Code: C) | | | | | | | |
| Lectures | | : | 4 Hours/Week | Continuous Assessment | | : | 30 |
| Final Exam | | : | 3 hours | Final Exam Marks | | : | 70 |
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| **Pre-Requisite**: | | | | | | | |
|  | | | | | | | |
| **UNIT-1** | | | | | (13 Hours) | | |
| Graphs, Sub graphs, some basic properties, various example of graphs & their sub graphs, walks, path & circuits, connected graphs, disconnected graphs and component, euler graphs, various operation on graphs, Hamiltonian paths and circuits, the traveling sales man problem. | | | | | | | |
| **UNIT-2** | | | | | (13 Hours) | | |
| Trees and fundamental circuits, distance diameters, radius and pendent vertices, rooted and binary trees, on counting trees, spanning trees, fundamental circuits, finding all spanning trees of a graph and a weighted graph, algorithms of primes, Kruskal and Dijkstra Algorithms. | | | | | | | |
| **UNIT-3** | | | | | (13 Hours) | | |
| Cuts sets and cut vertices, some properties, all cut sets in a graph, fundamental circuits and cut sets, connectivity and separability, network flows, Planer graphs, combinatorial and geometric dual: Kuratowski graphs, detection of planarity, geometric dual, Discussion on criterion of planarity, thickness and crossings. | | | | | | | |
| **UNIT-4** | | | | | (13 Hours) | | |
| Vector space of a graph and vectors, basis vector, cut set vector, circuit vector, circuit and cut set subspaces, Matrix representation of graph – Basic concepts; Incidence matrix, Circuit matrix, Path matrix, Cut-set matrix and Adjacency matrix. Coloring, covering and partitioning of a graph, chromatic number, chromatic partitioning, chromatic polynomials, matching, covering, four color problem Discussion of Graph theoretic algorithm wherever required. | | | | | | | |
| **Text Books :** | DeoNarsingh, Graph theory with applications to Engineering and Computer Science, PHI | | | | | | |
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| **References :** | 1. Gary Chartrand and Ping Zhang, Introduction to Graph Theory, TMH  2. Robin J. Wilson, Introduction to Graph Theory, Pearson Education  3. Harary, F, Graph Theory, Narosa  4. Bondy and Murthy: Graph theory and application. Addison Wesley.  5. V. Balakrishnan, Schaum's Outline of Graph Theory, TMH  6. GeirAgnarsson, Graph Theory: Modeling, Applications and Algorithms, Pearson  Education | | | | | | |

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| **ADVANCED DATABASE SYSTEMS**  Honer Course (Code: E) | | | | | | | |
| Lectures | | : | 3 Hours/Week | Continuous Assessment | | : | 30 |
| Final Exam | | : | 3 hours | Final Exam Marks | | : | 70 |
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| **Pre-Requisite**: | | | | | | | |
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| **UNIT-1** | | | | | (15 Hours) | | |
| Introduction to NoSQL: Difference between RDBMS and NoSQLDatabase, Definition of NoSQL, History of NoSQL, NoSQL Storage Architecture, Types of NoSQL databases-Document Databases, Key-value databases, Column Oriented databases, Graph databases, When to use NoSQL and when not, Interfacing and Interacting with NoSQL. | | | | | | | |
| **UNIT-2** | | | | | (15 Hours) | | |
| Introduction MongoDB: MongoDB installation, Basics of MongoDB, MongoDB shell, MongoDB datatypes, MongoDB CRUD operations: adding new documents to a collection, selecting documents, updating existing documents, removing documents from a collection. | | | | | | | |
| **UNIT-3** | | | | | (15 Hours) | | |
| MongoDb Aggregation frameworks and MongoDb Aggregation operations: $group, $limit, $project, $sort, $match, $add fields, $count, $lookup, $out operators. MongoDb sorting, MongoDb indexing: single field indexes, sorting with indexed, compound indexed, partial indexes. | | | | | | | |
| **UNIT-4** | | | | | (15 Hours) | | |
| MongoDb import and export, sharding in MongoDb, MongoDb python drivers, python and MongoDb, creating application with python and MongoDb. | | | | | | | |
| **Text Books :** | 1. MongoDB – The Definitive Guide, 2nd edition, Oreilly.  2. Pramod J.Sadalage, Martin Fowler, ”NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence”, 1st edition, Pearson Education, 2012. | | | | | | |
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| **References :** | 1. MongoDB Cook Book, 2nd edition, Cyrus Dasadia & Amol Nayak, PACKT Publishing.  2. Dan Sullivan, “NoSQL for Mere Mortals”, 1st edition, Pearson Education, 2015. | | | | | | |

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| **REAL TIME OPERATING SYSTEMS**  Honer Course (Code: F) | | | | | | | |
| Lectures | | : | 4 Hours/Week | Continuous Assessment | | : | 30 |
| Final Exam | | : | 3 hours | Final Exam Marks | | : | 70 |
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| **Pre-Requisite**: | | | | | | | |
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| **UNIT-1** | | | | | (13 Hours) | | |
| Introduction: Typical Real-Time applications, Hard versus Soft Real-Time systems, A reference model of Real-Time Systems. | | | | | | | |
| **UNIT-2** | | | | | (13 Hours) | | |
| Commonly used approaches to Real-Time scheduling: Clock-Driven scheduling, Pros and Cons of Clock-driven scheduling. | | | | | | | |
| **UNIT-3** | | | | | (13 Hours) | | |
| Priority-Driven scheduling of Periodic tasks: static assumption, Fixed-Priority versus Dynamic-Priority algorithms, Optimality of the RM and DM algorithms, A schedulability test for Fixed-Priority tasks with short response times and arbitrary response times, sufficient schedulability conditions for the RM and DM algorithms;  Scheduling Aperiodic and Sporadic jobs in priority-Driven systems: Deferrable Servers, Sporadic Servers, Constant Utilization, Total Bandwidth and weighted Fair-Queuing Servers, Scheduling of sporadic Jobs. | | | | | | | |
| **UNIT-4** | | | | | (13 Hours) | | |
| Resources and Resources Access Control: Scheduling Flexible computations and tasks with temporal distance constraints. | | | | | | | |
| **Text Books :** | Jane W.S.Liu, “Real-Time Systems”, Pearson Education Asia. | | | | | | |
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| **References :** | C.M.Krishna and G.Shin, “Real-Time Systems”, Tata McGraw Hill Co. Inc., 1997. | | | | | | |

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| **WEB SEMANTICS**  Honer Course (Code: M) | | | | | | | | | |
| Lectures | | : | | 3 Hours/Week, Tutorial:1 | Continuous Assessment | | | : | 30 |
| Final Exam | | : | | 3 Hours | Final Exam Marks | | | : | 70 |
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| **Pre-Requisite**: Web Technology | | | | | | | | | |
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| **Course Objectives:** The student will be able to | | | | | | | | | |
|  | Understand the advantages of Semantic web and schemas of the semantic web | | | | | | | | |
|  | Understand and implement the ideas of sematic web and querying in semantic web. | | | | | | | | |
|  | Develop and apply logic for inferences in semantic web. | | | | | | | | |
|  | Develop ontologies for various objects. | | | | | | | | |
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| **Course Outcomes**: Students will be able to | | | | | | | | | |
| CO-1 | Comprehend the advantages of Semantic web and schemas of the semantic web. | | | | | | | | |
| CO-2 | Develop and implement the ideas of sematic web and querying in semantic web. | | | | | | | | |
| CO-3 | Analyze and apply logic for inferences in semantic web. | | | | | | | | |
| CO-4 | Construct ontologies for various objects. | | | | | | | | |
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| **Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes** | | | | | | | | | |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | **PO’s** | | | | | | | | | | | | **PSO’s** | | | | **CO** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | | **CO-1** | 1 | 2 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 3 | 1 | 1 | | **CO-2** | 1 | 2 | 3 | 3 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 3 | 1 | 1 | | **CO-3** | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | **CO-4** | 1 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 3 | 1 | 1 | | | | | | | | | | |
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| **UNIT-I** | | | | | | 15 Periods | | | |
| The Semantic Web Vision, Today’s Web, Semantic Web Technologies, A Layered Approach Structured Web Documents in XML, Motivation and Overview, the XML Language Structuring, DTDs, XML Schema, Namespaces, Addressing and Querying XML Documents Processing. | | | | | | | | | |
| **UNIT-2** | | | | | | | 15 Periods | | |
| Describing Web Resources in RDF, Motivation and Overview, RDF: Basic Ideas, RDF: XML-Based Syntax RDF Schema: Basic Ideas, RDF Schema: The Language, RDF and RDF Schema in RDF Schema, An Axiomatic Semantics for RDF and RDF Schema, RDF,RDF Schema A direct inference system for RDF(S) Querying in RQL.  Web Ontology Language: OWL, Motivation and Overview, the OWL Language, Examples An African Wildlife Ontology, printer ontology, OWL in OWL, Future extensions. | | | | | | | | | |
| **UNIT-3** | | | | | | | 15 Periods | | |
| Logic and Inference: Rules , Motivation and Overview , An Example of Monotonic Rules: Family Relations , Monotonic Rules: Syntax , Monotonic Rules: Semantics , Nonmonotonic Rules: Motivation and Syntax , An Example of Nonmonotonic Rules: Brokered Trade , Rule Mark-up in XML: Monotonic Rules Rule Mark-up in XML: Nonmonotonic Rule  Applications: Introduction, Horizontal information products from Elsevier, Data integration at Boeing (and elsewhere), Skill-finding at Swiss Life , Think-tank portal at Ener Search, eLearning, Web Services ,Other applications scenarios. | | | | | | | | | |
| **UNIT-4** | | | | | | | 15 Periods | | |
| Ontology Engineering: Introduction, Manually constructing ontologies, Re-using existing ontologies Using semi-automatic methods, On-To-Knowledge Semantic Web architecture. | | | | | | | | | |
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| **Text Books :** | | | “A Semantic Web Primer”, Grigoris Antoniou,Frank van Harmelen, The MIT Press,Cambridge, Massachusetts ,London, England. | | | | | | |
| **References :** | | | “Foundations of Semantic Web Technologies”by [Markus Krotzsch](https://www.amazon.in/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Markus+Krotzsch&search-alias=stripbooks) , [Pascal Hitzler](https://www.amazon.in/Pascal-Hitzler/e/B001JS2672/ref=dp_byline_cont_book_2) , [Sebastian Rudolph](https://www.amazon.in/Sebastian-Rudolph/e/B002LTVBAQ/ref=dp_byline_cont_book_3) | | | | | | |