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MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

# SYLLABUS

# DR VISHWANATH KARAD

# MIT - WORLD PEACE UNIVERSITY

## FACULTY OF ENGINEERING AND TECHNOLOGY

## SCHOOL OF COMPUTER ENGINEERING AND TECHNOLOGY

## B. Tech (Computer Science & Engineering)

### BATCH 2020 – 2024 AND ONWARDS

# PROGRAMME STRUCTURE

## ***Preamble***:

The Computer Engineering and Technology is the most sought-after branch of Engineering in today's world. With the advancements in hardware and software technologies, there is huge scope for development of a wide range of applications. The Internet and allied technologies had connected the world so immensely that the world is now a "Global Village". The students of MITWPU will be tomorrow's global leaders, researchers, entrepreneurs and change-makers. MITWPU has the objective to make them competent for global scenarios.

The B.Tech (CSE) curriculum offers a varied range of subjects that fall into the core, specialization and basic sciences categories. The course also has provisions for pursuing Industry projects, Internships, Foreign and National study tours, Interdisciplinary Projects as a prudential aspect of the course curriculum. The value-based education is ensured by offering Peace related subjects and Yoga practice. The curriculum is based on the theme of "Continuous Evaluation". Theory and Laboratory components are given appropriate importance. The communication skills are enhanced through the component of Seminars. Industry exposure is given through Internships / Projects, and development of latest Tools / Technologies is cached through the components of "Add-on skills".

The curriculum will transform the students into winning personalities.

**Dr. Vrushali Kulkarni**
Head, School of Computer Engineering and Technology

Vice Chairman
BoS for School of Computer Engineering and Technology

**Dr. Prasad Khandekar**
Dean, Faculty of Engineering and Technology

Chairman,
BoS for School of Computer Engineering and Technology

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# ***Vision and Mission of the Programme***

## VISION

To be an academic centre of excellence in Computer Science and Engineering to cater to societal needs.

## MISSION

- To create conducive environment for nurturing integrity, discipline and technical knowledge in emerging areas of computer science and engineering.
- To encourage students to work in transdisciplinary domain in collaboration with industry and to inculcate research mindset.
- To develop globally competent graduates to provide solutions for societal problems.

# ***Programme Educational Objectives***

The Computer Engineering and Technology Graduate will:

**PEO 1 Competent Professionals:** Identify and effectively solve real life problems with sustainable solutions.

**PEO 2 Multifaceted Professionals:** Exhibit technical knowledge, research aptitude and innovative mindset to excel in multidisciplinary domains.

**PEO 3 Ethical Professionals:** Pursue ethical values, leadership and interpersonal skills during their professional careers for wellbeing of society.

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# ***Programme Outcomes (POs)***

Computer Engineering and Technology Graduates will be able to:

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

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

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

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

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

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

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

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

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

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

**PO11** **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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

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## ***Programme Specific Outcomes (PSOs)***

Computer Engineering and Technology Graduates will be able to:

**PSO 1** Analyse, design and develop computer-based systems to solve real life problems by applying knowledge of Computer Science and Engineering.

**PSO 2** Apply knowledge acquired through self-learning to implement computing systems in diverse domains of Computer Science and Engineering.

**PSO 3** Constructive mindful approach to architect innovative IT solutions with acumen for entrepreneurship, research and zest for higher studies.

## ***Programme Structure:***

**(a) Programme duration** : Four Years

**(b) System followed** : Trimester

**(c) Credits System:**

The outcome based education, trimester based credit and grading system is introduced to ensure quality of engineering education. Trimester based credit and grading system enables a much-required shift in focus from teacher centric to learner-centric education since the workload estimated is based on the investment of time in learning and not in teaching. It also focuses on continuous evaluation which will enhance the quality of education.

1. Per term or per year: : Credits are given per trimester
2. Total in the programme : 168 Credits

**(d) Credits for activities other than academics:**

In the curriculum, some credits are given to other activities such as social internship, domestic and international study tours, and Industry internship/project.

**(e) Internship:**

The program has rural immersion module as a part of social internship in the first year of study. The student would also have to undergo one full trimester Internship in Industry along with their project work during the final year. These internships have credits and mandatory for all the students.

**(f) Assessment Criteria:**

There will be continuous as well as end trimester assessment of a student's performance and grades will be awarded by the Subject Teacher. Various assessment tools such as tests, quizzes, assignments, project, group activities, presentations, etc. would be used to evaluate the performance of the students.

**(g) Branches or Specialisations:**

The students of B. Tech. (Computer Science & Engineering) Program can also be specialised in:

- Data Science

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- Information and Cyber Security
- Multimedia and Computer Vision
- Software Design and Development

**(h) <u>Mandatory Attendance to appear for examination</u>:**

As per the Examination Ordinance, 2020 of MIT-WPU, the student should have minimum 75% attendance in a trimester considering all concessions such as attendance concession given for sport, sick leave etc. to appear for external examination for that trimester.

**(i) <u>Medium of Instruction & Examination</u>**: English

As per Section 14(a), Academic Ordinance: 2018 of MIT-WPU, in all the Academic Programs, the medium of instruction and examination shall be English.

**(j) <u>Eligibility criteria for admission to the programme</u>:**

As per Para 4, Academic Ordinance: 2017 of MIT-WPU, the eligibility criteria for First Year B. Tech. admission is as below:

1. Passed HSC or its equivalent examination with Physics and Mathematics as compulsory subjects along with one of the Chemistry or Biotechnology or Biology or Technical Vocational subjects, and obtained at least 50 % marks (at least 45 % marks, in case of Backward class categories and Persons with Disability candidates belonging to Maharashtra State only) in the above subjects taken together **OR**
2. Passed Diploma in Engineering and Technology and obtained at least 50 % marks (at least 45 % marks, in case of Backward class categories and Persons with Disability candidates belonging to Maharashtra State only)
3. Obtained score in MHT-CET conducted by the Competent Authority. **OR** Obtained score in JEE (Main) conducted by the Competent Authority.

**Eligibility Criteria for B.Tech. (Lateral Entry)**

1. The candidate should have passed in First Class / First Class with condonation, post SSC Or post HSC diploma course in Engineering / Technology of the Maharashtra State Board of Technical Education (MSBTE) **OR**
2. Any other recognized Diploma equivalent to the Diploma awarded by the Maharashtra State Board of Technical Education (MSBTE) with English as a medium of instruction at Diploma level. **OR**
3. Any other state / Territory Diploma equivalent to MSBTE, approved by AICTE, English as a medium of instruction out of state.

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## B. Tech. Courses in Computer Engineering and Technology

### A. Definition of Credit:

| | |
|---|---|
| 1 Credit (Theory/Tutorial) | 15 Hrs |
| 1 Credit (Laboratory/Project or similar activity) | 30 Hrs |

### B. Credits:

Total number of credits for four-year **B.Tech. Computer Science and Engineering** programme would be 168.

### C. Structure of Credits for Undergraduate B.Tech. Computer Science and Engineering programme:

| S. No. | Category | Suggested Breakup of Credits (Total 168) |
|---|---|---|
| 1 | Humanities and Social Sciences and Peace programmes including Management courses | 19 |
| 2 | Basic Science courses | 31 |
| 3 | Engineering Science courses including workshop, drawing, Basics of electrical/mechanical/computer etc. | 23 |
| 4 | Professional core courses | 57 |
| 5 | Professional Elective courses relevant to chosen specialization/branch | 16 |
| 6 | Open subjects–Electives from other technical and/or emerging subjects | 04 |
| 7 | Project work, seminar and internship in industry or elsewhere | 18 |
| | **Total** | **168** |

### D. Course Code and Definition:

| *Course code* | *Definitions* |
|---|---|
| L | Lecture |
| T | Tutorial |
| ES | Engineering Science Courses |
| WPC | Humanities and Social Sciences and Peace programmes including Management courses |
| MEE | Mechanical Engineering Courses |
| ECE | Electronics and Communication |
| EEE | Electrical Engineering |
| CHE | Chemical Engineering |
| CET | Computer Engineering and Technology |
| POE | Polymer Engineering |
| CVE | Civil Engineering |
| PEL | Petroleum Engineering |

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## E. Grading Scheme:

According to Para 12.1 of Academic Ordinances 2017, University shall use trimester /semester / annual as per need of a program. The credit based system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice based credit system provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning. The University shall follow a 10-point grading system with the following letter grades as given below:

| Marks Out of 100 | Grade | Grade Point |
|---|---|---|
| 80-100 | O: Outstanding | 10 |
| 70-79 | A+: Excellent | 9 |
| 60-69 | A: Very Good | 8 |
| 55-59 | B+: Good | 7 |
| 50-54 | B: Above Average | 6 |
| 45-49 | C: Average | 5 |
| 40-44 | Pass | 4 |
| 0-39 | Fail | 0 |
| Ab | Absent | NA |

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## B. Tech. (First Year) (Batch 2020 – 2024)

## Trimester – I

| Sr. No. | Course Code | Name of Course | Type | Total Hrs. | | | Credits | | Assessment Marks** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Theory | Lab | CCA* | LCA* | ETT | Total |
| 1 | | Linear Algebra and Differential Calculus | BS | 30 | 15 | - | 3 | - | 100 | - | 50 | **150** |
| 2 | | Physics | BS | 30 | 15 | 30 | 3 | 1 | 100 | 50 | 50 | **200** |
| 3 | | Mechanics | BS | 45 | - | 30 | 3 | 1 | 100 | 50 | 50 | **200** |
| 4 | | Workshop Practices | ES | - | - | 30 | - | 1 | - | 50 | - | **50** |
| 5 | | Effective Communication | HSS | 15 | - | 30 | 1 | 1 | 50 | 50 | - | **100** |
| 6 | | World Famous Philosophers, Sages/Saints and Great Kings | WP | 30 | - | - | 2 | - | 70 | - | 30 | **100** |
| 7 | | Yoga - for Winning Personality | WP | - | - | - | - | - | - | - | - | - |
| | | **Total** | | **150** | **30** | **120** | **12** | **4** | **420** | **200** | **180** | **800** |

**Trimester Teaching Hours: 300 Hours**
**Total Credits First Year B.Tech. Trimester - I: 16**

****Assessment Marks are valid only if Attendance criteria are met**
* CCA: Class Continuous Assessment
* LCA: Laboratory Continuous Assessment

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## B. Tech. (First Year) (Batch 2020 – 2024)

## Trimester – II

| Sr. No. | Course Code | Name of Course | Type | Total Hrs. | | | Credits | | Assessment Marks** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Theory | Lab | CCA* | LCA* | ETT | Total |
| 1 | | Integral Calculus | BS | 30 | 15 | - | 3 | - | 100 | - | 50 | **150** |
| 2 | | Chemistry | BS | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 3 | | Material Science | BS | 30 | - | - | 2 | - | 50 | - | 50 | **100** |
| 4 | | Engineering Graphics | ES | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 5 | | Programming and Problem Solving | ES | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 6 | | Rural Immersion | HSS | - | - | - | - | - | - | - | - | - |
| 7 | | Yoga - for Winning Personality | WP | - | - | - | - | - | - | - | - | - |
| | | **Total** | | **150** | **15** | **90** | **11** | **3** | **300** | **150** | **250** | **700** |

****Assessment Marks are valid only if Attendance criteria are met**

***** CCA: Class Continuous Assessment

***** LCA: Laboratory Continuous Assessment

**Trimester Teaching Hours: 255 Hours**

**Total Credits First Year B.Tech. Trimester - II: 14**

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## B. Tech. (First Year) (Batch 2020 – 2024)

## Trimester – III

| Sr. No. | Course Code | Name of Course | Type | Total Hrs. | | | Credits | | Assessment Marks** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Theory | Lab | CCA* | LCA* | ETT | Total |
| 1 | | Biology for Engineers | BS | 30 | - | - | 2 | - | 50 | - | 50 | **100** |
| 2 | | Design Thinking Laboratory | ES | - | - | 30 | - | 1 | - | 50 | - | **50** |
| 3 | | Basics of Electrical and Electronics Engineering | ES | 45 | - | 30 | 3 | 1 | 100 | 50 | 50 | **200** |
| 4 | | Basics of Mechanical Engineering | ES | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 5 | | Basics of Civil Engineering | ES | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 6 | | Study of Languages, Peace in Communications and Human Dynamics | WP | 30 | - | - | 2 | - | 70 | - | 30 | **100** |
| 7 | | Yoga - for Winning Personality | WP | - | - | - | - | - | - | - | - | - |
| | | **Total** | | **165** | - | **120** | **11** | **4** | **320** | **200** | **230** | **750** |

****Assessment Marks are valid only if Attendance criteria are met**

***** CCA: Class Continuous Assessment

***** LCA: Laboratory Continuous Assessment

**Trimester Teaching Hours: 285 Hours**

**Total Credits First Year B.Tech. Trimester - III: 15**

**Total FY B.Tech. Credits: 16 + 14 + 15 = 45**

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## B. Tech. Computer Science & Engineering (Second Year) (Batch 2020 – 2024)

## Trimester – IV

| Sr. No. | Course Code | Name of Course | Type | Total Hrs. | | | Credits | | Assessment Marks** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Theory | Lab | CCA* | LCA* | ETT | Total |
| 1 | | Discrete Mathematics | BS | 30 | 15 | - | 3 | - | 100 | - | 50 | **150** |
| 2 | | Computer Organization and Architecture | ES | 30 | - | - | 2 | - | 50 | - | 50 | **100** |
| 3 | | Digital Electronics | ES | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 4 | | Principles of Programming Languages with Python Programming | PC | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 5 | | Data Structures-I with C Programming | PC | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 6 | | Indian Constitution | HSS | 15 | - | - | 1 | - | 50 | - | - | **50** |
| | | **Total** | | **165** | **15** | **90** | **12** | **3** | **350** | **150** | **250** | **750** |

**Trimester Teaching Hours: 270 Hours**

**Total Credits Second Year B.Tech. Trimester - IV: 15**

****Assessment Marks are valid only if Attendance criteria are met**

* CCA: Class Continuous Assessment

* LCA: Laboratory Continuous Assessment

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## B. Tech. Computer Science & Engineering (Second Year) (Batch 2020 – 2024)

## Trimester –V

| Sr. No. | Course Code | Name of Course | Type | Total Hrs. | | | Credits | | Assessment Marks** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Theory | Lab | CCA* | LCA* | ETT | Total |
| 1 | | Transform Techniques and Vector Calculus | BS | 30 | 15 | - | 3 | - | 100 | - | 50 | **150** |
| 2 | | Object Oriented Programming with C++ | PC | 15 | - | 30 | 1 | 1 | 50 | 50 | - | **100** |
| 3 | | Operating Systems | PC | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 4 | | Microprocessor Architectures | PC | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 5 | | Data Structures-II with C++ Programming | PC | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 6 | | Philosophy of Science and Religion / Spirituality | WP | 30 | - | - | 2 | - | 70 | - | 30 | **100** |
| | | National Study Tour | - | - | - | - | - | - | - | - | - | - |
| | | **Total** | | **165** | **15** | **120** | **12** | **4** | **370** | **200** | **230** | **800** |

**Trimester Teaching Hours: 300 Hours**

**Total Credits Second Year B.Tech. Trimester - V: 16**

****Assessment Marks are valid only if Attendance criteria are met**

* CCA: Class Continuous Assessment

* LCA: Laboratory Continuous Assessment

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## B. Tech. Computer Science & Engineering (Second Year) (Batch 2020 – 2024)

## Trimester –VI

| Sr. No. | Course Code | Name of Course | Type | Total Hrs. | | | Credits | | Assessment Marks** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Theory | Lab | CCA* | LCA* | ETT | Total |
| 1 | | Probability and Statistics | BS | 30 | 15 | - | 3 | - | 100 | - | 50 | **150** |
| 2 | | Parallel Programming | PC | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 3 | | Java Programming | PC | - | - | 60 | - | 2 | - | 100 | - | **100** |
| 4 | | Computer Networks | PC | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 5 | | Theory of Computation | PC | 30 | - | - | 2 | - | 50 | - | 50 | **100** |
| 6 | | Environmental Science | BS | 15 | - | - | 1 | - | 50 | - | - | **50** |
| 7 | | Employability Skills Development-I | AC | - | - | - | - | - | - | - | - | - |
| | | **Total** | | **135** | **15** | **120** | **10** | **4** | **300** | **200** | **200** | **700** |

****Assessment Marks are valid only if Attendance criteria are met**

***** CCA: Class Continuous Assessment

***** LCA: Laboratory Continuous Assessmen

**Trimester Teaching Hours: 270 Hours**

**Total Credits Second Year B.Tech. Trimester - VI: 14**

**Total SY B.Tech. Credits: 15 + 16 + 14 = 45**

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## B. Tech. Computer Science & Engineering (Third Year) (Batch 2020 – 2024)

## Trimester –VII

| Sr. No. | Course Code | Name of Course | Type | Total Hrs. | | | Credits | | Assessment Marks** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Theory | Lab | CCA* | LCA* | ETT | Total |
| 1 | | Database Management Systems | PC | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 2 | | Full Stack Development | PC | - | - | 60 | - | 2 | - | 100 | - | **100** |
| 3 | | Software Design Modelling and Testing | PC | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 4 | | Information Security | PC | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 5 | | OE-I | OE | 30 | - | - | 2 | - | 50 | - | 50 | **100** |
| 6 | | Indian Tradition, Culture and Heritage | WP | 30 | - | - | 2 | - | 70 | - | 30 | **100** |
| 7 | | Employability Skills Development-II | AC | - | - | - | - | - | - | - | - | - |
| | | **Total** | | **150** | **-** | **150** | **10** | **5** | **270** | **250** | **230** | **750** |

**Trimester Teaching Hours: 300 Hours**
**Total Credits Third Year B.Tech. Trimester - VII: 15**

****Assessment Marks are valid only if Attendance criteria are met**
* CCA: Class Continuous Assessment
* LCA: Laboratory Continuous Assessment

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## B. Tech. Computer Science & Engineering (Third Year) (Batch 2020 – 2024)

## Trimester –VIII

| Sr. No. | Course Code | Name of Course | Type | Total Hrs. | | | Credits | | Assessment Marks** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Theory | Lab | CCA* | LCA* | ETT | Total |
| 1 | | Data Warehousing and Data Mining | PC | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 2 | | Embedded Systems and Internet of Things | PC | - | - | 60 | - | 2 | - | 100 | - | **100** |
| 3 | | Design and Analysis of Algorithms | PC | 30 | - | - | 2 | - | 50 | - | 50 | **100** |
| 4 | | Cloud Computing | PC | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 5 | | Seminar | PC | - | - | 30 | - | 1 | - | 50 | - | **50** |
| 6 | | PE-I | PE | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 7 | | Finance and Costing | HSS | 30 | - | - | 2 | - | 50 | - | 50 | **100** |
| 8 | | Humanities - Ethical, Moral and Social Sciences | WP | 30 | - | - | 2 | - | 70 | - | 30 | **100** |
| | | Total | | **180** | **-** | **180** | **12** | **6** | **320** | **300** | **280** | **900** |

****Assessment Marks are valid only if Attendance criteria are met**

***** CCA: Class Continuous Assessment

***** LCA: Laboratory Continuous Assessment

**Trimester Teaching Hours: 360 Hours**

**Total Credits Third Year B.Tech. Trimester - VIII: 18**

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FACULTY OF ENGINEERING AND TECHNOLOGY

## B. Tech. Computer Science & Engineering (Third Year) (Batch 2020 – 2024)

## Trimester –IX

| Sr. No. | Course Code | Name of Course | Type | Total Hrs. | | | Credits | | Assessment Marks** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Theory | Lab | CCA* | LCA* | ETT | Total |
| 1 | | Machine Learning | PC | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 2 | | System Software and Compilers | PC | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 3 | | PE-II | PE | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 4 | | OE-II | OE | 30 | - | - | 2 | - | 50 | - | 50 | **100** |
| 5 | | Scientific Studies of Mind, Matter, Spirit and Consciousness | WP | 30 | - | - | 2 | - | 70 | -- | 30 | **100** |
| | | Total | | **150** | | **90** | **10** | **3** | **270** | **150** | **230** | **650** |

****Assessment Marks are valid only if Attendance criteria are met**

***** CCA: Class Continuous Assessment

***** LCA: Laboratory Continuous Assessment

**Trimester Teaching Hours: 240 Hours**

**Total Credits Third Year B.Tech. Trimester - IX: 13**

**Total TY B.Tech. Credits: 15 + 18 + 13 = 46**

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FACULTY OF ENGINEERING AND TECHNOLOGY

## B. Tech. Computer Science & Engineering (Final Year) (Batch 2020 – 2024)

## Trimester –X

| Sr. No. | Course Code | Name of Course | Type | Total Hrs. | | | Credits | | Assessment Marks** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Theory | Lab | CCA* | LCA* | ETT | Total |
| 1 | | Artificial Intelligence | PC | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 2 | | Mini Project / Interdisciplinary Project | PC | - | - | 30 | - | 1 | - | 50 | - | **50** |
| 3 | | PE-III | PE | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 4 | | PE-IV | PE | 30 | - | 30 | 2 | 1 | 50 | 50 | 50 | **150** |
| 5 | | Innovation and Entrepreneurship | HSS | 30 | - | - | 2 | - | 50 | - | 50 | **100** |
| | | Total | | **120** | **-** | **120** | **8** | **4** | **200** | **200** | **200** | **600** |

**Trimester Teaching Hours: 240 Hours**
**Total Credits Final Year B.Tech. Trimester - X: 12**

****Assessment Marks are valid only if Attendance criteria are met**
* CCA: Class Continuous Assessment
* LCA: Laboratory Continuous Assessment

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## B. Tech. Computer Science & Engineering (Final Year) (Batch 2020 – 2024)

## Trimester –XI

| Sr. No. | Course Code | Name of Course | Type | Total Hrs. | | | Credits | | Assessment Marks** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Theory | Lab | CCA* | LCA* | ETT | Total |
| 1 | | Capstone Project or Internship (Anyone) | PR | - | - | 240 | - | 8 | - | 400 | - | **400** |
| 2 | | OPE-I/MOOC | OP | 30 | - | - | 2 | - | 100 | - | - | **100** |
| | | **Total** | | **30** | **-** | **240** | **2** | **8** | **100** | **400** | **-** | **500** |

**Trimester Teaching Hours: 270 Hours**

**Total Credits Final Year B.Tech. Trimester - XI: 10**

****Assessment Marks are valid only if Attendance criteria are met**

* CCA: Class Continuous Assessment

* LCA: Laboratory Continuous Assessment

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# MIT WORLD PEACE UNIVERSITY

FACULTY OF ENGINEERING AND TECHNOLOGY

## B. Tech. Computer Science & Engineering (Final Year) (Batch 2020 – 2024)

## Trimester –XII

| Sr. No. | Course Code | Name of Course | Type | Total Hrs. | | | Credits | | Assessment Marks** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Theory | Lab | CCA* | LCA* | ETT | Total |
| 1 | | Capstone Project or Internship (Anyone) | PR | - | - | 240 | - | 8 | - | 400 | - | **400** |
| 2 | | OPE-II/MOOC | OP | 30 | - | - | 2 | - | 100 | - | - | **100** |
| | | **Total** | | **30** | **-** | **240** | **2** | **8** | **100** | **400** | **-** | **500** |

****Assessment Marks are valid only if Attendance criteria are met**

**Trimester Teaching Hours: 270 Hours**

**Total Credits Final Year B.Tech. Trimester - XII: 10**

***** CCA: Class Continuous Assessment

***** LCA: Laboratory Continuous Assessment

**Total Final Year B.Tech. Credits: 12 + 10 + 10 = 32**

## Total B. Tech. Credits: 45+45 +46+32 =168 Credits

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## Professional Electives (PE)

| | **Tack1: Data Science** | **Track2: Multimedia and Computer Vision** | **Track3: Information and Cyber Security** | **Track4: Software Design and Development** |
|---|---|---|---|---|
| PE-I | | Multimedia and Animation | Wireless and Mobile Network Security | Software Project Management and Testing |
| PE-II | Big Data Technologies | Computer Vision | Ethical Hacking | Software Architectures and Design Patterns |
| PE-III | Natural Language Processing for Cognitive Computing | Video Analytics and Applications | Cyber Forensics Investigation | Agile Methodologies |
| PE-IV | Principles of Deep Learning | Augmented Reality and Virtual Reality | Information Security Management | User Interface-User Experience Design |

## Online Professional Electives (OPE)

| | | | | |
|---|---|---|---|---|
| OPE-I | Soft Computing | Cloud Services Administration (AWS/IBM/Azure/Google) | Blockchain Technology | Green Computing |
| OPE-II | Business Intelligence | Problem Solving with Gamification | Security and Privacy in Social Media | Pervasive Computing |

## Open Electives (OE)

| | |
|---|---|
| OE-I | To be taken from other schools of FoET than the students own school. |
| OE-II | To be taken from schools other than the students own school. |

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| | | | | |
|---|---|---|---|---|
| **Course Code** | | | | |
| **Course Category** | **Basic Sciences (BS)** | | | |
| **Course Title** | **Discrete Mathematics** | | | |
| **Total Teaching Hrs and Credits** | **Lectures** | **Tutorial** | **Laboratory** | **Credits** |
| | **30** | **15** | **--** | **2+1 = 03** |

**Pre-requisites**:

- Basic Mathematics

**Course Objectives:**

1. To understand the logic for solving problems using set theory and combinatorial problem using probability theory
2. To gain the knowledge of relations and functions to solve relevant problems in computer science
3. To learn Graph Theory for modelling computer science problems
4. To acquire knowledge of concepts and applications of Trees

**Course Outcomes:**

After completion of this course students will be able to:

1. Analyze and Articulate the logic to solve a problem using set theory and combinatorial problem using probability theory
2. Apply knowledge of relations and functions to solve relevant problems in computer science
3. Model computer science problems using Graph theory
4. Demonstrate the concepts and applications of Trees in Computer Science

**Course Contents:**

1. Set Theory
2. Counting
3. Discrete Probability
4. Relations
5. Functions
6. Graph
7. Trees

**Tutorial List:**

1. Problem Solving on Set Theory
2. Questions on Counting
3. Problem solving on Discrete Probability
4. N-ary and Equivalence Relations
5. Problems on Bijective and Recursive Functions
6. Adjacency matrix and Shortest path problems using Graph
7. Huffman and Binary Search Tress

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**Learning Resources:**

**Text Books:**

1. Kenneth H. Rosen, ―Discrete Mathematics and its Applications‖, Tata McGraw-Hill, ISBN 978-0-07-288008-3, 7th Edition.
2. C. L. Liu, ―Elements of Discrete Mathematics‖, TMH, ISBN 10:0-07-066913-9.

**Reference Books:**

1. Bernard Kolman, Robert C. Busby and Sharon Ross, ―Discrete Mathematical Structures‖, Prentice-Hall of India /Pearson, ISBN: 0132078457, 9780132078450.
2. Dr. K. D. Joshi, ― Foundations of Discrete Mathematics‖, New Age International Limited, Publishers, January 1996, ISBN: 8122408265, 9788122408263

**Supplementary Reading:**

1. N. Biggs,"Discrete Mathematics", 2nd Edition, Oxford University Press
2. Data Structures – Seymour Lipschutz, Shaum's outlines, MCGraw – Hill Inc.

**Web Resources:**

https://learn.saylor.org/course/cs202
https://www.mooc-list.com/tags/discrete-mathematics

**Web links:**

https://www.tutorialspoint.com/discrete_mathematics/index.htm

**MOOCs:**

http://nptel.ac.in/courses/106106094/3
https://www.coursera.org/learn/discrete-mathematics

**Pedagogy:**

1. Chalk and Board
2. PPT
3. Two Teacher Method
4. Video Lectures

**Assessment Scheme:**

**Class Continuous Assessment (CCA)- 100 Marks**

| Assignments | Test | Tutorials | MCQ / Active Learning |
|---|---|---|---|
| 15 Marks | 15 Marks | 50 Marks | 20 Marks |

**Term End Examination: 50 Marks**

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**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs Theory |
|---|---|---|
| 1 | **Set Theory:** Sets, Combinations of sets, Venn Diagrams, Finite and Infinite sets: Uncountable and Countable, Principle of inclusion and exclusion, Multisets, Cartesian Product and Power Set<br>Fuzzy sets, Basic concepts and types of Fuzzy sets, Operations on Fuzzy sets<br>**Functions**: Surjective, Injective and Bijective functions, Inverse Functions and Compositions of Functions, Recursive Function. | 07 |
| 2 | **Relations:** Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Warshall's Algorithm to find transitive closure, Equivalence Relations, Partial Orderings - Chain, Anti chain and Lattices.<br>**Counting:** The Basics of Counting, Permutations and Combinations, Binomial Coefficients, Algorithms for generating Permutations and Combinations, The Pigeonhole Principle, Introduction to groups, types of groups. | 07 |
| 3 | **Graphs:** Graph and Graph Models, Graph Terminology and Types of Graph, Representing Graph and Graph Isomorphism, vertex and edge Connectivity, Eulerian and Hamiltonian, Single source shortest path- Dijkstra's pseudo code algorithm, Planar Graph, Graph Coloring, digraphs. | 08 |
| 4 | **Trees:** Introduction, properties of trees, Binary search tree, decision tree, prefix codes and Huffman coding, Spanning Trees and Minimum Spanning Tree –Kruskal's and Prim's pseudo code algorithms, Case Study- Game Tree. | 08 |

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**Tutorial:**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Tutorial |
| 1 | Problem Solving on Set Theory | 02 |
| 2 | Questions on Counting | 02 |
| 3 | Problem solving on Discrete Probability | 02 |
| 4 | N-ary and Equivalence Relations | 02 |
| 5 | Problems on Bijective and Recursive Functions | 02 |
| 6 | Adjacency matrix and Shortest path problems using Graph | 02 |
| 7 | Huffman and Binary Search Tress | 03 |

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| | | | | |
|---|---|---|---|---|
| **Course Code** | | | | |
| **Course Category** | **Engineering Sciences** | | | |
| **Course Title** | **Computer Organization and Architecture** | | | |
| **Total Teaching Hrs and Credits** | **Lectures** | **Tutorial** | **Laboratory** | **Credits** |
| | **30** | **--** | **--** | **02** |

**Pre-requisites**:

- Introduction to Electronics Engineering

**Course Objectives:**

1. To acquire the knowledge of structure, function and evolution of computer architecture
2. To study Arithmetic Logical Unit and Control Unit of digital computers
3. To gain knowledge of Instruction set, addressing mode and its role in pipeline management.
4. To acquire the concept of Memory Organization, Multiple processor Organization and Parallel Processing.

**Course Outcomes:**

**After completion of the course the students will be able to: -**

1. Relate Computer Architectural Concept used in design of various generations of processors.
2. Illustrate the ALU functionality using correlated algorithms.
3. Infer and understand the contribution of an Instruction in Pipelining concept and its relevance with Processor's performance.
4. Outline the memory organization and multiple processor organization with Summarization of parallel processing.

**Laboratory Exercises : Not Applicable**

**Learning Resources:**

**Text Books:**

1. W. Stallings, "Computer Organization and Architecture: Designing for performance", Pearson Education/ Prentice Hall of India, 2003, ISBN 978-93-325-1870-4, 7th Edition.
2. Zaky S, Hamacher, "Computer Organization", 5th Edition, McGraw-Hill Publications, 2001, ISBN- 978-1-25-900537-5, 5th Edition.

**Reference Books:**

1. M. Usha, T. S. Srikanth, "Computer System Architecture and Organization", Wiley, ISBN: 978-81-265-2284-2, 2014.
2. A. S. Tanenbaum "Structured Computer Organization", 4th Edition, Prentice Hall of India, ISBN: 81–203–1553–7, 1991,
3. J. Hays, "Computer Architecture and Organization", 2nd Edition, McGraw-Hill, ISBN 0–07–100479–3, 1988

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**Supplementary Readings:**

**Web Resources:**

**Web Links:** https://www.booksfree.org/computer-organization-and-architecture-by-william-stallings-pdf/

**Pedagogy:**

1. Presentation /slides
2. Chalk and Talk

**Assessment Scheme:**
**Class Continuous Assessment : 50 Marks**

| PBL (Poster) Home | Theory Home Assignment | Mid Term MCQ | Presentation based on Mind Mapping 4 Students/Gr | Quiz |
|---|---|---|---|---|
| 8 Marks | 7 Marks | 15 Marks | 10 Marks | 10 Marks |

**Term End Examination: 50 Marks**

**Syllabus:**

**Theory**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Theory |
| 1 | Computer Function, Interconnections and Evolution<br>Computer Organization and Architecture, Structure and Function, basic operational concepts –bus structures –Memory locations and addresses – A brief history of computer, Evolution of Intel microprocessor from 4004 to core i7, Comparison of various generations of microprocessor ,Characteristics of Reduced Instruction Set Architectures, CISC versus RISC Characteristics. | 07 |
| 2 | **Computer Arithmetic**<br>The arithmetic and logic unit, Integer Representation, Integer Arithmetic, Multiplication – Block diagram, Hardware implementation of unsigned binary multiplication, Multiplication of positive number, signed number multiplication, Booth's Algorithm, Division – Flowchart for unsigned binary division, Division Algorithms. Floating -Point Representation, IEEE standard 754 | 08 |
| | **Processor Organization and Control Unit**<br>Instruction format, Types of Instruction and operations, common addressing techniques, Processor Structure and function - Processor and | |

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| | | |
|---|---|---|
| 3 | register organization, Instruction Cycle, Instruction Pipelining, Pipeline Performance, Pipeline Hazards - Structural, Data, Control. Control Unit Operation - The functional requirement of processor, Micro – operation and instruction cycle, Functional Requirements & Operations of the Control Unit, Block diagram of control unit. | 08 |
| 4 | **Memory and Parallel Processor Organizations**<br>Key characteristics of memory system, memory hierarchy, basic concepts semiconductor RAMs, memory system considerations, semiconductor ROMs –flash memory – Cache Memory - Cache memory principles, mapping functions, Multiple Processor Organization: Flynn's Taxonomy, Array Processors, Clusters, and NUMA Computers Multi-Core Computers: Introduction, Organization and Performance. | 07 |

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| | | | | |
|---|---|---|---|---|
| **Course Code** | | | | |
| **Course Category** | **Engineering Sciences** | | | |
| **Course Title** | **Digital Electronics** | | | |
| **Total Teaching Hrs and Credits** | **Lectures** | **Tutorial** | **Laboratory** | **Credits** |
| | **30** | **-** | **30** | **2+1=03** |

**Pre-requisites**:

- Exposure to Basics of Electrical and Electronics Engineering.

**Course Objectives:**

**1. Knowledge**

1. To introduce the concepts of digital logic families.
2. To introduce Boolean expression reduction techniques.
3. To acquainting students with microprocessor architecture and software tools for coding.

**2. Skills**

1. To design and analyze the combinational & sequential logic circuits
2. To design and analyze finite state machines
3. To develop assembly level programming skills

**4. Attitude**

1 Apply the knowledge gained in the design of Counters, Registers and A/D & D/A converters.

**Course Outcomes:**

After completion of this course students will be able to

1. Understand the concepts of digital logic families and reduction techniques
2. Design and analyze combinational & sequential logic circuits
3. Develop state machines for various applications
4. Write efficient codes in assembly language, and debug using software tools

**Course Contents:**

1. Combinational Logic Design
2. Sequential Logic Design
3. Finite State Machines
4. Introduction to Microprocessor

**Laboratory Exercises :**

1. Design and Implement Code Converters using basic logic gates
2. Design and Implement Combinational Logic Design using MUX/Decoder ICs
3. Design and Implement MOD-N asynchronous counter using JK- Flip flop
4. Design and implement Synchronous Counter

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5. Design and implement Sequence Detector
6. Design and implement finite state machine (Simulation)
7. Assembly language program for addition & subtraction of two 2-digit numbers
8. Assembly language program for multiplication/Division of two 2- digit numbers
9. Design and implement Digital Electronics Application
10. Design and implement project for providing real time solutions using Microcontrollers Boards

**Learning Resources:**

**Text Books:**

1. Thomas L. Floyd, Digital Fundamentals, Pearson Education, 11th Edition, 2015
2. R.P. Jain, Modern Digital Electronics, New Delhi: Tata McGraw-Hill, 4th Edition, 2009
3. Hall, D. V., Microprocessors and Interfacing, New Delhi: Tata McGraw Hill, 2nd Edition, 2006

**Reference Books:**

1. J. F. Wakerly, Digital Design: Principles and Practices, Pearson Education, 3rd Edition
2. Anand Kumar, Fundamentals of Digital Circuits, PHI Publication, 4th Edition, 2016

**Web Resources:**

http://tlc.iith.ac.in/arduino.html
https://nptel.ac.in/courses/108/105/108105132/

**Pedagogy:**

1. Power Point Presentations, Videos
2. Group Activities
3. Active Leaning Methods
4. Project Based Learning

**Assessment Scheme:**
**Class Continuous Assessment : 50 Marks**

| Mid-term Exam | Assignment/Active Learning Tool/Quiz | PBL/ Case Study/Group Activity (Either or both) |
|---|---|---|
| 15 Marks | 15 Marks | 20 Marks |

**Laboratory Continuous Assessment: 50 Marks**

| Assessment as per rubrics | Mid-term evaluation | End-term evaluation |
|---|---|---|
| 15 Marks | 15 Marks | 20 Marks |

**Term End Examination: 50 Marks**

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**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs. |
|---|---|---|
| | | Theory |
| 1 | **Combinational Logic Design:** Introduction to digital logic families, Minimization of logic functions using K map, Design examples: Arithmetic circuits, Comparator, Code converters, Parity generators and checkers, BCD to 7 segment decoder, Multiplexers, De-multiplexers. | 08 |
| 2 | **Sequential Logic Design:** 1-bit Memory Cell, Flip flops, Conversion of flip flops, Shift registers, Applications of Shift registers (ring and twisted ring counters), Pulse train generator, Design of ripple counters and synchronous counters, Lock out condition. | 08 |
| 3 | **Finite State Machines:** Synchronous sequential circuits, Concept of Moore and Mealy machines, Basic design steps, Finite state machine design, Sequence detector. | 06 |
| 4 | **Introduction to Microprocessor:** Introduction to 8086, Microprocessor architecture, Memory segmentation, Programming model, Addressing modes, Instruction set, Assembly language programming. | 08 |

**Laboratory:**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Lab |
| 1 | Design and Implement Code Converters using basic logic gates | 03 |
| 2 | Design and Implement Combinational Logic Design using MUX/Decoder ICs | 03 |
| 3 | Design and Implement MOD-N asynchronous counter using JK- Flip flop | 03 |
| 4 | Design and implement Synchronous Counter | 03 |
| 5 | Design and implement Sequence Detector | 03 |
| 6 | Design and implement finite state machine (Simulation) | 03 |
| 7 | Assembly language program for addition & subtraction of two 2-digit numbers | 03 |
| 8 | Assembly language program for multiplication/Division of two 2-digit numbers | 03 |
| 9 | Design and implement Digital Electronics Application. (PBL) | 03 |
| 10 | Design and implement project for providing real time solutions using Microcontrollers Boards. (PBL) | 03 |

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| | | | | |
|---|---|---|---|---|
| **Course Code** | | | | |
| **Course Category** | **Professional Core** | | | |
| **Course Title** | **Principles of Programming Languages with Python** | | | |
| **Total Teaching Hrs and Credits** | **Lectures** | **Tutorial** | **Laboratory** | **Credits** |
| | **30** | **--** | **30** | **2+1=03** |

**Pre-requisites**

- Programming and Problem Solving

**Course Objectives:**

1. To study the core aspects of programming language
2. To illustrate the process of structuring the data using lists, tuples and dictionaries
3. To learn the advance syntax and semantics of python programming
4. To learn the various data pre-processing methods used in python programming.

**Course Outcomes:**

On completion of course, students should be able to

1. Understand and apply core programming concepts
2. Develop fully-functional programs and commonly used data structures using python
3. Identify advance concept and programming features of the python language
4. Understand and apply the data pre-processing techniques using python

**Course Contents:**

1. Fundamentals of Programming Language
2. Python Programming
3. Advance Python Programming
4. Introduction to Files and Pre-processing data

**Laboratory Exercises**:

1. Introduction to basic Python commands.
2. Implement a Python program to perform String operations.
3. Write a Python program to find the factorial of a given number.
4. Write a Python program to sort (ascending and descending) a dictionary by value.
5. Merge two Lists and sort it using Python.
6. Given a square matrix of N rows and columns, find out whether it is symmetric or not using Python.
7. Implement a Python program for addition, subtraction, multiplication and division of two matrices.
8. Implement a Python program to perform pre-processing on given dataset.

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**Learning Resources:**

**Text Books:**

1. Pratt T.W, Zelkowitz, 'Programming Languages: Design and Implementation', PHI, 2002, 4th Edition.
2. Sethi Ravi, 'Programming Languages: Concepts and Constructs', Addison Wesley1996.
3. YashavantKanetkar and Aditya Kanetkar, 'Let us Python', First Edition, 2019, BPB Publications

**Reference Books:**

1. Sebesta R. W, 'Concepts of programming languages', Pearson Education 2001, 4th edition.
2. Learn Python 3 the Hard Way, Zed A. Shaw, First Edition, 2018, Pearson Education Inc.
3. Jake Vander Plas, 'Python Data Science Handbook: Essential Tools for Working with Data', 1st Edition, O'Reilly Media, 2016. ISBN-13: 978-1491912058
4. Gowrishankar S, Veena A, 'Introduction to Python Programming', 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-0815394372
5. David Amos, Dan Bader, Joanna Jablonski, Fletcher Heisler , 'Python Basics: A Practical Introduction to Python 3', Revised and Updated 4th Edition
6. Brian Heinold, 'A Practical Introduction to Python Programming'

**Supplementary Reading:**

**Web Resources:**

https://nptel.ac.in/courses/106/102/106102067/
https://nptel.ac.in/courses/106/106/106106182/
https://nptel.ac.in/courses/106/106/106106212/

**Web links:**

https://www.python.org
https://realpython.com/beginners-guide-python-turtle/
https://realpython.com/python-gui-tkinter/
http://www.codecademy.com/tracks/python
http://learnpythonthehardway.org/book/

**MOOCs:**

https://www.coursera.org/learn/python-programming-intro

**Pedagogy:**

1. Power Point Presentation
2. Two Teacher Method
3. Video Lectures
4. Flipped Classroom Activity
5. Group Discussion
6. Chalk and Board

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**Assessment Scheme:**
**Class Continuous Assessment: 50 Marks**

| Assignments | Mid Term Exam | Active learning | Case study |
|---|---|---|---|
| 15 Marks | 15 Marks | 10 Marks | 10 Marks |

**Laboratory Continuous Assessment: 50 Marks**

| Practical | Oral | Problem based Learning |
|---|---|---|
| 25 Marks | 15 Marks | 10 Marks |

**Term End Examination: 50 Marks**

**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Theory |
| 1 | **Fundamentals of Programming Language:**<br>**Introduction**: Characteristics of Programming Languages, Influencing Factors for the Evolution of Programming Language, Desirable Features and Design Issues<br>**Brief Introduction to Programming Language Paradigms:** Imperative, Object Oriented, Functional, Logic and Concurrent Programming<br>**Syntactic Structure:** Syntax, Semantics, Structure, Character Set Tokens, Sentence-Syntax and Semantics, Expression Notation, Grammar, Syntax Tree, Context Free Grammar, Translators | 08 |
| 2 | **Python Programming**<br>**Strings:** Accessing Strings, Basic Operations, String slices<br>**List:** Introduction, Accessing list, Operations on lists<br>**Tuple**: Introduction, Accessing tuples, Operations on Tuples<br>**Dictionary:** Introduction, Accessing values in dictionaries, Properties, Operations on dictionaries<br>**Regular Expression:** Syntax, Groups, Standard Function | 07 |
| 3 | **Advance Python Programming:**<br>**OOP in Python** : Modules vs. Classes and Objects, Class Creation, Constructor, Inheritance and Polymorphism, Object Serialization<br>**Exception Handling:** Errors and exceptions, Try, Except and Finally Blocks | 08 |

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| | | |
|---|---|---|
| | **Memory Management:** Activation Record, Static vs. Dynamic, Stack and Heap Memory, Memory Structure(Arenas, Pools, Blocks), Garbage Collection | |
| 4 | **Introduction to Files and Pre-processing of Data:** Types of Files, Creating and Reading Data, Reading and Writing CSV Files, reprocessing the Data (is null, not null, is empty etc.) **Packages and Libraries for Data Analysis** **Graphic in Python**: Programming with Turtle, GUI Programming with Tkinter | 07 |

**Laboratory:**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Lab |
| 1 | Introduction to basic Python Commands | 04 |
| 2 | Develop a Python program to perform String operations. | 04 |
| 3 | Write a Python program to find the factorial of a given number. | 04 |
| 4 | Write a Python program to sort (ascending and descending) a dictionary by value. | 04 |
| 5 | Merge two Lists and sort it using Python. | 04 |
| 6 | Given a square matrix of N rows and columns, find out whether it is symmetric or not using Python. | 04 |
| 7 | Develop a Python program for addition, subtraction, multiplication and division of two matrices. | 03 |
| 8 | Implement a python program to perform pre-processing on a given dataset. | 03 |

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| | | | | |
|---|---|---|---|---|
| **Course Code** | | | | |
| **Course Category** | **Professional Core** | | | |
| **Course Title** | **Data Structures-I with C Programming** | | | |
| **Total Teaching Hrs and Credits** | **Lectures** | **Tutorial** | **Laboratory** | **Credits** |
| | **30** | **--** | **30** | **2+1=03** |

**Pre-requisites**:

- Programming and Problem Solving.

**Course Objectives:**

1 To understand the need of data structures, concept of abstract data type.
2 To familiarize with the structural constraints and usage of the data.
3 To study the use of data structures in solving real life problems.
4 To study different searching and sorting techniques for solving complex data related problems.

**Course Outcomes:**

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

1 To develop skills for writing and analyzing algorithms to solve domain problems.
2 To compare and contrast different linear data structures and identify appropriate usage
3 To analyze different searching and sorting algorithms so as to understand their applications.
4 To demonstrate the use of sequential data structures.

**Course Contents:**

1 Introduction to Data Structures
2 Linear Data Structures
3 Searching
4 Sorting
5 Stacks
6 Queues
7 Linked List

**Laboratory Exercises:**

1 Array Operation
2 Sparse Matrix Operations
3 Searching and Sorting on Student Database
4 Expression Conversion using Stack
5 Implementation of Queue
6 Operations on Singly Linked List
7 Polynomial Operations Using Circular Linked List

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**Learning Resources**

**Text Books:**

1. Maureen Spankle ,"Problem Solving and Programming Concepts", ISBN: 81-317-0711-E.
2. Horowitz, S. Sahani, S. Anderson-Freed, "Fundamentals of Data Structures in C", Universities Press, 2008

**Reference Books:**

1. Dennis Ritchie, Kernighan, "The C Programming Language", Prentice Hall.
2. Treamblay, Sorenson, "An introduction to data structures with applications", Tata McGraw Hill, Second Edition.

**Supplementary Readings:**

1. Aaron Tanenbaum, "Data Structures using C", Pearson Education.
2. R. Gilberg, B. Forouzan, "Data Structures: A pseudo code approach with C", Cenage Learning, ISBN 9788131503140.
3. R.G.Dromy, "How to Solve it by Computers", Prentice Hall.

**Web Resources:**

https://www.khanacademy.org/computing/computer-science/algorithms
https://www.hackerrank.com/contests/basic-ds-quiz-1/

**Web Links:**

https://www.tutorialspoint.com/data_structures_algorithms/

**MOOCs:**

http://nptel.ac.in/courses/106102064/1
https://nptel.ac.in/courses/106103069/

**Pedagogy:**

1 Chalk and Board
2 PowerPoint Presentations
3 Two Teacher Method
4 Video Lectures
5 Discussion Forum
6 Flipped Classroom

**Assessment Scheme:**

**Class Continuous Assessment : 50 Marks**

| Assignment 1 | Active Learning 1 | Mid Term Examination | Poster Presentation |
|---|---|---|---|
| 10 Marks | 15 Marks | 15 Marks | 10 Marks |

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**Laboratory Continuous Assessment: 50 Marks**

| Practical | Practical Examination |
|---|---|
| 30 Marks | 20 Marks |

**Term End Examination: 50 Marks**

**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Theory |
| 1 | **Introduction to Data Structures:** Data, Data Objects, Abstract Data types (ADT) and Data Structures, Types of data structures(Linear and Non-linear, Static and dynamic)Introduction to algorithms, Algorithm design tools: Pseudo code and flowchart,<br>Analysis of Algorithms- Space complexity, Time complexity, Asymptotic notations-Big-O, Theta and Omega, finding complexity using step count method, Analysis of programming constructs-Linear, Quadratic, Cubic, Logarithmic | 05 |
| 2 | **Linear Data Structures:** Array as an Abstract Data Type, Sequential Organization, Memory Representation and Address Calculation.<br>Representation of Polynomials using arrays, addition and evaluation of Polynomials, Representation of sparse matrix, Addition, Simple Transpose and Fast transpose of sparse matrix<br>**Searching:** Linear search, Binary search.<br>**Sorting:** Types of sorting-Internal and External sorting, Sorting methods- Bubble sort, Insertion sort, Selection sort, Merge Sort, Comparison and analysis of sorting methods. | 09 |
| 3 | **Stacks:** Stack as an Abstract Data Type, Representation of Stack Using Sequential Organization, Applications of Stack- Expression Conversion and Evaluation, Recursion.<br>**Queues**: Queue as Abstract Data Type, Representation of Queue Using Sequential Organization, Circular Queue, Advantages of Circular queues, Deque-Basic concept, types(Input restricted and Output restricted), Application of Queue : Job scheduling. | 07 |
| | **Linked List:** Linked List as an Abstract Data Type, Representation of Linked List Using Sequential Organization, Representation of Linked List Using Dynamic Organization, Operations on Linked List, Polynomial operations using linked list. Circular Linked List, Doubly Linked List , Generalized Linked List (GLL)<br>**Case Study :** Garbage Collection | 09 |

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**Laboratory:**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Labs |
| 1 | Write a C program for department library which has N books, write functions for following: Delete duplicate entries, display details of all books whose cost is <=500, Count number of books with cost more than 500, Copy books in a new list which has cost less than 500. | 04 |
| 2 | Write a C program for sparse matrix realization and operations on it- Transpose, Fast Transpose. | 04 |
| 3 | Write a C program to create student database using array of structures. Apply searching (Linear and Binary Search) and sorting techniques (Bubble Sort, Insertion Sort, Selection Sort). | 04 |
| 4 | Implement stack as an ADT and apply it for different expression conversions (infix to postfix or infix to prefix (Any one), prefix to postfix or prefix to infix, postfix to infix or postfix to prefix (Any one)). | 04 |
| 5 | Pizza parlor accepting maximum M orders. Orders are served in first come first served basis. Order once placed cannot be cancelled. Write a C program to simulate the system with simple queue using array. Implement the same system using Circular Queue. | 04 |
| 6 | Write a C program to implement Singly Linked List and perform following operations on it.<br>i) Insert a node<br>ii) Delete a node<br>iii) Display linked list<br>iv) Reverse a linked list(Using Pointers)<br>v) Sort a list(Using Pointers)<br>**vi)** Merging of two lists(Using Pointers) | 05 |
| 7 | Implement following polynomial operations using Circular Linked List: Create, Display, Addition and Evaluation. | 05 |

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| | | | | |
|---|---|---|---|---|
| **Course Code** | | | | |
| **Course Category** | **Basic Sciences** | | | |
| **Course Title** | **Transform Technique & Vector Calculus(TTVC)** | | | |
| **Total Teaching Hrs and Credits** | **Lectures** | **Tutorial** | **Laboratory** | **Credits** |
| | **30** | **15** | **--** | **2+1=03** |

**Pre-requisites**:

- LADC & IC ( Mathematics in F. Y. B. Tech )

**Course Objectives:**

1. To understand integral transform techniques and their applications.
2. To learn vectors calculus for applications in engineering field.

**Course Outcomes:**

After completion of this course students will be able to

1. Solve problems related to Fourier Transforms
2. Solve problems using Z transforms
3. Apply the knowledge of vector calculus for solving engineering problems

**Course Contents:**

1. Fourier Transform
2. Z-Transform
3. Vector Differential Calculus
4. Vector Integral Calculus

**Tutorial Exercises:**

1. Fourier Sine and Cosine Transforms.
2. Finite & Discrete Fourier Transform
3. Z-Transform and Inverse Z-Transform.
4. Solution of Difference Equation
5. Vector differentiation- problems on tangential & normal component, velocity, acceleration.
6. Gradient, divergence and curl.
7. Work done, Green's Lemma
8. Stoke's and Divergence Theorem.

Two tutorials will be conducted using Mathematical Software. Tutorial shall be engaged in four batches (batch size of 15 students) per division.

**Learning Resources:**

**Reference Books**

1. KreyszigErwin,"Advanced Engineering Mathematics" ,10th edition ,Wiley Eastern Limited 2015.
2. O' Neil Peter,"Advanced Engineering Mathematics" ,8th edition ,Cengage Learning 2015.

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3. Greenberg Michael D.,"Advanced Engineering Mathematics", 2nd edition, Pearson . 2009.
4. Grewal B.S., "Higher Engineering Mathematics" ,43rd edition Khanna Publishers 2014

**Supplementary Reading:**

Weber H.J. and Arfken G.B. "Mathematical Methods For Physicists" , 6th edition, Academic Press 2011.

**Web Resources:**

http://nptel.ac.in/courses/111105035/6
http://nptel.ac.in/courses/111105090

**MOOCs :**

https://ocw.mit.edu/courses/mathematics/18-02sc-multivariable-calculus-fall-2010/

**Pedagogy:**

1. Co-teaching
2. Audio- video techniques
3. Tutorials and class tests

**Assessment Scheme:**

**Class Continuous Assessment : 100 Marks**

| Assignment/ short term Question answers Tests | Tutorial | Mid Term Test | Total |
|---|---|---|---|
| 20 Marks | 50 Marks | 30 Marks | 100 Marks |

**Laboratory Continuous Assessment : NA**

**Term End Examination: 50 marks**

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**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Theory |
| 1 | Fourier Transform: Fourier Integral theorem, Fourier Sine and Cosine Transforms, Inverse Fourier Transform.<br>Finite Fourier Transform, Discrete Fourier Transform. | 08 |
| 2 | Z-Transform: Definition, Properties, Z- transform of standard sequences and their inverse, solution of difference equations. | 08 |
| 3 | Vector Differential calculus: Physical interpretation of Vector differentiation, Vector differential operator, Gradient, Divergence and Curl, Directional derivative, Vector identities. | 07 |
| 4 | Vector integral Calculus: Line, Surface and Volume integration, Work done, Green's Lemma, Stoke's and Divergence Theorem. Applications in Engineering field(branch specific) | 07 |

**Tutorial:**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Tutorial |
| 1 | Fourier Sine and Cosine Transforms. | 02 |
| 2 | Finite & Discrete Fourier Transform | 02 |
| 3 | Z-Transform and Inverse Z-Transform. | 02 |
| 4 | Solution of Difference Equation | 02 |
| 5 | Vector differentiation- problems on tangential & normal component, velocity, acceleration. | 02 |
| 6 | Gradient, divergence and curl. | 02 |
| 7 | Work done, Green's Lemma | 02 |
| 8 | Stoke's and Divergence Theorem. | 01 |

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| | | | | |
|---|---|---|---|---|
| **Course Code** | | | | |
| **Course Category** | **Professional Core** | | | |
| **Course Title** | **Object Oriented Programming with C++** | | | |
| **Total Teaching Hrs and Credits** | **Lectures** | **Tutorial** | **Laboratory** | **Credits** |
| | **15** | **-----** | **30** | **1+1= 02** |

**Pre-requisites:**

- Programming and Problem Solving

**Course Objectives:**

1. Learn object oriented paradigm and its fundamentals.
2. Understand Inheritance, Polymorphism and dynamic binding.
3. Study the concepts of file handling.
4. Learn to design generic classes and use Exception Handling.

**Course Outcomes:**

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

1. Apply the basic concepts of Object Oriented Programming to design an application.
2. Make use of Inheritance and Polymorphism to develop real world applications.
3. Apply the concepts of file handling to store and retrieve the data.
4. Develop an application using Templates and exceptions.

**Course Contents:**

1. Introduction to Object Oriented Programming
2. Inheritance and Polymorphism
3. File and IO Streams
4. Exception Handling and Templates

**Laboratory Exercises :**

1. Classes
2. Types of constructors and dynamic allocation
3. Inheritance
4. Operator Overloading
5. Polymorphism
6. File handling and Exception handling
7. Templates
8. Standard Template Library

**Learning Resources:**

**Text books:**

1. Robert Lafore, 'Object-Oriented Programming in C++', Fourth Edition, Sams Publishing, ISBN: 0672323087, ISBN-13: 978-8131722824
2. Deitel, "C++ How to Program", 10th Edition, Pearson Education, ISBN 13: 9780134448237

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**Reference Books:**

1. Herbert Schildt, 'C++ The Complete Reference', Eighth Edition, McGraw Hill Professional, 2011, ISBN-13: 978-0072226805
2. Bjarne Stroustrup, 'The C++ Programming language', Seventh Edition, Pearson Education. ISBN: 9788131705216
3. K. R. Venugopal, Rajkumar Buyya, T. Ravishankar, 'Mastering C++', Tata McGraw-Hill, ISBN 13: 9780074634547
4. E.Balaguruswamy, "Object-Oriented Programming with C++", 7th edition, Graw-Hill Publication, ISBN 10:9352607996 ISBN 13:9789352607990

**Supplementary Reading:**

1. Power Point Slides
2. Lab Manual
3. Question Bank
4. Practice Assignments

**Web Resources:**

1. https://www.springer.com/gp/book/9781852334505
2. https://www.ebookphp.com/object-oriented-programming-in-c-epub-pdf/
3. https://www.springer.com/gp/book/9781447133780

**MOOCs:**

1. https://www.coursera.org/learn/c-plus-plus-a
2. https://nptel.ac.in/courses/106/105/106105151/
3. https://www.classcentral.com/course/swayam-programming-in-c-6704

**Pedagogy:**

1. PPTs
2. Practical Demos
3. Videos
4. Expert lectures
5. Workshop
6. Co Teacher Scheme

**Assessment Scheme:**

**Class Continuous Assessment : 50 Marks**

| Theory Assignments | Mid Term Exam | Active Learning | MCQ |
|---|---|---|---|
| 10 Marks | 15 Marks | 10 Marks | 15 Marks |

**Laboratory Continuous Assessment : 50 Marks**

| Lab Assignment | Practical Exam | Mini Project | Any other |
|---|---|---|---|
| 20 Marks | 20 Marks | 10 Marks | Nil |

**Term End Examination: NA**

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**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs<br>Theory |
|---|---|---|
| 1 | **Introduction to Object Oriented Programming (OOP)**<br>**Fundamentals of OOP:** Introduction to OOP, Fundamentals of object oriented programming: Classes, Objects, methods, Data Abstraction, Data Encapsulation, Information hiding, Inheritance, Polymorphism. Benefits of OOP<br>**Introduction to C++**: Basics of C++, Class, Object, Array of objects, Data Members, Member Function , Access Specifiers, Function prototype, Passing and Returning object in Function, Constructor and destructor, Types of constructor, Objects and Memory requirements, Inline function, Friend function, Friend Class , Static members: variable and function, | 04 |
| 2 | **Inheritance and Polymorphism**<br>**Inheritance:** Introduction, Base and Derived Classes, Protected: Data member and Member Function. Member Access Control, Inheriting Constructors and Destructors, Types of Inheritance, Overriding Member Functions, Ambiguity in Multiple Inheritance, Virtual Base Class.<br>**Polymorphism:** Introduction to Polymorphism, Types of Polymorphism, Function overloading, Operator Overloading: Concept of Operator Overloading, Overloading Unary and Binary Operators, Prefix and Postfix Operator Implementation.<br>**Run time Polymorphism**: Pointers to Objects, Pointers to Derived Class, Importance of Virtual Function, Pure Virtual Function and virtual table, Virtual Destructors, Early and Late Binding. Abstract base Class | 04 |
| 3 | **File and IO Streams**<br>**File Handling:** Stream and Files, Stream Classes, File Pointers, File I/O with Member Functions, Formatted I/O and I/O Manipulators, Error handling during file operations, Overloading Insertion and Extraction Operators. | 03 |
| 4 | **Exception Handling and Templates**<br>**Exception Handling**: Introduction, Exception Handling Mechanism - try, catch and throw, Multiple Exceptions, Re-throwing an exception, Exception and Inheritance.<br>**Templates**: Introduction to Template, types of templates, Function Template, overloading Function templates, Class Template.<br>Introduction to STL, STL components, Containers - Sequence Containers and Associative Containers, Container Adapters, Application of Container : vector, list<br>Algorithms: searching and sorting. Introduction to iterator. | 04 |

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**Laboratory:**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Lab |
| 1 | A airline information system want to maintain the information of passengers travelling by their airways. Following is the information that is to be maintained for the passengers.<br>• Name of passenger<br>• Age of passenger<br>• flight no.<br>• departure time<br>• source<br>• destination<br>Design a C++ class to accept and display information for the airlines. | 04 |
| 2 | Develop an object-oriented program in C++ to create a database of employee information system containing the following information: Employee Name, Employee number, qualification, address, contact number, salary details (basic, DA, TA, Net salary), etc Construct the database with suitable inline member functions for initializing and destroying the data viz constructor, default constructor, Copy constructor, destructor. Use dynamic memory allocation concept while creating and destroying the object of a class. Use static data member concept wherever required. Also, Display the Employee information. | 04 |
| 3 | Design and develop inheritance for a given case study, identify objects and relationships and implement inheritance wherever applicable.<br>Employee class has Emp_name, Emp_id, Address, Mail_id, and Mobile_no as members. Inherit the classes: Programmer, Team Lead, Assistant Project Manager and Project Manager from employee class. Add Basic Pay as the member of all the inherited classes with 97% of Basic Pay as DA, 10 % of Basic Pay as HRA, 12% of Basic Pay as PF, 0.1% of Basic Pay for staff club fund. Generate pay slips for the employees with their gross and net salary. | 04 |
| 4 | Define a class Box consisting of the following:<br>Data members: length, breadth, height<br>Member Functions:<br>1. One default constructor<br>2. Two overloaded operator member functions “<<” and “>>” to display and read Box dimensions.<br>3. One-member function “+” to add the two box objects and one friend function to compute the volume of this box using operator overloading. | 04 |
| 5 | Write a C++ program with base class Employee and derive classes Class1_Employee, Class2_Employee and Class3_Employee. Salary of an employee is calculated as per his/her designation. Declare calculate salary () as a pure virtual function in base class and define it in respective derive classes to calculate salary of an employee. | 04 |

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<table>
<tr><td>6</td><td>A school maintains the mark sheets of all standard students in the following form –<br><br><table><tr><td>PRN</td><td>Student Name</td><td>Maths</td><td>Physics</td><td>Chemistry</td><td>Total %</td><td>Grade</td></tr></table><br>A teacher put marks for the student by his/her PRN and the system checks whether marks for different subjects are negative or not. If it is negative, the system displays appropriate message, otherwise updates the file by storing the marks across the selected subject. The system calculates the total percentage after putting marks for all three subjects and accordingly finds the grade. Whenever an administrator wants to search a student’s record, he/she inputs the student's PRN and the system searches in a file and displays whether it is available or not, otherwise an appropriate message is displayed. An administrator can also delete/modify a record of a student. Design such system using C++ Program with file and exceptions handling.</td><td>04</td></tr>
<tr><td>7</td><td>Perform bubble sort operation using the template for integer and float data type.</td><td>02</td></tr>
<tr><td>8</td><td>Write a program to manage a shopping list. Each shopping list item is represented by a string stored in a container. Your design requires a print function that prints out the contents of the shopping list.<br><br>• Create an empty list.<br>• Append the items, "eggs," "milk," "sugar," "chocolate," and "flour" to the list. Print the list.<br>• Remove the first element from the list. Print the list.<br>• Insert the item, "coffee" at the beginning of the list. Print the list.<br>• Find the item, "sugar" and replace it with "honey." Print the list.<br>• Insert the item, "baking powder" before "milk" in the list. Print the list.<br>• Sort and Search the item in the list.</td><td>02</td></tr>
<tr><td>9</td><td>Mini Project</td><td>02</td></tr>
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|---|---|---|---|---|
| **Course Code** | | | | |
| **Course Category** | **Professional Core** | | | |
| **Course Title** | **Operating Systems** | | | |
| **Total Teaching Hrs and Credits** | **Lectures** | **Tutorial** | **Laboratory** | **Credits** |
| | **30** | **------** | **30** | **2+1=03** |

**Pre-requisites**:

- Fundamentals of Computers
- Data Structures
- Computer Organization

**Course Objectives:**

1. To discuss a generic overview of operating systems.
2. To describe the concepts of process management.
3. To state the concepts related to synchronization of processes.
4. To explain the concepts of Memory Management and I/O management

**Course Outcomes:**

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

1. Comprehend key mechanisms of the Operating System functions.
2. Demonstrate processor scheduling algorithms.
3. Explain solutions to process synchronization problems.
4. Assess memory management issues.

**Course Contents:**

1. Overview of Operating System.
2. Process Management.
3. Concurrency Control.
4. Memory Management, I/O and File Management.

**Laboratory Exercises :**

1. Shell Programming.
2. Process Control.
3. CPU Scheduling
4. Banker's algorithm for deadlock avoidance.
5. POSIX threads (pthread) to perform arithmetic operations.
6. Page Replacement Algorithms.

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**Learning Resources:**

**Text Books:**

1. William Stallings, Operating System: Internals and Design Principles, Prentice Hall,ISBN-10: 0-13-380591-3, ISBN-13: 978-0-13-380591-8, 8th Edition.
2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts,WILEY,ISBN 978-1-118-06333-0, 9th Edition.

**Reference Books:**

1. Harvey M. Deitel, Operating Systems, Prentice Hall, ISBN-10: 0131828274, ISBN-13:978-0131828278.
2. W. Richard Stevens, Stephen A. Rago, Advanced Programming in the UNIX Environment, Addison- Wesley Professional, ISBN: 9780321637734,3rd Edition.
3. Sumitabha Das, Unix concepts and applications, McGraw Hill,ISBN-13-978-0-07063546-3,4th Edition.

**Supplementary Reading:**

1. Andrew Tanenbaum, Modern Operating Systems, Peasrson, 4th Edition.

**Web Resources:**

**E-books:**

http://engineeringppt.blogspot.in/2009/07/operating-system-concepts-8th-edition.html

**Web links:**

https://www.google.co.in/search?q=advanced+programming+in+unix+environment&ie=ut f-8&oe=utf-8&client=firefox-b&gfe_rd=cr&dcr=0&ei=5khOWtHyCK_T8geE65jQAQ
http://williamstallings.com/OperatingSystems/

**MOOCs:**

https://in.udacity.com/course/introduction-to-operating-systems--ud923http://nptel.ac.in/courses/106108101/

**Pedagogy:**

1. White Board/Smart Board
2. PowerPoint Presentations
3. Blended Learning (Combination of online and / on campus classes)
4. Co Teaching

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**Assessment Scheme:**

**Class Continuous Assessment: 50 Marks**

| Assignments | Test | Active Learning | Write-up on Course Outcomes |
|---|---|---|---|
| 15 Marks | 15 Marks | 15 Marks | 5 Marks |

**Laboratory Continuous Assessment : 50 Marks**

| Practical | Oral based on Practical |
|---|---|
| 30 Marks | 20 Marks |

**Term End Examination: 50 Marks**

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**Syllabus: Theory**

| Module No. | Contents | Workload Hr |
|---|---|---|
| | | Theory |
| 1 | **Overview of Operating System**<br>Operating System objectives and its evolution. Operating System, structure: Layered, Monolithic, Microkernel Operating Systems. Introduction to Linux OS, BASH shell scripting. | 08 |
| 2 | **Process Management**<br>**Process:** Concept of a Process, Process States, Process Control- creation, new program execution, termination.<br>**Threads:** Processes and Threads, Concept of Multithreading, Types of Threads, Thread programming Using Pthreads.<br>**Scheduling:** Types of Scheduling, Scheduling Algorithms: FCFS, SJF, Priority, Round Robin. | 07 |
| 3 | Concurrency Control Process Synchronization: Principles of Concurrency, Requirements for Mutual Exclusion, Mutual Exclusion: Hardware Support, Operating System Support (Semaphores and Mutex). Classical synchronization problems: Readers/Writers Problem, Producer and Consumer problem. Deadlock: Principles of Deadlock, Deadlock Modeling, Deadlock Prevention, Deadlock Avoidance, Deadlock detection and recovery. | 08 |
| 4 | **Memory Management, I/O and File Management**<br>**Memory Management:** Memory Management Requirements, Memory Partitioning: Fixed Partitioning, Dynamic Partitioning, Paging, segmentation, virtual memory File Management: Overview, File Organization and Access, File Directories, File Sharing, Record Blocking. I/O Management: I/O Devices, Organization of the I/O Functions, I/O Buffering, Disk Scheduling. | 07 |

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**Laboratory: -**

| Module No. | Contents | Workload Hr |
|---|---|---|
| | | Lab |
| 1 | **Shell Programming**<br>• Study of Basic Shell commands<br>• Write a bash shell script to implement addition, subtraction, division and multiplication operations<br>• Write a bash shell script to convert a string from upper case to lower case or vice versa | 05 |
| 2 | **Process Control**<br>Write a program using fork to create a child process. The parent process should sort elements in ascending order and child process should sort elements in descending order. | 05 |
| 3 | **CPU Scheduling**<br>Write a menu driven program to simulate the following CPU Scheduling algorithms :-<br>• First Come First Serve (FCFS).( Non Pre-emptive)<br>• Shortest Remaining Time Next (SRTN) ( Pre-emptive | 05 |
| 4 | **Deadlocks**<br>Write a program to simulate Bankers algorithm for deadlock avoidance | 05 |
| 5 | **Multi-Threading**<br>Write a program using POSIX threads (pthread ) to perform arithmetic operations | 05 |
| 6 | **Page Replacement Algorithms**<br>Write a menu driven program to simulate the following page replacement algorithms:<br>**A.** First In First Out (FIFO) **B.** Least Recently Used (LRU). | 05 |

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|---|---|---|---|---|
| **Course Code** | | | | |
| **Course Category** | **Professional Core** | | | |
| **Course Title** | **Microprocessor Architecture** | | | |
| **Total Teaching Hrs and Credits** | **Lectures** | **Tutorial** | **Laboratory** | **Credits** |
| | **30** | **--** | **30** | **2+1=03** |

**Pre-requisites**:

- Digital Electronics and Logic Design (May get changed in new syllabus)
- Computer Organization and Architecture

**Course Objectives:**

1. To acquire the knowledge of the Pentium processor architectural features, programmer's model, system registers.
2. To learn Pentium addressing modes and instruction set for the development of x86/64-bit assembly language programs.
3. To understand the memory management mechanisms for real address mode and protected mode of Pentium processor.
4. To learn the role of CPU in handling multitasking and processing of interrupts and exceptions in Pentium environment.
5. To get acquainted with architectural advancement and performance benefits of P6.

**Course Outcomes:**

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

1. Describe Pentium features and explain the Pentium architecture in details.
2. Develop 80x86 assembly language programs by applying the knowledge of addressing modes and instructions set.
3. Explain and analyse working of the Pentium protected mode memory management mechanism based on segmentation and paging concept with illustration of protection mechanism
4. Explain/Demonstrate the concept of Task management and Interrupt handling within the Pentium processor.
5. Summarize the advanced processor P6.

**Course Contents:**

1. Pentium Architecture
2. Pentium Operating Modes
3. Paging and Protection
4. Pentium Task Management and Interrupt handling

**Laboratory Exercises:**

1. String operations
2. Calculation of factorial of a given integer.
3. Display contents of system registers in Pentium.
4. Simulation of 'cp'/'cat' command.
5. Array addition
6. Password validation.
7. Sorting of numbers from an array.
8. CPU identification

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**Learning Resources:**

**Text Books:**

1. James Antonakos , "The Pentium Microprocessor" , 2004, Pearson Education ISBN – 81-7808-545-3.

**Reference Books:**

1. Intel architecture software developer's manual volume 3.
2. Intel architecture software developer's manual volume 1.
3. P6 Family of Processors Hardware Developer's Manual
4. Intel 64 and IA-32 Architectures software developer's manual

**Supplementary Reading: -**

**Web Resources:**

https://www.intel.in/content/www/in/en/architecture-and-technology/64-ia-32-architectures-software-developer-system-programming-manual-325384.html
E-books

**Web links:**

https://nptel.ac.in/courses/106/104/106104122/
https://nptel.ac.in/courses/117/104/117104072/

**Pedagogy:**

1. White Board/Smart Board
2. PowerPoint Presentations
3. Blended Learning (Combination of online and / on campus classes)
4. Co Teaching

**Assessment Scheme:**

**Class Continuous Assessment : 50 Marks**

| Theory Assignment /Active Learning/PBL/Quiz | Mid Term Test | MCQ |
|---|---|---|
| 20 Marks | 15 Marks | 15 Marks |

**Laboratory Continuous Assessment : 50 Marks**

| Practical Implementation | Viva | End Term Assessment |
|---|---|---|
| 15 Marks | 15 Marks | 20 Marks |

**Term End Examination: 50 Marks**

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**Syllabus: Theory**

| Module No. | Contents | Workload in Hours |
|---|---|---|
| | | Theory |
| 1 | Pentium Architecture: Pentium features, Pentium super-scalar architecture - Pipelining, Branch prediction, and Instruction and Data caches. The Floating point Unit: features, pipeline stages & data types. Pentium programmer's model, Register set, System registers, Addressing modes and Instruction set. | 08 |
| 2 | Pentium operating modes:<br>Pentium Modes of Operation, Pentium Real address mode: Memory organization, Memory segments, segment registers, logical to physical address generation<br>Protected mode: Segmentation unit support registers, related instructions, segment Memory descriptors, logical to linear address translations | 07 |
| 3 | Paging and Protection:<br>Paging Unit: support registers, related data structures, linear to physical address translation, TLB<br>Protection by segmentation, privilege-levels, rules of inter-privilege level transfer for data and code segments, page level protection. | 08 |
| 4 | Pentium Task Management and Interrupt handling: Task Management, support registers, related data structures, Task switching. Interrupt and Exception Overview, Sources of Interrupts & exceptions, Exception and Interrupt Vectors, Interrupt Descriptor Table (IDT), IDT Descriptors, Exception- or Interrupt-Handler Procedures<br>P6 Architecture: Case Study | 07 |

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**Laboratory:** Lab Assignments 1 to 4 are compulsory.
Instructor can select any two assignments from the assignments 5 to 8.

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Lab |
| 1 | Write X86/64 Assembly Language Program (ALP) to accept a character string from the user and display the same.<br>Write X86/64 ALP for the following operations on the string entered by the user a) Calculate length of string b) Reverse the string c) Check string is palindrome or not a palindrome d) Count the number of words and spaces in a string.<br>Select any two string operations from the above list of 4 operations. | 04 |
| 2 | Write X86/64 ALP to find the factorial of a given integer number. Accept user input. | 04 |
| 3 | Write X86/64 ALP to display the contents of system registers GDTR, IDTR, LDTR, TR and MSW. | 04 |
| 4 | Write X86/64 ALP to simulate any one of the following Linux commands.<br>Linux Commands: 'cp' , 'cat'<br>Take file name from user as a command line argument. | 06 |
| 5 | Write X86/64 ALP to add an array of N hexadecimal numbers. | 06 |
| 6 | Write X86/64 ALP to accept password from user. Validate the same and display appropriate messages. Program should display asterisk ('*') while taking password input from user. | 06 |
| 7 | Write X86/64 ALP to sort the list of integers in ascending/descending order. | 06 |
| 8 | Write X86/64 ALP to identify the CPU type. | 06 |

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| **Course Code** | | | | |
| **Course Category** | **Professional Core** | | | |
| **Course Title** | **Data Structures-II with C++ Programming** | | | |
| **Total Teaching Hrs and Credits** | **Lectures** | **Tutorial** | **Laboratory** | **Credits** |
| | **30** | **--** | **30** | **2+1=03** |

**Pre-requisites**:

- Data Structures-I with C Programming.

**Course Objectives:**

1. To study various non-linear data structures.
2. To understand different ways of file organization.
3. To apply non-linear data structures in problem solving.

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

1. To choose appropriate non-linear data structures to solve a given problem.
2. To compare and select different file organization and to apply hashing for implementing direct access organization.
3. To solve real life applications using non-linear data structures like tree and graph.

**Course Contents:**

1. Tree
2. Graph
3. Heap
4. Symbol Table
5. Hashing
6. File Organization
7. APIs for Data Structure

**Laboratory Exercises :**

1. Creation of binary tree and traversal
2. Binary search tree operations.
3. Creation of threaded binary tree.
4. Adjacency list representation and DFS & BFS traversals.
5. Prim’s algorithm for Minimum spanning tree.
6. Linear probing with and without replacement.
7. Heap Sort.

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**Learning Resources:**

**Text Books:**

1. Horowitz, Sahani, Dinesh Mehta, "Fundamentals of Data Structures in C++", Galgotia Publisher, ISBN: 8175152788, 9788175152786.
2. Peter Brass, "Advanced Data Structures", Cambridge University Press, ISBN: 978-1-107-43982.

**Reference Books:**

1. Sartaj Sahani, "Data Structures, Algorithms and Applications in C++", Second Edition, University Press, ISBN: 81-7371522 X.
2. Augenstein ,Tenenbaum & Langsam,"Data Structure Using C & C++",PHI Publication.

**Supplementary Reading:**

1. Yashwant Kanitkar," Data Structures through C++", BPB Publication.

**Web Resources:**

https://www.khanacademy.org/computing/computer-science/algorithms
https://www.hackerrank.com/contests/basic-ds-quiz-1/

**Web links:**

https://www.tutorialspoint.com/data_structures_algorithms/

**MOOCs:**

http://nptel.ac.in/courses/106102064/1
https://nptel.ac.in/courses/106103069/

**Pedagogy:**

1. Chalk and Board
2. PowerPoint Presentations
3. Two Teacher Method
4. Video Lectures
5. Discussion Forum
6. Flipped Classroom

**Assessment Scheme:**

**Class Continuous Assessment : 50 Marks**

| Assignment 1 | Active Learning 1 | Mid Term Examination | Case Study/Poster Presentation |
|---|---|---|---|
| 10 Marks | 15 Marks | 15 Marks | 10 Marks |

**Laboratory Continuous Assessment : 50 Marks**

| Practical | Practical Examination |
|---|---|
| 30 Marks | 20 Marks |

**Term End Examination: 50 Marks**

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**Syllabus:**

**Theory**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Theory |
| 1 | **Tree-** Basic Terminology, Binary Tree- Properties, Converting Tree to Binary Tree, Representation using Sequential and Linked organization, Binary tree creation and Traversals, Operations on binary tree. Binary Search Tree (BST) and its operations, Threaded binary tree- Creation and Traversal of In-order Threaded Binary tree.<br>**Case Study**- Expression tree. | 11 |
| 2 | **Graph-** Basic Terminology, Storage representation**:** Adjacency matrix, Adjacency list, Creation of Graph and Traversals, Minimum spanning Tree- Prim's and Kruskal's Algorithms, Dikjtra's Single source shortest path, Topological sorting. | 05 |
| 3 | **Heap**- Heap as a priority queue, Heap sort.<br>**Symbol Table-**Introduction to Symbol Tables, Static tree table-Optimal Binary Search Tree (OBST), Dynamic tree table-AVL tree, Multi way search tree- B-Tree. | 10 |
| 4 | **Hashing-** Introduction to hashing**,** Hash functions, Collision resolution strategies- Open Addressing and Chaining, Hash Table Overflow.<br>**File Organization**: Sequential file organization- concept and primitive operations, Direct Access File- Concepts and Primitive operations, Indexed sequential file organization-concept, types of indices, structure of index sequential file<br>**APIs for Data Structure**- Standard Template Library (STL) for data structures. | 04 |

**Laboratory: -**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Lab |
| 1 | Implement binary tree using C++ and perform following operations: Creation of binary tree and traversal recursive and non-recursive. | 05 |
| 2 | Implement a dictionary using a binary search tree where the dictionary stores keywords & its meanings. Perform following operations:<br>• Insert a keyword | 05 |

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| | • Delete a keyword<br>• Create mirror image and display level wise<br>• Copy<br>• Create mirror image and display level wise | |
| 3 | Implement threaded binary tree. Perform in order traversal on the threaded binary tree. | 04 |
| 4 | Consider a friend's network on Facebook social web site. Model it as a graph to represent each node as a user and a link to represent the friend relationship between them using adjacency list representation and perform DFS traversal. Perform BFS traversal for the above graph. | 04 |
| 5 | A business house has several offices in different countries; they want to lease phone lines to connect them with each other and the phone company charges different rent to connect different pairs of cities. (Create & display of Graph). Solve the problem using Prim's algorithm. | 04 |
| 6 | Read the marks obtained by students of second year in an online examination of a particular subject. Find the maximum and minimum marks obtained in that subject. Use heap data structure. | 04 |
| 7 | Implement direct access file using hashing (linear probing with and without replacement) perform following operations on it a. Create Database b. Display Database c. Add a record d. Search a record e. Modify a record | 04 |

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**Dr. Prasad D Khandekar**
**Chair, BoS and Dean, FoET**

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