MIT-WPU

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Dr. Vishwanath Karad

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 2022 – 2026**

# 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 have connected the world cohesively offering immense opportunities at national and international levels. 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 programme 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 Technologies is achieved and enhanced through usage of latest Tools.

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

## ***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 trans-disciplinary 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 well-being of society.

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Dean

## ***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.

## ***Foundation / Orientation Programme***

A brief on any requirement of foundation or orientation course prior to initiating the intended programme and the methodology (As applicable)

## ***Programme Structure:***

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

**(b) System followed** : Semester

**(c) Credits System:**

The outcome-based education, semester-based credit and grading system is introduced to ensure quality of engineering education. Semester 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 semester |
| 2. Total in the programme: | 165 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 semester 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 semester assessment of a student's performance and grades will be awarded by the Subject Teacher. Various assessment tools such as tests, quizzes, assignments, projects, 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
- Information and Cyber Security
- Multimedia and Computer Vision
- Software Design and Development

**(h) Mandatory Attendance to appear for examination:**

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

**(i) Medium of Instruction & Examination**: English

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

**(j) Eligibility criteria for admission to the programme:**

As per Para 4, Academic Ordinance: 2017 of MITWPU, 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 distinction, 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.

# B. Tech. Courses in Computer Engineering and Technology

## A. Definition of Credit:

| | |
|---|---|
| 1 Hours Lecture/Tutorial per week | 1 Credit |
| 2 Hours Practical (Lab) per week | 1 Credit |

## B. Credits:

Total number of credits for four-year **B.Tech. Computer Science and Engineering** programme would be 165.

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

| S. No. | Category | Suggested Breakup of Credits (Total 165) |
|---|---|---|
| 1 | Humanities and Social Sciences and including Management courses | 07 |
| 2 | World Peace Programme | 14 |
| 3 | Basic Science courses | 30 |
| 4 | Engineering Science courses including workshop, drawing, Basics of electrical/mechanical/computer etc. | 29 |
| 5 | Professional core courses | 56 |
| 6 | Professional Elective and Open Professional Electives courses relevant to chosen specialization/branch | 12 |
| 7 | Open subjects–Electives from other technical and/or emerging subjects | 03 |
| 8 | Project work, seminar and internship in industry or elsewhere | 14 |
| | **Total** | **165** |

## 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 |

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| | |
|---|---|
| CHE | Chemical Engineering |
| CET | Computer Engineering and Technology |
| POE | Polymer Engineering |
| CVE | Civil Engineering |
| PEL | Petroleum Engineering |

## E. Multiple Entry and Multiple Exit Policy

## F. 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 |

# MIT WORLD PEACE UNIVERSITY

## FACULTY OF ENGINEERING AND TECHNOLOGY

## B. Tech. Computer Science & Engineering (First Year) (Batch 2022 – 2026)

## Semester –I

| Sr. No. | Course Code | Name of Course | Type | Weekly Workload, Hrs | | | Credits | | Assessment, Marks | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Th | Lab | CCA* | LCA* | End Term Test | Total |
| 1 | MAS1019B | Linear Algebra and Differential Calculus | BS | 3 | 1 | -- | 4 | -- | 60 | -- | 40 | 100 |
| 2 | PHY2065B | Physics | BS | 3 | -- | 2 | 3 | 1 | 30 | 30 | 40 | 100 |
| 3 | MEC1101B | Ideas and Innovation in Manufacturing | ES | -- | -- | 2 | -- | 1 | -- | 100 | -- | 100 |
| 4 | BIO1002B | Biology for Engineers | BS | 2 | -- | -- | 2 | -- | 60 | -- | 40 | 100 |
| 5 | MEC1102B | Engineering Graphics | ES | 2 | -- | 2 | 2 | 1 | 100 | 50 | -- | 150 |
| 6 | MEC1104B | Material Science for Engineers | BS | 3 | -- | -- | 3 | -- | 60 | -- | 40 | 100 |
| 7 | CET1041B | Programming Foundations | ES | 2 | -- | 4 | 2 | 2 | 30 | 30 | 40 | 100 |
| 8 | FET1001B | Effective Communication | HSS | | -- | 2 | -- | 1 | -- | 100 | -- | 100 |
| 9 | WPC2001B | Peaceful Communication and Collaborative Human Dynamics | WP | 3 | -- | -- | 3 | -- | 90 | -- | 60 | 150 |
| 10 | WPC2006B | Yoga for Excellence in Life-I | WP | -- | 1 | -- | 1 | -- | 50 | -- | -- | 50 |
| | | | | **18** | **2** | **12** | **20** | **6** | 480 | 310 | 260 | 1050 |

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

**Weekly Teaching Hours: 32 Hours**
**Total Credits First Year B.Tech. Semester -I: 26**

* CCA: Class Continuous Assessment
* LCA: Laboratory Continuous Assessment

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## FACULTY OF ENGINEERING AND TECHNOLOGY

## B. Tech. Computer Science & Engineering (First Year) (Batch 2022 – 2026)

## Semester –II

| Sr. No. | Course Code | Name of Course | Type | Weekly Workload, Hrs | | | Credits | | Assessment, Marks | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Th | Lab | CCA* | LCA* | End Term Test | Total |
| 1 | MAS1025B | Discrete Mathematics with Graph Theory | BS | 3 | 1 | -- | 4 | -- | 60 | -- | 40 | 100 |
| 2 | CHM1001B | Chemistry | BS | 3 | -- | 2 | 3 | 1 | 30 | 30 | 40 | 100 |
| 3 | | Object Oriented Programming using C++ | ES | 2 | -- | 2 | 2 | 1 | 100 | 50 | -- | 150 |
| 4 | | Digital Design and Computer Architecture | ES | 3 | -- | 2 | 3 | 1 | 30 | 30 | 40 | 100 |
| 5 | CIV1020B | Engineering Mechanics | ES | 2 | -- | 2 | 2 | 1 | 30 | 30 | 40 | 100 |
| 6 | WPU1001B | Rural Immersion Program. | HSS | 0 | -- | 2 | 0 | 1 | -- | 100 | -- | 100 |
| 7 | WPC2007B | Yoga for Excellence in Life-II | WP | -- | 1 | -- | 1 | -- | 50 | -- | -- | 50 |
| | | | | **13** | **2** | **10** | **15** | **5** | 300 | 240 | 160 | 700 |

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

**Weekly Teaching Hours: 25 Hours**

**Total Credits First Year B.Tech. Semester -II: 20**

* CCA: Class Continuous Assessment

* LCA: Laboratory Continuous Assessment

**Total First Year B.Tech. Credits: 26+20 = 46**

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## FACULTY OF ENGINEERING AND TECHNOLOGY

## B. Tech. Computer Science & Engineering (Second Year) (Batch 2022 – 2026)

## Semester –III

| Sr. No. | Course Code | Name of Course | Type | Weekly Workload, Hrs | | | Credits | | Assessment, Marks | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Th | Lab | CCA* | LCA* | End Term Test | Total |
| 1 | CET2004B | Microprocessors and Microcontrollers | ES | 3 | -- | 2 | 3 | 1 | 30 | 30 | 40 | 100 |
| 2 | MAS2071B | Calculus and Numerical Methods | BS | 3 | 1 | -- | 4 | -- | 60 | -- | 40 | 100 |
| 3 | MEC1105B | Design Thinking | ES | 1 | -- | 2 | 1 | 1 | 100 | 50 | -- | 150 |
| 4 | CET1043B | Fundamentals of Data Structures | ES | 3 | -- | 2 | 3 | 1 | 30 | 30 | 40 | 100 |
| 5 | CET2002B | Database Management Systems | PC | 3 | -- | 2 | 3 | 1 | 30 | 30 | 40 | 100 |
| 6 | CET2003B | Operating Systems | PC | 3 | -- | 2 | 3 | 1 | 30 | 30 | 40 | 100 |
| 7 | WPC2002B | Universal Human Values-II | WP | 3 | -- | -- | 3 | -- | 90 | -- | 60 | 150 |
| 8 | FET1002B | Indian Constitution | HSS | 1 | -- | -- | 1 | -- | 100 | -- | -- | 100 |
| | | | | **20** | **1** | **10** | **21** | **5** | 470 | 170 | 260 | 900 |

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

**Weekly Teaching Hours: 31 Hours**
**Total Credits Second Year B.Tech. Semester-III: 26**

***** CCA: Class Continuous Assessment
***** LCA: Laboratory Continuous Assessment

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## FACULTY OF ENGINEERING AND TECHNOLOGY

## B. Tech. Computer Science & Engineering (Second Year) (Batch 2022 – 2026)

## Semester –IV

| Sr. No. | Course Code | Name of Course | Type | Weekly Workload, Hrs | | | Credits | | Assessment, Marks | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Th | Lab | CCA* | LCA* | End Term Test | Total |
| 1 | MAS2067B | Probability and Statistics | BS | 3 | 1 | -- | 4 | -- | 60 | -- | 40 | 100 |
| 2 | CET2001B | Advanced Data Structures | PC | 3 | -- | 2 | 3 | 1 | 30 | 30 | 40 | 100 |
| 3 | CET2005B | Computer Networks | PC | 3 | -- | 2 | 3 | 1 | 30 | 30 | 40 | 100 |
| 4 | CET2006B | Software Engineering and Project Management | PC | 3 | -- | 2 | 3 | 1 | 30 | 30 | 40 | 100 |
| 5 | CET3001B | Design and Analysis of Algorithms | PC | 3 | -- | -- | 3 | -- | 60 | -- | 40 | 100 |
| 6 | CET3002B | Embedded Systems and Internet of Things | PC | -- | -- | 2 | -- | 1 | -- | 100 | -- | 100 |
| 7 | CET1045B | Python Programming | PC | -- | -- | 2 | -- | 1 | -- | 100 | -- | 100 |
| 8 | WPC2003B | Vishwadharmi Dr. Vishwanath Karad's Theory of World Peace | WP | 3 | -- | -- | 3 | -- | 150 | -- | -- | 150 |
| | | | | **18** | **1** | **10** | **19** | **5** | 360 | 290 | 200 | 850 |

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

**Weekly Teaching Hours: 29 Hours**

**Total Credits Second Year B.Tech. Semester-IV: 24**

***** CCA: Class Continuous Assessment

***** LCA: Laboratory Continuous Assessment

**Total Second Year B.Tech. Credits: 26+24 = 50**

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## FACULTY OF ENGINEERING AND TECHNOLOGY

## B. Tech. Computer Science & Engineering (Third Year) (Batch 2022 – 2026)

## Semester –V

| Sr. No. | Course Code | Name of Course | Type | Weekly Workload, Hrs | | | Credits | | Assessment, Marks | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Th | Lab | CCA* | LCA* | End Term Test | Total |
| 1 | CET3003B | Full Stack Development | PC | -- | -- | 4 | -- | 2 | -- | 100 | -- | 100 |
| 2 | | Professional Elective -I<br>A. Bigdata Technologies (CET4001B)<br>B. Software Design Modelling and Testing (CET4002B)<br>C. Computer Graphics and 3D Modelling (CET4003B)<br>D. Wireless and Mobile Device Security (CET4004B) | PE | 3 | -- | 2 | 3 | 1 | 30 | 30 | 40 | 100 |
| 3 | CET2007B | Artificial Intelligence and Expert Systems | PC | 3 | -- | 2 | 3 | 1 | 30 | 30 | 40 | 100 |
| 4 | CET3004B | Information and Cyber Security | PC | 3 | -- | 2 | 3 | 1 | 30 | 30 | 40 | 100 |
| 5 | CET3005B | Data Engineering | PC | 2 | -- | 2 | 2 | 1 | 30 | 30 | 40 | 100 |
| 6 | FET2003B | Employment Skills Development | HSS | -- | -- | 2 | -- | 1 | -- | 100 | -- | 100 |
| 7 | FET2004B | Innovation & Entrepreneurship | HSS | 1 | -- | -- | 1 | -- | 100 | -- | -- | 100 |
| | | | | **12** | **0** | **14** | **12** | **7** | 220 | 320 | 160 | 700 |

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

**Weekly Teaching Hours: 26 Hours**

**Total Credits Third Year B.Tech. Semester-V: 19**

***** CCA: Class Continuous Assessment

***** LCA: Laboratory Continuous Assessment

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## FACULTY OF ENGINEERING AND TECHNOLOGY

## B. Tech. Computer Science & Engineering (Third Year) (Batch 2022 – 2026)

### Semester –VI

| Sr. No. | Course Code | Name of Course | Type | Weekly Workload, Hrs | | | Credits | | Assessment, Marks | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Th | Lab | CCA* | LCA* | End Term Test | Total |
| 1 | CET3006B | Machine Learning | PC | 3 | -- | 2 | 3 | 1 | 30 | 30 | 40 | 100 |
| 2 | CET2008B | Theory of Computation | PC | 3 | -- | -- | 3 | -- | 60 | -- | 40 | 100 |
| 3 | CET3007B | High-Performance Computing | PC | 3 | -- | 2 | 3 | 1 | 30 | 30 | 40 | 100 |
| 4 | | Professional Elective -II<br>A. Cognitive Computing and Natural Language Processing (CET4005B)<br>B. Data Privacy (CET4006B)<br>C. Blockchain Technology (CET4007B)<br>D. User Interface and User Experience Design(CET4008B) | PE | 3 | -- | 2 | 3 | 1 | 30 | 30 | 40 | 100 |
| 5 | | Mini Project using Java Programming | PR | -- | -- | 4 | -- | 2 | -- | 100 | -- | 100 |
| 6 | CET3008B | Seminar | PR | -- | -- | 2 | -- | 1 | -- | 100 | -- | 100 |
| 7 | CIV1026B | Environmental Science | BS | 1 | -- | -- | 1 | -- | 100 | -- | -- | 100 |
| 8 | FET2005B | Finance and Costing | HSS | 2 | -- | -- | 2 | -- | 60 | -- | 40 | 100 |
| 9 | WPC2004B | Indian Tradition, Culture and Heritage | WP | 3 | -- | -- | 3 | -- | 90 | -- | 60 | 150 |
| | | | | **18** | **0** | **12** | **18** | **6** | 400 | 290 | 260 | 950 |

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

* CCA: Class Continuous Assessment

* LCA: Laboratory Continuous Assessment

**Weekly Teaching Hours: 30 Hours**

**Total Credits Third Year B.Tech. Semester-VI: 24**

**Total Third Year B.Tech. Credits: 19+24 = 43**

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## FACULTY OF ENGINEERING AND TECHNOLOGY

## B. Tech. Computer Science & Engineering (Final Year) (Batch 2022 – 2026)

## Semester –VII

| Sr. No. | Course Code | Name of Course | Type | Weekly Workload, Hrs | | | Credits | | Assessment, Marks | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Th | Lab | CCA* | LCA* | End Term Test | Total |
| 1 | CET4061B | Capstone Project | PR | -- | -- | 12 | -- | 6 | -- | 200 | -- | 200 |
| 2 | CET3010B | Distributed and Cloud Computing | PC | 2 | -- | 2 | 2 | 1 | 30 | 30 | 40 | 100 |
| 3 | CET3011B | System Software and Compiler Design | PC | 3 | -- | 2 | 3 | 1 | 30 | 30 | 40 | 100 |
| 4 | | OPE/Professional Elective –III<br>A. Deep Learning (CET3012B)<br>B. Augmented Reality and Virtual Reality (CET4009B)<br>C. Vulnerability Identification and Penetration Testing (CET4010B)<br>D. Computer Vision (CET4011B) | PE | 3 | -- | 2 | 3 | 1 | 30 | 30 | 40 | 100 |
| | | | | **8** | **--** | **18** | **8** | **9** | 90 | 290 | 120 | 500 |

**Weekly Teaching Hours: 26 Hours**
**Total Credits Final Year B.Tech. Semester-VII: 17**

****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 2022 – 2026)

## Semester –VIII

| Sr. No. | Course Code | Name of Course | Type | Weekly Workload, Hrs | | | Credits | | Assessment, Marks | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Th | Lab | CCA* | LCA* | End Term Test | Total |
| 1 | | Open Elective | OE | 3 | -- | 0 | 3 | 0 | 100 | | | 100 |
| 2 | CET4062B | Internship | PR | -- | -- | 18 | -- | 6 | | 200 | | 200 |
| | | | | **3** | **0** | **18** | **3** | **6** | 100 | 200 | | 300 |

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

**Weekly Teaching Hours: 21 Hours**
**Total Credits Final Year B.Tech. Semester-VIII: 09**

***** CCA: Class Continuous Assessment
***** LCA: Laboratory Continuous Assessment

**Total Final Year B.Tech. Credits: 17+09 = 26**

**Total B. Tech. Credits: 46+50 +43+26 =165 Credits**

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## Professional Electives (PE)

| | Tack1 | Track2 | Track3 | Track4 |
|---|---|---|---|---|
| PE-I | Bigdata Technologies (CET4001B) | Computer Graphics and 3D Modelling (CET4003B) | Wireless and Mobile Device Security(CET4004B) | Software Design Modeling and Testing (CET4002B) |
| PE-II | Cognitive Computing and Natural Language Processing(CET4005B) | Blockchain Technology (CET4007B) | Data Privacy(CET4006B) | User Interface and User Experience Design(CET4008B) |
| PE-III | Deep Learning (CET3012B) | Computer Vision(CET4011B) | Vulnerability Identification and Penetration Testing(CET4010B) | Augmented Reality and Virtual Reality (CET4009B) |

**Open Electives (OE): Will be offered by other school**

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## Course Structure

| | | | | |
|---|---|---|---|---|
| **Course Code** | **MAS1019B** | | | |
| **Course Category** | **Basic Sciences** | | | |
| **Course Title** | **Linear Algebra and Differential Calculus** | | | |
| **Teaching Scheme and Credits**<br>**Weekly load hrs.** | **Lecture** | **Tutorial** | **Laboratory** | **Credits** |
| | 03 hours | 1 hour | -- | 3+1+0=4 |

**Pre-requisites**:

- HSC (Mathematics)

**Course Objectives:**

**1. Knowledge:**

i. To understand basic concepts of Linear Algebra & Differential Calculus

**2. Skills:**

i. To acquire skills of using Matrices & series solutions for various Engg. applications

ii. To acquire skill of solving the problems with ordinary & partial derivatives

**3. Attitude:**

i. A positive attitude while learning Matrices & Calculus.

**Course Outcomes:**

After completion of this course students will be able to

1. apply the knowledge of Matrices for solving system of Linear equations, compute Eigen values and Eigen vectors and applications in computational geometry.
2. solve problems on continuity and differentiability.
3. determine convergence/ divergence of an infinite series using various tests.
4. differentiate functions of several variables that are essential in various branches of engineering.
5. examine maxima / minima of real variable functions, error estimation, approximation, and apply concept of Jacobian to find functional dependence.
6. analyze the vector fields and apply to fluid flow equations.

**Course Contents:**

1. **Theory of Matrices (10 Hrs.)**

   Rank of a matrix, System of Linear Equations, Linear dependence and Independence, Linear and Orthogonal Transformations, Orthogonal matrix, Matrix Eigen value problems, Caley-Hamilton Theorem, Applications of Matrices; scaling, stretching, reflections, rotation, translation in XY-plane, rotation about coordinate axes in three dimensional space.

2. **Differential Calculus (08 Hrs.)**

Review of limits, continuity and differentiability of univariate functions, Mean value theorems, local extrema, increasing and decreasing functions, concavity, points of inflection, $n^{th}$ derivative of standard functions, Leibnitz's Theorem.

3. **Sequence and Series: (08 Hrs.)**
   Sequences, limits, subsequences, monotone sequences, infinite series, tests for convergence (Geometric series, p-series test, Ratio test, Root test, Comparison test, Leibnitz's test for alternating series), absolute convergence, power series and its convergence Taylor's and Maclaurin's series expansion of a function.

4. **Partial Differentiation (07 Hrs.)**
   Introduction to functions of several variable, Partial derivatives, Euler's Theorem for Homogeneous functions, Partial derivatives of Composite and Implicit functions, Total derivative.

5. **Application of Partial Differentiation (07 Hrs.)**
   Errors and approximations, Maxima and Minima of a function of two independent variables, Lagrange's method of undetermined multipliers, Jacobians and Functional Dependence.

6. **Vector Differentiation (5 Hrs.)**
   Physical interpretation of vector differentiation, Vector differential operator, Gradient, Divergence, Curl, Directional derivative, Vector identities.

**Tutorial Exercises:**

1. Rank of a matrix, System of Linear Equations.
2. Linear dependence and Independence of vectors, Orthogonal matrix
3. Eigen values &Eigen Vectors, Applications of matrices.
4. Limit, continuity, mean value theorems
5. $n^{th}$derivative of functions.
6. Leibnitz's Theorem.
7. Convergence/divergence of infinite series
8. Convergence/divergence of infinite series
9. Taylor's series and Maclaurin's series.
10. Partial Differentiation and related problems
11. Euler's Theorem and its deductions.
12. Partial derivatives of Composite function and Implicit functions, Total derivative
13. Errors and Approximations, Maxima and Minima of a function of two variables
14. Lagrange's method of undetermined multiplier, Jacobians and Functional Dependence.
15. Vector differentiation.
16. *Introductory session on Mathematical Software will be conducted.

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**Learning Resources:**

**Reference Books**

1. Thomas' Calculus (12th edition) by Maurice D. Weir, Joel Hass, Frank R. Giordano, Pearso Education.
2. Kreyszig Erwin, "Advanced Engineering Mathematics", 10th edition, Wiley Eastern Limited2015.
3. Greenberg Michael D., "Advanced Engineering Mathematics", 2nd edition, Pearson 2009.
4. Grewal B.S. "Higher Engineering Mathematics", 44th edition, Khanna Publishers 2017.
5. David F. Rogers, J. Alan Adams,"Mathematical Elements For Computer Graphics" McGraw-Hill 1976.
6. Differential Calculus by Shanti Narayan, S. Chand and company, New Delhi.
7. Advanced Engineering Mathematics by C.R. Wylie, McGraw Hill Publications, New Delhi.

**Supplementary Reading:**

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

**Web Resources:**

1. http://nptel.ac.in/courses/111105035/6
2. https://www.khanacademy.org/math/precalculus/x9e81a4f98389efdf:matrices/x9e81a4f98389efdf:matrices-as-transformations/v/matrix-transformation-triangle

**MOOCs (Coursera)**

1. https://www.edx.org/course/calculus-1c-coordinate-systems-infinite-mitx-18-01-3x-0
2. https://nptel.ac.in/courses/122/104/122104017/

**Pedagogy:**

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

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**Assessment Scheme:**
**Class Continuous Assessment (CCA): 60 Marks**

| Mid Term | Component 1 (Active Learning) | Component 2 | Component 3 |
|---|---|---|---|
| 15 Marks | 15 Marks | 15 Marks | 15 Marks |

**Laboratory Continuous Assessment (LCA): NA**
**Term End Examination: 40 Marks**

## Syllabus: Theory

| Module No. | Contents | Workload in Hrs | |
|---|---|---|---|
| | | Theory | Tutorial |
| 1 | Theory of Matrices | 10 | 3 |
| 2 | Differential Calculus | 8 | 3 |
| 3 | Sequence and Series | 8 | 3 |
| 4 | Partial Differentiation | 7 | 3 |
| 5 | Applications of Partial Differentiation | 7 | 2 |
| 6 | Vector Differentiation | 5 | 1 |

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# COURSE STRUCTURE

|  |  |  |  |  |
|---|---|---|---|---|
| **Course Code** | **CET1041B** | | | |
| **Course Category** | **Engineering Science** | | | |
| **Course Title** | **Programming Foundations** | | | |
| **Total Teaching Hrs and Credits** | **Lectures** | **Tutorial** | **Laboratory** | **Credits** |
| | **2hrs/wk** | **--** | **4hrs/wk** | **2+2=4** |

**Pre-requisites**:

- Introductory Knowledge of Computers.

**Course Objectives:**

**1. Knowledge:**

i. Learn programming skills and programming language constructs.

**2. Skills:**

i. Understand the functions,arrays and structures using C language.
ii. Understand file handling and pointers using C language.

**3.Attitude:**

i. Learn to apply programming skills for solving real world problems.

**Course Outcomes:**

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

1. Develop efficient logic and algorithms for solving a problem.
2. Analyze the given problem and solve it using suitable programming constructs.
3. Apply programming skills for solving real world problems.

**Course Contents:**

1. Introduction of Computer System and Problem Solving
2. Fundamentals of C
3. Data types and Functions in C
4. Pointers and File handling in C
5. Fundamentals of Programming Language

**Laboratory Exercises:**

1. C Data Types
2. C Control Structures
3. C Functions
4. Arrays and Structures in C
5. Pointers
6. File Handling

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## Learning Resources:

**Reference Books:**

1. Pradeep Sinha, Priti Sinha, “Computer Fundamentals”, Sixth edition, bpb publication.
2. Ramon Mata-Toledo, Pauline K. Cushman, “Introduction to Computer Science”, Schaum’s Outline series.
3. Herbert Schildt, "C: The Complete Reference", Fourth Edition, McGraw Hill Professional.
4. Yashwant Kanetkar, “Let us C”, Fifteenth edition, bpb publication.

**Web Resources:**

**Web Links:**

1. http://www.studytonight.com/c/overview-of-c.php
2. https://www.tutorialspoint.com/cprogramming

**MOOCs:**

1. http://nptel.ac.in/courses/106105085/2
2. http://nptel.ac.in/courses/106104074/1
3. https://nptel.ac.in/courses/106/105/106105171
4. https://nptel.ac.in/courses/106/106/106106212/

## Pedagogy:

1. Power point presentations
2. Practical Demos
3. Videos
4. Online Classroom
5. Expert Lectures

## Assessment Scheme:

**Class Continuous Assessment (CCA): 30 Marks**

| Mid Term | Component 1 (Active Learning) | Component 2 |
|---|---|---|
| 15 Marks | 10 Marks | 5 Marks |

**Laboratory Continuous Assessment (LCA): 30 Marks**

| Practical Performance | Active lerning / Mini Project/Additional implementation/ On paper design | End term practical /oral examination |
|---|---|---|
| 10 Marks | 10 Marks | 10 Marks |

**Term End Examination: 40 Marks**

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## Syllabus: Theory

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Theory |
| 1 | **Introduction of Computer System and Problem Solving:**<br>Basics of Computers: Architecture, Processors, Memory, Number Systems, Data Representation- Floating point, Char, String. System Software - Operating system, Editor, Compiler, Assembler, Linker, Loader.<br>Introduction to Problem Solving: Problem solving process/framework, Programming Paradigms: Imperative, Object Oriented, Functional and Logic programming. Characteristics of Programming Languages, Role of programming languages, need of studying programming languages.<br>Programming Design Tools: Algorithms, Pseudo-code and Flowchart, Case studies for Algorithm, Flowchart and Pseudocode. Top-Down and Bottom-Up design approach. Software Development Life Cycle. | 07 |
| 2 | **Fundamentals of C**<br>**Introduction to C:** Fundamentals of C-Programming, Data types, Constants, Variables, Operators, Expression, Pre-processor directives. Data Input and Output.<br>**Control Structures:** Decision control statements, Selection/conditional branching Statements: if, if-else, nested if, if-elif-else statements. Basic loop Structures/Iterative statements: while loop, for loop, selecting appropriate loop. Nested loops, the break, continue, pass, else statement used with loops<br>Structure of C program, Coding conventions | 07 |
| 3 | **Derived data types and Functions in C**<br>**Derived data types:** Array- Single and Multidimensional arrays, Structure – Structure and Array of structure, Union. Strings<br>**Functions in C:** User defined and Library Functions-String Library Functions. Different parameter passing methods (Call by Value and Call by Reference), Passing array to a function, Recursion. | 08 |
| 4 | **Pointers and File handling in C**<br>**Pointers:** Lifetime of Variables, Scope Rules: Static and Dynamic scope. Pointers, Passing Pointers to function, Pointers and Arrays, Dynamic memory allocation and its application.<br>**File Handling in C:** File, Types of Files, File operations.<br>**Fundamentals of Programming Language:**<br>Introduction: Characteristics of Programming Languages, Influencing Factors for the Evolution of Programming Language, Desirable Features and Design Issues. Brief Introduction to Programming Language Paradigms: Imperative, Object Oriented, Functional, Logic and Concurrent Programming | 08 |

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| | | |
|---|---|---|
| | Syntactic Structure: Syntax, Semantics, Structure, Character Set Tokens, Sentence-Syntax and Semantics, Expression Notation, Grammar, Syntax Tree, Context Free Grammar, Translators | |

**Laboratory:**

| Assignment No. | Contents | Workload in Hrs |
|---|---|---|
| | | Lab |
| 1 | Write a program in C to check leap year.<br>Write a menu driven program in C to implement the basic arithmetic operations.<br>Write a program in C to generate multiplication tables. | 04 |
| 2 | Write a C Program to calculate salary of an employee given his basic pay (take as input from user). Calculate gross salary of employee. Let HRA be 10 % of basic pay and TA be 5% of basic pay. Let employee pay professional tax as 2% of total salary. Calculate net salary payable after deductions. | 02 |
| 3 | Write a program in C to perform basic operation such as addition, saddle point, inverse, magic square of two matrices. | 04 |
| 4 | Write a C function to compute the factorial of a number with and without recursion. | 02 |
| 5 | Write a C program to accept student details and display their result using array of structures. | 02 |
| 6 | To accept a student's five course marks and compute his/her result. Student is passing if he/she scores marks equal to and above 40 in each course. If student scores aggregate greater than 75%, then the grade is distinguished. If aggregate is 60>= and <75 then the grade of first division. If aggregate is 50>= and <60, then the grade is second division. If aggregate is 40>= and <50, then the grade is third division. | 02 |
| 7 | To check whether the input number is Armstrong number or not. An Armstrong number is an integer with three digits such that the sum of the cubes of its digits is equal to the number itself. Ex. 371. | 02 |
| 8 | To simulate a simple calculator that performs basic tasks such as addition, subtraction, multiplication and division with special operations like computing xy and x! | 04 |
| 9 | To accept the number and Compute a) square root of number, b) Square of number, c) Cube of number d) check for prime, d) factorial of number e) prime factors | 04 |
| 10 | To accept two numbers from user and compute smallest divisor and Greatest Common Divisor of these two numbers. | 04 |

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| | | |
|---|---|---|
| 11 | To accept a number from user and print digits of number in a reverse order. | 02 |
| 12 | To input binary number from user and convert it into decimal number. | 02 |
| 13 | To generate pseudo random numbers | 04 |
| 14 | To accept list of N integers and partition list into two sub lists even and odd numbers. | 02 |
| 15 | To accept the number of terms a finds the sum of sine series. | 04 |
| 16 | Write a C program that accepts a string from user and perform following string operations- i. Calculate length of string ii. String reversal iii. Equality check of two strings iii. Check palindrome ii. Check substring | 04 |
| 17 | Create Structure EMPLOYEE for storing details (Name, Designation, gender, Date of Joining and Salary). Define function members to compute a)total number of employees in an organization b) count of male and female employee c) Employee with salary more than 10,000 d) Employee with designation “Asst Manager” | 04 |
| 18 | Write a C function to swap two numbers with and without pointers. | 04 |
| 19 | Write a C program to copy contents of one file to another using File handling. | 02 |
| 20 | Write a menu driven program in C to perform all string operations. (In built functions). | 02 |

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## COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **MAS1025B** | | | |
| **Course Category** | **Basic Sciences** | | | |
| **Course Title** | **Discrete Mathematics with Graph Theory** | | | |
| **Teaching Scheme and Credits**<br>**Weekly load hrs.** | **Lecture** | **Tutorial** | **Laboratory** | **Credits** |
| | **03** | **01** | **--** | **3+1+0=4** |

**Pre-requisites**:

- Basic Mathematics

**Course Objectives:**

**1. Knowledge:**

i. To understand the logic for solving problems using set theory and combinatorial problem using probability theory

**2. Skills:**

i. To acquire skills of using Graph Theory for modelling computer science problems

ii. To acquire relations and functions to solve relevant problems in computer science

iii. To apply Number Theory in Computer Application

**3. Attitude:**

i. A positive attitude for learning Discrete Mathematics

**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 Number Theory in Computer Science.

**Course Contents:**

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
   Fuzzy sets, Basic concepts and types of Fuzzy sets, Operations on Fuzzy sets

2. **Relations and Functions:** 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. Function: surjective, injective and bijective functions, Inverse Functions and Compositions of Functions, Recursive Function.

3. **COUNTING:** The Basics of Counting, Permutations and Combinations, Binomial Coefficients, Algorithms for generating Permutations and Combinations, The Pigeonhole Principle,

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Algebraic structure: algebraic system, Semi Groups, Monoids, Groups, Homomorphism, subgroups, Normal Subgroups and congruence relations, Rings, Integral Domains and Fields.

4. **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 algorithm, Planar Graph, dual of a planer graph, independence number and clique number, chromatic number, statement of Four-color theorem, digraphs.
5. **Trees:** Introduction, properties of trees, Binary search tree, decision tree, prefix codes and Huffman coding, cut sets, Spanning Trees and Minimum Spanning Tree, Kruskal‘s and Prim‘s algorithms, The Max flow- Min Cut Theorem.

6. **Number Theory and Its Applications:** Modular Arithmetic & its properties, The Euclidean Algorithm, Extended Euclidean algorithm, Solving Congruence equations, The Chinese Remainder Theorem, Fermat's Theorem, Primitive Roots and Discrete Logarithms.

**<u>Tutorial Exercises:</u>**

1. Problem Solving on Set Theory
2. Relations, equivalence and partial order relation
3. functions
4. permutation, combination
5. Pigeonhole principle
6. Group, subgroup, Homomorphism
7. Rings, Integral domain.
8. Fields.
9. Adjacency matrix and Shortest path problems using Graph
10. Graph coloring, planar graphs, digraphs
11. Trees, spanning tree, Huffman coding
12. Max flow –min cut theorem
13. Problem solving on Number Theory.
14. Two tutorials will be conducted using Mathematical Software. Tutorial shall be engaged in four batches (batch size of 15 students) per division.

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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.
3. George J. Klir and Bo Yuan - Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice Hall

**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", 2ndEdition, Oxford University Press
2. Data Structures – Seymour Lipschutz, Shaum's outlines, MCGraw – Hill Inc.

**Web Resources:**

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

**Web links:**

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

**MOOCs:**

1. http://nptel.ac.in/courses/106106094/3
2. 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)- 60 Marks**

| **Mid Term** | **Component 1 (Active Learning)** | **Component 2** | **Component 3** |
|---|---|---|---|
| 15 Marks | 15 Marks | 15 Marks | 15 Marks |

**Term End Examination: 40 Marks**

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**Syllabus: Theory:**

| Module No. | Contents | Workload in Hrs | |
|---|---|---|---|
| | | **Theory** | **Tut** |
| 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 | 07 | 2 |
| 2 | **Relations and Functions:** 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>Function: surjective, injective and bijective functions, Inverse Functions and Compositions of Functions, Recursive Function. | 08 | 2 |
| 3 | **COUNTING:** The Basics of Counting, Permutations and Combinations, Binomial Coefficients, Algorithms for generating Permutations and Combinations, The Pigeonhole Principle, Algebraic structure : algebraic system , Semi Groups, Monoids , Groups, Homomorphism , subgroups, Normal Subgroups and congruence relations, Rings, Integral Domains and Fields. | 08 | 3 |
| 4 | **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 algorithm, Planar Graph, Graph Coloring, digraphs. | 07 | 3 |
| 5 | **Trees:** Introduction, properties of trees, Binary search tree, decision tree, prefix codes and Huffman coding, cut sets, Spanning Trees and Minimum Spanning Tree, Kruskal's and Prim's algorithms, The Max flow- Min Cut Theorem. | 07 | 2 |
| 6 | **Number Theory and Its Applications:** Modular Arithmetic & its properties, The Euclidean Algorithm, Extended Euclidean algorithm, Solving Congruence equations, The Chinese Remainder Theorem, Fermat's Theorem, Primitive Roots and Discrete Logarithms | 08 | 3 |

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## COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | | | | |
| **Course Category** | **Professional Core** | | | |
| **Course Title** | **Object Oriented Programming using C++** | | | |
| **Teaching Scheme and Credits**<br>**Weekly load hrs** | **Lecture** | **Tutorial** | **Laboratory** | **Credits** |
| | **2 hr/wk** | **--** | **2 hr/wk** | **2+1 = 3** |

**Pre-requisites:**

- Programming Foundations

**Course Objectives:**

**1. Knowledge**

**i.** Learn object oriented paradigm and its fundamentals.

**2. Skills**

**i.** Understand Inheritance, Polymorphism and dynamic binding using C++.

**ii.** Study the concepts of Exception Handling and file handling using C++.

**3. Attitude**

**i.** Learn to apply advanced concepts to solve real world problems.

**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 exceptions and file handling to store and retrieve the data.
4. Develop an application using advance concepts.

**Course Contents:**

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

**Laboratory Exercises:**

1. Classes, Types of constructors
2. Inheritance
3. Polymorphism
4. File handling and Exception handling
5. Templates & Standard Template Library

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## 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.

### 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/

## Pedagogy:

1. PPTs
2. Practical Demos
3. Videos
4. Expert lectures

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**Assessment Scheme:**

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

| Assignments | Mid Term Exam | MCQ/Skill Test | Mini Project |
|---|---|---|---|
| 30 Marks | 20 Marks | 20 Marks | 30 Marks |

**Laboratory Continuous Assessment (LCA): 50 Marks**

| Lab Assignment | Practical Exam |
|---|---|
| 30 Marks | 20 Marks |

**Term End Examination: NA**

**Syllabus: Theory**

| Module No | Content | Workload in Hrs |
|---|---|---|
| | | Theory |
| 1 | **Introduction to Object Oriented Programming (OOP)**<br>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 | 06 |
| 2 | **Inheritance and Polymorphism**<br>**Inheritance:** Base and Derived Classes, Types of inheritance, protected: Data member and Member Function, Member Access Control, Inheriting Constructors and Destructors, Overriding Member Functions, Ambiguity in Multiple Inheritance, Virtual Base Class.<br>**Polymorphism:** Introduction to Polymorphism, Types of Polymorphism: Static polymorphism, Dynamic polymorphism. Function overloading, Operator Overloading, Pure Virtual Function, Abstract base Class.Case study/examples in C++. | 06 |
| 3 | **Exception Handling and File and IO Streams**: | 05 |

| | | |
|---|---|---|
| | **Exception Handling**: Introduction, Exception Handling Mechanism - try, catch and throw, Multiple Exceptions.<br>**File and IO Streams:** Stream and Files, Stream Classes, File Pointers, File I/O with Member Functions. Case study/examples in C++. | |
| 4 | **Advance concepts:**<br>**Templates:** Introduction to Template, types of templates, Function Template, overloading Function templates, Class Template<br>**STL:** STL components, Containers - Sequence Containers and Associative Containers, Container Adapters, Application of Container: vector, list, Algorithms: searching and sorting. Introduction to iterator. | 05 |

**Laboratory:**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Lab |
| 1 | Implements basic concept of object, classes, constructors and destructors in C++. | 02 |
| 2 | Implements constructors and destructors in C++. | 02 |
| 3 | Implement the concept of inheritance in C++. | 02 |
| 4 | Implement the concept of polymorphism and pure virtual function in C++. | 04 |
| 5 | Implement concept of exceptions handling in C++ | 02 |
| 6 | Implement file handling and File input output operations in C++ | 02 |
| 7 | Implement template in C++ | 02 |
| 8 | Implement concept of STL in C++ | 04 |
| 9 | Mini-Project | 04 |

## COURSE STRUCTURE

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| | | | | |
|---|---|---|---|---|
| **Course Code** | | | | |
| **Course Category** | Engineering Sciences(ES) | | | |
| **Course Title** | **Digital Design and Computer Architecture ( DDCA)** | | | |
| **Teaching Scheme and Credits**<br>**Weekly load hrs** | **Lecture** | **Tutorial** | **Laboratory** | **Credits** |
| | **3 hr/wk** | **--** | **1 hr/wk** | **3+1 = 4** |

**Pre-requisites**:

1. Physics

**Course Objectives:**

By participating in and understanding all facets of this Course a student will be able:

1. **Knowledge**
   ii. To learn number systems, Boolean algebra and to introduce the concepts of digital logic families.
2. **Skill**
   i. To develop skills for design and implementation of combinational logic circuits.
   ii. To develop skills for design and implementation of sequential circuits
3. **Attitude**
   i. To understand the functions, characteristics of various components of computer, instruction set, addressing mode of computer architecture and Pipeline Hazards
   ii. To acquire the knowledge of Control unit architecture and Memory Organization

**Course Outcomes:**

On completion of course, students will be able to

5. Identify and use the basic logic gates and solve logic equations with various reduction techniques of digital logic circuits.
6. Design and implement combinational logic circuits
7. Design and implement sequential logic circuits
8. Recognize the functions and organization of various blocks of CPU.
9. Describe CPU instruction characteristics used in Pipelining concept and its relevance with Processor’s performance.
10. Demonstrate computer architecture concepts related control unit  and memory

**Course Contents:**

1. Number Systems and Digital Arithmetic
2. Combinational Logic Design
3. Sequential Logic Design
4. Fundamental of Computer Architectures

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5. Processor organization and Memory System

Laboratory Exercises:

1. **Verification of Logic Gates**
2. **Binary to Gray Code / Gray to Binary Converter**
3. **Combinational logic circuit using MUX (4:1)**
4. **Sequential logic for flip-flop conversion (T/D)**
5. **Asynchronous counter using IC 7476**
6. **MOD – 7 Counter**
7. **Single-bit ALU**
8. **Booth's Algorithm**
9. **Display 2-digit Hex number**
10. Accept input through Keyboard

**Learning Resources:**

**Text Books:**

1. "Modern Digital Electronics", R.P. Jain, Tata McGraw-Hill, Third Edition
2. "Digital Electronics, Principles,Devices and Applications", Anil K. Maini, Wiley, First Edition
3. "Computer organization and architecture, designing for performance" by William
4. Stallings, Prentice Hall ,Eighth edition

**Reference Books:**

1. "Digital Design", M Morris Mano, Prentice Hall, Third Edition
2. "Computer organization", Hamacher and Zaky, Fifth Edition
1. "Microprocessors and interfacing-programming and hardware" Douglas V. Hall and SSSP Rao, McGraw-Hill, Third Edition

**Web links:**

1. https://nptel.ac.in/courses/106/105/106105163/
2. https://nptel.ac.in/courses/117/106/117106086/
3. Virtual Lab simulator Link **http://vlabs.iitkgp.ac.in/coa/**
4. https://www.booksfree.org/computer-organization-and-architecture-by-william-stallings-pdf/

**MOOCs:**

1. https://www.classcentral.com/course/swayam-digital-electronic-circuits-12953

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**Pedagogy:**

1. PowerPoint Presentation
2. Active learning
3. Flipped Classroom Activity
4. Group Discussion

**Assessment Scheme:**

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

| Assignments | Mid Term Test | Problem based Learning | Total |
|---|---|---|---|
| 5 Marks | 15 Marks | 10 Marks | 30 Marks |

**Laboratory Continuous Assessment (LCA): 50 Marks**

| Practical continuous assessment | Practical examination | Total |
|---|---|---|
| 20 Marks | 10 Marks | 30 Marks |

**Term End Examination: NA**

**Syllabus: Theory**

| Module No | Content | Workload in Hrs |
|---|---|---|
| | | Theory |
| 1 | **Number Systems and Digital Arithmetic** Introduction to Number System and conversion, Sign Magnitude representation, 1’s and 2’s complement, Binary Addition and Subtraction, Boolean Algebra, Logic Gates, Minimization of logic functions using K map (SOP and POS) | **8** |
| 2 | **Combinational Logic Design:**<br>Half adder, full adder, half subractor, full subtractor, 4 bit parallel adder, design of look ahead carry generator, Implementing Boolean Functions with Multiplexers, Cascading Multiplexer Circuits, Implementing Boolean Functions with Decoders, Cascading Decoder Circuits | **8** |
| 3 | **Sequential Logic Design:** | **9** |

| | | |
|---|---|---|
| | 1-bit Memory Cell, Flip flops, Conversion of flip flops, Design of ripple counters and synchronous counters, Modulus of the counter, Shift registers, Applications of Shift registers (ring and twisted ring counters) | |
| 4 | **Fundamental of Computer Architectures:** Structure and Function, IAS Machine, Types of computer units (CPU, Memory, I/O, System Bus), Von Neumann & Harvard architecture, Key characteristics of RISC & CISC.<br>ALU: Block diagram, Arithmetic (signed and unsigned) operations – addition, subtraction (covered in Unit 1) Multiplication and division<br>Control Unit (Hardwired and Micro-programmed) | **9** |

**Laboratory:**

| **Module No.** | **Contents** | **Workload in Hrs** |
|---|---|---|
| | | **Lab** |
| 1 | Truth Table Verification using Logic Gates | 2 |
| 2 | Design and Implement 3 Bit Binary to Gray Code / Gray to Binary Converter | 2 |
| 3 | Design and implement combinational logic circuit using MUX (4:1) | 2 |
| 4 | Design and implement sequential logic for flip-flop conversion (T/D) | 2 |
| 5 | Design and implement Asynchronous counter using IC 7476 | 2 |
| 6 | Design and Implement MOD – 7 Counter | 2 |
| 7 | Design & simulate single-bit ALU | 2 |
| 8 | Design & simulate Booth’s Algorithm | 2 |
| 9 | Write ALP to display 2 digit Hex number | 2 |
| 10 | Write ALP to accept input through Keyboard | 2 |

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