MIT-WPU
॥ विश्वशान्तिर्पुर्वं भूयात ॥

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 2020 – 2024

3rd year.

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

MIT-WPU

# PROGRAMME STRUCTURE

**Preamble:**

The Computer Science and Engineering 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, researcher, 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 seminar component. 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**
Chairman, BoS in Computer Engineering
Professor & Head, School of Computer Engineering and Technology

**Dr. L. K. Kshirsagar**
Dean,
Engineering and Technology

Head
School of Computer
Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38.

MIT-WPU
Approved by
Academic Council

## Vision and Mission of the Programme

### Vision

- To build a value based academic center of excellence in Computer Engineering.

### Mission

- To create an ambience nurturing integrity, discipline, technical knowledge and research in the emerging areas of Computer Engineering.

## Programme Educational Objectives

- Adapt to rapidly changing technical scenario.
- Lead teams of multidisciplinary professionals with the sense of integrity, discipline and social responsibility.
- Design and develop systems in various domains.
- Demonstrate Innovative and Entrepreneurial spirit in their professional careers.

## Foundation / Orientation Programme

The students admitted to the Computer Science and Engineering programme belong to varied backgrounds and possess different levels of technical awareness. Thus, a one day orientation programme is conducted for the students to acquaint them with the overall programme structure and its prospectus. Students are also briefed about the current technical trends and domains, project prospectus, co-curricular, extra-curricular activities along with recruitment opportunities and avenues. The orientation programme helps the students to choose their specialization subject interests towards the fulfilment of their carrier goals and future education.

( Prof.L.K.Kshirsagar )
( Dean )

Head
School of Computer
Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38.

MIT-WPU
Approved by
Academic Council

## Programme Outcomes (POs)

**PO-1** To apply knowledge of Mathematics, Science, Engineering fundamentals and Computer Engineering concepts to understand and develop systems and products in various domains that meet desired specifications and requirements.

**PO-2** Developing problem analysis and problem solving skills by applying principles of Mathematics and Computer Engineering concepts.

**PO-3** To make students capable of designing and developing systems for various Application domains relevant to cultural, societal, environmental, public health and safety issues using Computer Engineering design principles.

**PO-4** Ability to investigate complex systems and research problems, correlating emerging trends in Computer Engineering.

**PO-5** To make students aware and competent in using modern tools and techniques for analysis, modelling and simulation of highly data intensive applications.

**PO-6** To imbibe best practices and sense of responsibility to understand safety, legal, cultural societal and health issues in IT industry.

**PO-7** Apply knowledge of Computer Engineering Fundamentals to solve complex Engineering problems in global, economical, environmental and social context. To give sustainable, viable and green IT solutions to create better environment for living.

**PO-8** To make students understand professional and ethical responsibility by nurturing disciplinary habits, behavioural etiquettes, formal communication techniques (verbal and non-verbal) and time management.

**( Prof.L.K.Kshirsagar )**
( Dean )

Head
School of Computer Engg. & Technology,
Dr. Vishwanath Karad

MIT-WPU
Approved by
Academic Council

**PO-9** To develop and groom students as a competent individual with leadership skills to face industrial and societal challenges.

**PO-10** To develop effective and comprehensive communication skills required for proficient presentations and technical writing.

**PO-11**An ability to accomplish a task using project management principles to meet Economical, environmental, social, political and ethical constraints.

**PO-12** To develop ability to foresee future trends and inculcate adaptive learning skills to sustain in the rapidly evolving IT industry

**Programme Specific Outcomes**

- **PSO-1:** Ability to model, design and develop computer based systems to solve real life problems by applying knowledge of Mathematical Foundations, Algorithmic Principles and Computer Science theory.
- **PSO-2:** Ability to learn and use advancements in tools and technologies on the basis of software and hardware fundamentals, logic building and analytical skills; so as to cope up with the rapidly changing technical scenarios.
- **PSO-3:** The ability to perform information processing using high performance computation leading to innovative solutions to solve societal problems.

( Prof.L.K.Kshirsagar )
( Dean )

Head
School of Computer
Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38.

MIT-WPU
Approved by
Academic Council

**Programme Structure:**

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

(b) **System followed**: Trimester

(c) **Credits System**:

Total credits for B.Tech. Programme are decided as 172 and each credit corresponds to 15 contact hours in classroom. Three theory lectures [One hour classroom sessions] per week correspond to 2 credits. For laboratory sessions, two contact hours per week for 12 weeks makes for one credit.

**DIVISION OF CREDITS OVER FOUR ACADEMIC YEARS**

| Sr. No. | Year | No. of Credits |
|---|---|---|
| 1 | First Year | 43 |
| 2 | Second Year | 42 |
| 3 | Third Year | 47 |
| 4 | Final Year | 34 |
| | Total Credits | 166+6 MOOCs |

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

Immersion programmes are an important part of WPU method. They are designed to give student an exposure to real life problems at societal and professional level. They are included in the structure as follows.

| Sr. No. | Type of Immersion | Year |
|---|---|---|
| 1 | Social Immersion | First Year |
| 2 | National Study Tour | Second Year |
| 3 | International Study Tour | Third Year |

Head
School of Computer
Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38.

( Prof.L.K.Kshirsagar )
( Dean )

MIT-WPU
Approved by
Academic Council

**(e) Internship:**

Summer industrial training has been a part of engineering education for a long time. MIT-WPU insists on one trimester summer internship either in industry or in an R&D organization, including educational institutes with excellent research culture. The student is expected to submit a formal report at the end of the programme.

**(f) Assessment Criteria:**

For a typical subject having 2 Credits for Theory Class and 1 Credit for Laboratory Practice, assessment of the course will have three components:

1. Class Continuous Assessment(CCA)(50Marks)
2. Laboratory Continuous Assessment(LCA)(50Marks)
3. End of the Term Test(ETT)(50Marks)

Student will be considered eligible for appearing in ETT if and only if he/she has scored above 20 independently in LCA and CCA each.

The final grade for the course will be derived from the total score in the above three components normalized on10 point scale.

**That is, Grade Point in a Subject = (Total of CCA+ LCA +ETT/ 150)*10**

Typically, CCA will have Attendance/Initiative, Assignments, Mid-term Test and Group Activity as components; but they may vary as per the requirement of the course.

There will be continuous assessment of a student's performance throughout the trimester and grades will be awarded by the Subject Teacher / Coordination Committee formed for this purpose. The following should be taken as a guideline to ensure uniformity of grading among all courses.

1. For arriving at a grade obtained by a student for a particular subject, initially a numeric marks obtained by the student out of 150 is to be determined and then, the same is to be converted to letter grade.

2. For theory subjects, the subcomponents and the respective weights assigned to these are given below.

**( Prof.L.K.Kshirsagar )**
( Dean )

Head
School of Computer
Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38.

MIT-WPU
Approved by
Academic Council

| Subcomponent | Weight |
|---|---|
| Laboratory Continuous Assessment | 33.3% |
| Class Continuous Assessment | 33.3% |
| End-Term Test | 33.3% |

The assessment Marks are valid only if Attendance criteria are met.

3. For assigning marks in Teacher's Assessment (T.A.), performance in home assignments, class tests, tutorials, viva-voce, attendance etc. are to be considered. It is recommended that at least two class tests for 4 credit theory courses and 1 test for 3 credit theory courses are to be conducted for a subject.
   The weights of different subcomponents of T.A. may be announced to the students by the teacher at the beginning of the trimester.

4. For assignment of marks in the laboratory component, the relevant subcomponents that are to be considered are: day-to-day work, regularity, assignments and viva-voce etc. Percentage weights of the different subcomponents in deciding the final marks are to be announced at the beginning of the trimester. The evaluation process must be completed before the beginning of end trimester examination.

5. To the extent possible, laboratory work should be completed and evaluated every class thus ensuring continuous evaluation. Final examination and/or viva voce, if any, may not carry more than 20% marks.

**(g) Branches or Specialisations: (as applicable)**

There are three tracks in B.Tech Computer Science & Engineering program

| | | |
|---|---|---|
| Track I | : | Data Mining and Machine Learning |
| Track II | : | Networks and security |
| Track III | : | Intelligent Systems |

**(h)Mandatory Attendance to appear for examination: 90%,**
**(Para 13.1. of Academic Ordinance: 2017)**

It is expected on the part of the student to attend each and every Lecture, Tutorial, and Laboratory practical sessions in a course for the academic excellence. However, due to any contingencies, the attendance requirement will be a minimum of 90% of the classes scheduled/ held.

**( Prof.L.K.Kshirsagar )**
( Dean )

Head
School of Computer
Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38.

MIT-WPU
Approved by
Academic Council

**(j) Medium of Instruction & Examination: English (Para 9of Academic Ordinance: 2017)**

In all the Academic Programs, the medium of instruction and examination shall be English.

**(k) Eligibility criteria for admission to the programme (as per para 4 of Academic Ordinance: 2017)**

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.

**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.

**( Prof.L.K.Kshirsagar )**
**( Dean )**

**Head**
**School of Computer**
**Engg. & Technology,**
**Dr. Vishwanath Karad**
**MIT-WPU, Pune-38.**

MIT-WPU
Approved by
Academic

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

MIT-WPU

## B. Tech Courses in CSE Engineering
2018-19

**A. Definition of Credit:-**

| | |
|---|---|
| 3 Hr. Lecture / Tutorial per week | 2 credits |
| 2Hours Practical (Lab) per week | 1 credit |

**B. Credits:-**

Total number of credits for four year undergraduate B.Tech CSE Engineering Programme would be 166.

**C. Structure of Credits for Undergraduate B.Tech CSE Engineering program:-**

| S. No. | Category | Suggested Breakup of Credits |
|---|---|---|
| 1 | Humanities and Social Sciences and Peace Programmes including Management courses | 06 |
| 2 | Basic Science courses | 24 |
| 3 | Engineering Science courses including workshop, drawing, | 19 |
| 4 | Professional core courses | 52 |
| 5 | Professional Elective courses relevant to chosen | 18 |
| 6 | Open subjects–Electives from other technical and/or emerging | 18 |
| 7 | Project work, seminar and internship in industry or elsewhere | 15 |
| | **Total** | **166+6 MOOC** |

( **Prof.L.K.Kshirsagar** )
( Dean )

Head
School of Computer
Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38.

MIT-WPU
Approved by
Academic Council

**D. Course Code and Definition:-**

| Course code | Definitions |
|---|---|
| L | Lecture |
| T | Tutorial |
| ES | Engineering Science Courses |
| WP | Humanities and Social Sciences and Peace Programs including Management courses |
| ME | Mechanical Engineering Courses |
| EC | Electronics and Communication |
| EE | Electrical Engineering |
| CH | Chemical Engineering |
| CS | Computer Science and Engineering |
| PO | Polymer Engineering |
| CE | Civil Engineering |
| PE | Petroleum Engineering |

**E. Grading Scheme:**

(According to Para 12.1 of Academic Ordinances 2017)

( Prof.L.K.Kshirsagar )
( Dean )

Head
School of Computer Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38.

MIT-WPU
Approved by
Academic Council

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

**B. Tech. Computer Science & Engineering (First Year) (Batch 2018-19)**
**Trimester – I**

| Sr. No. | Course Code | Name of Course | Category | Weekly Workload, Hrs | | | Credits | | Assessment, Marks** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Th | Lab | CCA | LCA | ETT | Total |
| 1 | ES111 | Mathematics -I | BS | 3 | 1 | -- | 3 | -- | 100 | - | 50 | 150 |
| 2 | ES112 | Physics | BS | 3 | 1 | 2 | 3 | 1 | 100 | 50 | 50 | 200 |
| 3 | CE111 | Applied Mechanics | ES | 3 | 1 | 2 | 3 | 1 | 100 | 50 | 50 | 200 |
| 4 | ME111 | Workshop Practices | ES | - | - | 2 | - | 1 | - | 50 | - | 50 |
| 5 | ES113 | Effective Communication | HSS | 2 | - | 2 | 1 | 1 | 50 | 50 | - | 100 |
| 6 | 9 | Practicing Yoga and Meditation | WP | - | | 1 | - | - | - | - | - | - |
| | - | Total : | | 11 | 03 | 09 | 10 | 04 | 350 | 200 | 150 | 700 |

Type: (Refer Para 11 of Academic Ord. 2017)

Weekly Teaching Hours: 23

Total Credits: First Year B. Tech Trimester I: 14

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

(Prof.L.K.Kshirsagar)
(Dean )

MIT WPU
Approved by
Academic Council
20 OCT 2018
Date.....

Head
School of Computer
Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38.

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

MIT-WPU

**B. Tech. Computer Science & Engineering (First Year) (Batch 2018-19)**
**Trimester – II**

| Sr. No. | Course Code | Name of Course | Category | Weekly Workload, Hrs | | | Credits | | Assessment Marks ** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Th | Lab | CCA | LCA | ETT | Total |
| 1 | ES121 | Mathematics II | BS | 3 | 1 | - | 3 | - | 100 | - | 50 | 150 |
| 2 | ES122 | Chemistry | BS | 3 | - | - | 2 | - | 50 | - | 50 | 100 |
| 3 | ME121 | Material Science For Engineers | BS | 3 | - | 2 | 2 | 1 | 50 | 50 | 50 | 150 |
| 4 | ME122 | Engineering Graphics | ES | 2 | - | 2 | 1 | 1 | - | 50 | 50 | 100 |
| 5 | CS121 | Computer Programming | ES | 3 | - | 2 | 2 | 1 | 50 | 50 | 50 | 150 |
| 6 | WPC1 | Philosophers of Bharat, Great Kings & Dynasties | WP | 3 | - | - | 2 | - | 50 | - | 50 | 100 |
| 7 | | Rural Immersion Programme | WP | - | - | - | - | - | - | - | - | - |
| 8 | | Practicing Yoga and Meditation | WP | - | - | 1 | - | - | - | - | - | - |
| | | Total : | | 17 | 1 | 07 | 12 | 03 | 300 | 150 | 300 | 750 |

Type: (Refer Para 11 of Academic Ord. 2017)

Weekly Teaching Hours: 25

Total Credits: First Year B. Tech Trimester II:15

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

( Prof.L.K.Kshirsagar )
( Dean )

MIT-WPU
Approved by
Academic Council
0 OCT 2018

Head
School of Computer
Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38.

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

**B. Tech. Computer Science & Engineering (First Year) (Batch 2018-19)**
**Trimester – III**

| Sr. No. | Course Code | Name of Course | Category | Weekly Workload, Hrs | | | Credits | | Assessment Marks** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Th | Lab | CCA | LCA | ETT | Total |
| 1 | ES131 | Biology | BS | 3 | - | 2 | 2 | 1 | 50 | 50 | 50 | 150 |
| 2 | ME131 | Engineering Design Principles | ES | 3 | - | 2 | 2 | 1 | 50 | 50 | 50 | 150 |
| 3 | EL131 | Engineering Science Elective Course I* | ES | 3 | - | 2 | 2 | 1 | 50 | 50 | 50 | 150 |
| 4 | EL132 | Engineering Science Elective Course II* | ES | 3 | - | 2 | 2 | 1 | 50 | 50 | 50 | 150 |
| 5 | WPC2 | Gandhian Philosophy | WP | 3 | - | - | 2 | - | 50 | - | 50 | 100 |
| 6 | | PracticingYoga and Meditation | WP | - | - | 1 | - | - | - | - | - | - |
| | | Total : | | 15 | - | 09 | 10 | 04 | 250 | 200 | 250 | 700 |

Type: (Refer Para 11 of Academic Ord. 2017)

Weekly Teaching Hours: 24

Total Credits: First Year B. tech.Trimester III: 14

Total First YearB. TechCredits: 14+15+14=43

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

( Prof.L.K.Kshirsagar )
( Dean )

MIT-WPU
Approved by
Academic Council
10 OCT 2018

Head
School of Computer
Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38.

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

*** Any two courses other than parent/ home discipline can be chosen from the list given below.**

| Sr. No. | Course Code | Name of Course |
|---|---|---|
| 1 | | Introduction to Civil Engineering |
| 2 | | Introduction to Mechanical Engineering |
| 3 | CS131 | Introduction to Computer Science and Engineering |
| 4 | | Introduction to Electrical Engineering |
| 5 | | Introduction to Electronics Engineering |
| 6 | | Introduction to Polymer Engineering |
| 7 | | Introduction to Petroleum Engineering |
| 8 | | Introduction to Chemical Engineering |

MIT-WPU
Approved by
Academic Council
20 OCT 2019
Date...../...../.....

( Prof.L.K.Kshirsagar )
( Dean )

Head
School of Computer
Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38.

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

MIT-WPU
॥ विद्यानिधिर्नृणां धनम् ॥

**B. Tech. Computer Science & Engineering (Second Year) (Batch 2018-19)**
**Trimester – IV**

| Sr. No. | Course Code | Name of Course | Category | Weekly Workload, Hrs | | | Credits | | Assessment Marks** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Th | Lab | CCA | LCA | ETT | Total |
| 1 | CS211 | Discrete Structures | BS | 3 | 1 | -- | 3 | -- | 100 | - | 50 | 150 |
| 2 | CS212 | Principles of Programming Languages | PC | 3 | - | 2 | 2 | 1 | 50 | 50 | 50 | 150 |
| 3 | CS213 | Digital Electronics and Logic Design | PC | 3 | - | 2 | 2 | 1 | 50 | 50 | 50 | 150 |
| 4 | CS214 | Object Oriented Programming | PC | 3 | - | 2 | 2 | 1 | 50 | 50 | 50 | 150 |
| 5 | CS215 | Computer Organization | PC | 3 | - | - | 2 | - | 50 | - | 50 | 100 |
| 6 | ES | Environmental Science | HSS | 2 | - | - | 1 | - | 50 | - | - | 50 |
| | | Total : | | 17 | - | 06 | 12 | 03 | 350 | 150 | 250 | 750 |

Type: (Refer Para 11 of Academic Ord. 2017)

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

Weekly Teaching Hours: **23**

Total Credits: Second Year B. Tech.Trimester I:**15**

MIT-WPU
Approved by
Academic Council
20 OCT 2019
Date...../...../.....

( **Prof.L.K.Kshirsagar** )
( Dean )

Head
School of Computer
Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38.

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

MIT-WPU

## Trimester – V

| Sr. No. | Course Code | Name of Course | Category | Weekly Workload, Hrs | | | Credits | | Assessment Marks** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Th | Lab | CCA | LCA | ETT | Total |
| 1 | ES222 | Mathematics -III | BS | 3 | 1 | -- | 3 | -- | 100 | - | 50 | 150 |
| 2 | CS221 | Data Structures - I | PC | 3 | - | 2 | 2 | 1 | 50 | 50 | 50 | 150 |
| 3 | CS222 | Microprocessor and Interfacing Techniques | PC | 3 | - | 2 | 2 | 1 | 50 | 50 | 50 | 150 |
| 4 | CS223 | Data and Mobile Communication | PC | 3 | - | 2 | 2 | 1 | 50 | 50 | 50 | 150 |
| 5 | WPC1 | World Famous Philosophers, Sages/Saints, and Great Kings | WP | 3 | - | - | 2 | - | 70 | - | 30 | 100 |
| 6 | | National Study Tour | WP | - | - | - | - | - | - | - | - | - |
| | | Total : | | 15 | 1 | 06 | 11 | 03 | 300 | 150 | 250 | 700 |

Type: (Refer Para 11 of Academic Ord. 2017)

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

Weekly Teaching Hours: **22**

Total Credits: Second Year B. Tech.Trimester II:**14**

( Prof.L.K.Kshirsagar )
( Dean )

MIT-WPU
Approved by
Academic Council
20 OCT 2018
Date...../...../.....

Head
School of Computer
Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38.

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

MIT-WPU

## B. Tech. Computer Science & Engineering (Second Year) (Batch 2018-19)

### Trimester – VI

| Sr. No. | Course Code | Name of Course | Category | Weekly Workload, Hrs | | | Credits | | Assessment Marks** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Th | Lab | CCA | LCA | ETT | Total |
| 1 | CS231 | Data Structures - II | PC | 3 | - | 2 | 2 | 1 | 50 | 50 | 50 | 150 |
| 2 | CS232 | Microprocessor and Microcontroller | PC | 3 | - | 2 | 2 | 1 | 50 | 50 | 50 | 150 |
| 3 | CS233 | Software Engineering and Project Management | PC | 3 | - | 2 | 2 | 1 | 50 | 50 | 50 | 150 |
| 4 | CS234 | Operating Systems | PC | 3 | - | 2 | 2 | 1 | 50 | 50 | 50 | 150 |
| 5 | IC | Indian Constitution | HSS | 2 | - | - | 1 | - | 50 | - | - | 50 |
| | | Total : | | 14 | - | 08 | 09 | 04 | 250 | 200 | 200 | 650 |

Type: (Refer Para 11 of Academic Ord. 2017)

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

Weekly Teaching Hours: **22**

Total Credits: Second Year B. Tech.Trimester III: **13**

Total Second Year B. TechCredits: **15+14+13 = 42**

( Prof.L.K.Kshirsagar )
( Dean )

MIT-WPU
Approved by
Academic Council
20 OCT 2018
Date...../...../.....

Head
School of Computer
Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38.

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

MIT-WPU
Approved by
Academic Council
Date 23 JUL 2022

# MIT WORLD PEACE UNIVERSITY

## FACULTY OF ENGINEERING AND TECHNOLOGY

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

## Semester –V

| Sr. No. | Course Code | Name of Course | Type | Weekly Workload, Hrs.. | | | Credits | | Assessment Marks** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Th | Lab | CCA* | LCA* | ETT | Total |
| 1 | CET3015B | Full Stack Development Technologies | PC | 2 | -- | 4 | 2 | 2 | 100 | 50 | -- | 150 |
| 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 | CET2002B | Database Management Systems | PC | 3 | -- | 2 | 3 | 1 | 30 | 30 | 40 | 100 |
| 6 | FET2002B | Employment Skills Development-II | HSS | 2 | -- | -- | -- | -- | -- | -- | -- | -- |
| 7 | FET2004B | Innovation & Entrepreneurship | HSS | 1 | -- | -- | 1 | -- | 100 | -- | -- | 100 |
| 8 | WPC2011B | Indian Tradition, Culture and Heritage | WP | 2 | -- | -- | 2 | -- | 60 | -- | 40 | 100 |
| | | | | **19** | **0** | **12** | **17** | **6** | 380 | 170 | 200 | 750 |

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

* CCA: Class Continuous Assessment

* LCA: Laboratory Continuous Assessment

**Weekly Teaching Hours: 31 Hours**

**Total Credits Third Year B.Tech. Semester-V: 23**

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

MIT-WPU
Approved by
Academic Council
Date 22/11/2022

# MIT WORLD PEACE UNIVERSITY

## FACULTY OF ENGINEERING AND TECHNOLOGY

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

## Semester –VI

| Sr. No. | Course Code | Name of Course | Type | Weekly Workload, Hrs.. | | | Credits | | Assessment Marks** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory | Tutorial | Lab | Theory | Lab | CCA* | LCA* | ETT | Total |
| 1 | CET3006B | Machine Learning | PC | 3 | -- | 2 | 3 | 1 | 30 | 30 | 40 | 100 |
| 2 | CET3016B | Analysis of Algorithms | PC | 3 | 1 | -- | 4 | 0 | 60 | -- | 40 | 100 |
| 3 | CET3002B | Embedded Systems and Internet of Things Laboratory | PC | -- | -- | 4 | 0 | 2 | -- | 100 | -- | 100 |
| 4 | | Professional Elective -II<br>A. Cognitive Computing and Natural Language Processing (CET4005B)<br>B. Data Privacy (CET4006B)<br>C. Block chain Technology (CET4007B)<br>D. User Interface and User Experience Design (CET4008) | PE | 3 | -- | 2 | 3 | 1 | 30 | 30 | 40 | 100 |
| 5 | CET2006B | Software Engineering and Project Management | PC | 3 | -- | 2 | 3 | 1 | 30 | 30 | 40 | 100 |
| 6 | CET2010B | TY Mini Project | PR | -- | -- | 4 | -- | 2 | -- | 100 | -- | 100 |
| 7 | CET3017B | TY Seminar | PR | -- | -- | 4 | -- | 2 | -- | 100 | -- | 100 |
| 8 | FET2005B | Finance and Costing | HSS | 2 | -- | -- | 2 | -- | 60 | -- | 40 | 100 |
| 9 | WPC2012B | Humanities – Ethical, Moral & Social Sciences | WP | 2 | -- | -- | 2 | -- | 60 | -- | 40 | 100 |
| | | | -- | **16** | **1** | **18** | **17** | **9** | **270** | **390** | **240** | **900** |

**Weekly Teaching Hours: 35 Hours**

**Total Credits Third Year B.Tech. Semester-VI: 26**

**Total Third Year B.Tech. Credits: 23+26 = 49**

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

* CCA: Class Continuous Assessment

* LCA: Laboratory Continuous Assessment

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

MIT-WPU
Approved by
Academic Council
Date 23/11/2022

# MIT WORLD PEACE UNIVERSITY

## FACULTY OF ENGINEERING AND TECHNOLOGY

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

## 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 | CET3018B | Distributed Computing | PC | 3 | -- | 2 | 3 | 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 |
| 5 | WPC2013B | Scientific Studies of Mind, Matter, Spirit and Consciousness | WP | 2 | -- | -- | 2 | -- | 60 | -- | 40 | 100 |
| | | | -- | **11** | -- | **18** | **11** | **9** | 150 | 290 | 160 | 600 |

**Weekly Teaching Hours: 29 Hours**
**Total Credits Final Year B.Tech. Semester-VII: 20**

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

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

# MIT WORLD PEACE UNIVERSITY
## FACULTY OF ENGINEERING AND TECHNOLOGY
## B. Tech. Computer Science & Engineering (Final Year) (Batch 2020 – 2024)
### 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 | -- | -- | 12 | -- | 6 | | 200 | -- | 200 |
| | | | | **3** | **0** | **12** | **3** | **6** | 100 | 200 | -- | 300 |

**Weekly Teaching Hours: 15 Hours**
**Total Credits Final Year B.Tech. Semester-VIII: 09**

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

**Total Final Year B.Tech. Credits: 20+09 = 29**

**Total B. Tech. Credits: 45+45 +49+29 =168**

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

MIT-WPU
Approved by
Academic Council
23 IIII 2022
Date...../...../.....

## 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 Modelling 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**

Dr.Prasad Khandekar
Dean

# COURSE STRUCTURE

| Course Code | CS211 | | | |
|---|---|---|---|---|
| Course Category | Basic Science | | | |
| Course Title | Discrete Structures | | | |
| Teaching Scheme and Credits | L | T | Laboratory | Credits |
| Weekly load hrs | 3 | 1 | -- | 2+1=3 |

**Pre-requisites:**

- Basic Mathematics

**Course Objectives:**

1. To understand the basic concept of Set theory, Relations and Functions.
2. To study discrete mathematic concept in computer algorithms and programming languages.
3. To learn the concept of Tree and Graph theory to solve real-world computer science problems.

**Course Outcomes:**

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

1. Design logic to formulate and solve a problem using concept of Set theory, Relations and Functions.
2. Develop logic for solving problems in computer science.
3. Solve computer science problem by applying the concept of Tree and Graph theory.

**Course Contents:**

1) Set Theory
2) Counting
3) Relations
4) Functions
5) Graph
6) Trees

**Tutorial:**

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

**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:**

- Chalk and Board
- PPT
- Two Teacher Method
- Video Lectures

**Assessment Scheme:**

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

| Assignments | Test | Tutorials | Case study | MCQ | Oral | Attendance |
|---|---|---|---|---|---|---|
| - | 30% | 30% | - | 20% | - | 20% |

**Term End Examination: 50 Marks (100% weightage)**

**Syllabus:**

| Module No. | Contents | Workload in Hrs | |
|---|---|---|---|
| | | Theory | Lab |
| 1 | **Set Theory:** Sets, Combinations of sets, Venn Diagrams, Finite and Infinite sets, Uncountable infinite sets, Principle of inclusion and exclusion, Multisets, Cartesian Product and Power Set.<br>**Counting:** The Basics of Counting, Permutations and Combinations, Binomial Coefficients, Algorithms for generating Permutations and Combinations, The Pigeonhole Principle. | 08 | |
| 2 | **Relations :** Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations , Closures of Relations, Equivalence Relations, Partial Orderings- Chain, Anti chain and Lattice, Groups, Types of Groups.<br>**Functions:** Subjective, Injective and Bijective functions, Inverse Functions and Compositions of Functions, Recursive Function. | 08 | |
| 3 | **Graphs:** Graph and Graph Models, Graph Terminology and Types of Graph, Representing Graph and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Single source shortest path- Dijkstra's pseudo code algorithm, Planar Graph. | 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 | |

**Tutorial List:**

**A. Set Theory:**

1) Draw a Venn diagram for the symmetric difference of the sets A and B.
2) Let A, B and C be sets. Show that
   a. $(A \cup B) \subseteq (A \cup B \cup C)$
   b. $(A - B) - C \subseteq A - C$

**B. Counting:**

1) Find the expansion of $(x + y)^4$
   a. Using Combinatorial Reasoning
   b. Using Binomial Theorem
2) How many different ways are there to choose a dozen donuts from the 21 varieties at a donut shop?

**C. Relations:**

1) The 4-tuples in a 4-ary relation represents these attributes of published book: title, ISBN, Publication Date, Number of Pages.
   **a.** What is a likely primary key for this relation?
   **b.** Under what conditions would (title, publication date) be a composite key?
   **c.** Under what conditions would (title, Number of Pages) be a composite key?

2) Which of these relations on the set of all people are equivalence relations?
   **a.** { (a, b) | a and b are the same age}
   **b.** { (a, b) | a and b have the same parents}
   **c.** { (a, b) | a and b share a common parent}

**D. Functions**

1) Show that the following functions are primitive recursive
   a. Exponentiation
   b. Factorial Function
2) Determine whether each of these functions is a bijection from R to R
   a. $f(x)=2x+1$
   b. $f(x)=x^2+1$

**E. Graph**

1) Draw a graph with following adjacency matrix

| | | |
|---|---|---|
| 1 | 1 | 0 |
| 1 | 0 | 1 |
| 0 | 1 | 0 |

2) Is a shortest path between two vertices in a weighted graph unique if the weights of edges are distinct?

**F. Trees**

1) Build a binary search tree for the words banana, peach, apple, pear, coconut, mango and papaya using alphabetical order.
2) Use Huffman coding to encode these symbols with given frequencies: a: 0.20, b: 0.10, c: 0.15, d: 0.25, e: 0.30. What is the average number of bits required to encode a character?

| Prepared By | Checked By | Approved By |
|---|---|---|
| **Dr. Himangi Pande** | **Ramaa Sandu** | **Dr. Vrushali Kulkarni** |
| Course Coordinator | Course Advisor | Chairman BOS |

Head
School of Computer
Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38.

MIT-WPU
Approved by
Academic Council

# COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CS212** | | | |
| **Course Category** | **Professional Core** | | | |
| **Course Title** | **Principles of Programming Languages** | | | |
| **Teaching Scheme and Credits**<br>**Weekly load hrs** | **L** | **T** | **Laboratory** | **Credits** |
| | **3** | **-** | **2** | **2+1= 3** |

**Pre-requisites**

- Computer Science and Information Technology-I
- Computer Science and Information Technology-II

**Course Objectives:**

1. To learn programming language features and designs
2. To analyze and compare different programming paradigms of languages
3. To gain overall knowledge of programming languages

**Course Outcomes:**

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

1. Apply appropriate programming paradigm in real-time application
2. Select appropriate programming language for solving problems

**Course Contents:**

1. Introduction
2. Basic Building Blocks of a Language
3. Procedures
4. Functional Programming Languages (FPL)

**Laboratory Exercises / Practicals:**

1. Basic functional programming language command execution
2. Implement Factorial program using lisp
3. Implement bubble sort using lisp
4. Case study of Haskell

**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.

**Reference Books:**

1. Sebesta R. W, 'Concepts of programming languages', Pearson Education 2001, 4th edition.
2. Carlo Ghezzi, Mehdi Jazayeri, 'Programming Language Concepts', 3rd edition, Wiley Publications.
3. Patric Henry Winston and Berthold Klaus Paul Horn, 'LISP', Pearson Education, 3rd edition.

**Supplementary Reading:**
**https://www.cs.rutgers.edu/~lou/314-f04-slides/topic01_intro.post.pdf**

**Web Resources:**

https://www.khanacademy.org/computing/computer-science/
https://www.hackerrank.com/contests

**Web Links:**
www.nptel.ac.in/course.php
https://videoken.com
https://www.tutorialspoint.com

**MOOCs:**
https://www.cs.rmu.edu/~rwh/courses/ppl/

**Pedagogy:**

- Power Point presentations
- White board teaching
- Few video lectures (ex. NPTEL)

**Assessment Scheme:**

**Class Continuous Assessment (CCA) : 50 Marks**

| Assignments | Test | Presentations | Case study | MCQ | Oral | Attendance |
|---|---|---|---|---|---|---|
| 20% | 30% | - | - | 30% | - | 20% |

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

| Practical | Oral based on practical | Site Visit | Mini Project | Problem based Learning | Any other (Mock 1 and Mock2) |
|---|---|---|---|---|---|
| 60% | - | - | - | - | 40% |

**Term End Examination: 50 Marks (100% weightage)**

**Syllabus :**

| Module No. | Contents | Workload in Hrs | |
|---|---|---|---|
| | | Theory | Lab |
| 1 | **Introduction**<br>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. | 07 | |
| 2 | **Basic Building Blocks of a Language**<br>**Data Representation:** Data Object, Declaration of Variables, Constants, Data Types, Properties of Structured and Non-Structured Data Types.<br>**Data Types:** Derived and Abstract Data Types, Type Checking, Binding and Binding Times, Type Conversion, Control Flow Statements.<br>**Storage Structure:** Implementation and Storage Representation of Data Types. | 07 | |

| | | | |
|---|---|---|---|
| 3 | **Procedures**<br>**Subprogram:** Simple Call Subprogram, Recursive Subprogram, Static And Dynamic Scope, Referencing Environment (Local, Non-Local and Global).<br>**Parameter Passing:** Parameter Passing Methods, Dynamic Scope of Variables.<br>**Activation Records:** Control Flow between Activations, Elements of Activation Records. | 07 | |
| 4 | **Functional Programming Languages (FPL)**<br>**Introduction to FPL:** Fundamentals and Elements of FPL, Function Declaration, Expression Evaluation, Application of Functional Programming Languages, Comparison of Functional and Imperative Languages.<br>**Type Checking:** Type Inference, Type Names and Type Equivalence, Coercion.<br>**Case Studies**: LISP, Haskel. | 08 | |

**Laboratory:**

| Module No. | Contents | Workload in Hrs | |
|---|---|---|---|
| | | Theory | Lab |
| 1 | Basic functional programming language command execution | | 02 |
| 2 | Implement Factorial program using lisp | | 02 |
| 3 | Implement bubble sort using lisp | | 02 |
| 4 | Case study of Haskell | | 04 |

**Prepared By**
**Jayshree Aher**
Course Coordinator

**Checked By**
**Sumedha Sirsikar**
Course Advisor

**Approved By**
**Dr. Vrushali Kulkarni**
Chairman BOS

**Head**
**School of Computer Engg. & Technology,**
**Dr. Vishwanath Karad**
**MIT-WPU, Pune-38.**

MIT-WPU
Approved by
Academic Council

## COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CS213** | | | |
| **Course Category** | **Professional Core** | | | |
| **Course Title** | **Digital Electronics and Logic Design** | | | |
| **Teaching Scheme and Credits** | **L** | **T** | **Laboratory** | **Credits** |
| **Weekly load hrs** | **3** | **-** | **2** | **2+1 = 3** |

- **Pre-requisites**: Introduction to Electronics Engineering

**Course Objectives:**

1. To gain knowledge of characteristics of Logic Families
2. To design Combinational and Sequential Circuits
3. To realize concept of ASM chart.
4. To design and implement combinational and sequential circuits
5. To design and implement digital circuits using Very High Speed Integrated Circuit Hardware Description Language (VHDL).

**Course Outcomes:**

1. Design combinational circuits using gates and MSI Integrated Circuits (ICs).
2. Design sequential circuits using Flip flops and Registers.
3. Devise applications using ASM chart and concept of Moore, Mealy machine.
4. Implement combinational and sequential circuits using Integrated Circuits.
5. Implement combinational and sequential circuits using VHDL program.

**Course Contents**

1. Combinational Logic Design.
2. Sequential Logic Design.
3. Synchronous Sequential Circuit Design.
4. Introduction to Very High Speed Integrated Circuit Hardware Description Language (VHDL).

**Laboratory Exercises / Practicals:**

1. To Realize Half Subtractor, Full Subtractor using Basic Gates and Universal gates
2. Realize following functions using IC 74153
   a) Half adder b) 8:1 Mux ( $\Sigma$ m (0,2,4,7) )
3. Design and inplement 3 bit up and 3 bit down Ripple Counter using IC7476.
4. Design and implement 3 bit Synchronous Up Counter using IC7476.
5. Draw ASM chart for real life digital system ( e.g. Washing Machine, Vending Machine, Elevator control, ATM machine)
6. Design & simulate 4 bit up/down synchronous counter using Behavioral modeling in VHDL
7. Design & simulate 4:1 Multiplexer using Dataflow modeling

8. Design & simulate Full adder using structural modeling.

**Learning Resources:**

**Text Books:**

1. R.P. Jain, "Modern Digital Electronics", McGraw Hill Education,2012, ISBN–13: 978-0-07- 066911-6., 4th edition
2. J. Bhaskar , "A VHDL Primer", Pearson Education, 2008, ISBN: 9788177582000, 3rd Edition

**Reference Books:**

1. Morris Mano, "Digital Logic & Computer Design", Pearson Education
2. D. Leach, Malvino, Saha, "Digital Principles and Applications", Tata McGraw Hill, 2011, ISBN – 13:978-0-07-014170-4. , 7th edition
3. Thomas Floyd, "Digital Fundamentals", Pearson Education, 2003, ISBN: 8178088762, 8th Edition

**Web Resources:**

https://viden.io/knowledge/114/attachments/427?name=viden-K105-Digital+Logic+And+Computer+Design+By+M.+Morris+Mano+%282nd+Edition%29.pdf

**Web Links:** http://nptel.ac.in/courses/117105080/40

**MOOCs:** http://nptel.ac.in/courses/117105080/3

**Pedagogy:**

- Power Point presentations
- White board teaching

**Assessment Scheme:**

**Class Continuous Assessment (CCA) 50 Marks**

| Assignments | Test | Presentations | Case study | MCQ | Oral | Attendance |
|---|---|---|---|---|---|---|
| 20% | 30% | - | - | 30% | - | 20% |

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

| Practical | Oral based on practical | Site Visit | Mini Project | Problem based Learning | Any other (Mock 1 and Mock2) |
|---|---|---|---|---|---|
| 60% | - | - | - | - | 40% |

**Term End Examination: 50 Marks (100% weightage)**

**Syllabus:**

**Theory:-**

| Module No. | Contents | Workload in Hrs | |
|---|---|---|---|
| | | Theory | Lab |
| 1 | **Combinational Logic Design**<br>Characteristics of Digital ICs: Speed, Power dissipation, Figure of merit, Fan-in, Fan-out, Current and voltage parameters, Noise immunity, Operating temperature range. Minimization of SOP and POS equations using K-Maps up to 4 variables. Multiplexers, MUX (IC 74153), MUX tree, De-multiplexers, Decoder (IC74138). Implementation of Half- Adder, Full Adder using MUX and Decoder. | 07 | |
| 2 | **Sequential Logic Design**<br>SR, JK, MS JK, D, T Flip Flops. Truth Tables and Excitation tables. Conversion from one type to another type of Flip Flop. Study of IC7476. Counters: 3 bit up, 3bit down Asynchronous and Synchronous counter. Study of Modulus n counter, IC 7490 and its application to implement MOD Counters. Registers: Buffer register, shift register types-SISO, SIPO, PISO, PIPO. Ring counters, Johnson Counter. | 08 | |
| 3 | **Synchronous Sequential Circuit Design**<br>State diagram, State Tables, State assignment. Moore and Mealy Machine representations, Sequence detector using Mealy model. Algorithmic State Machines (ASM): Finite State Machines (FSM). ASM charts, notations, construction of ASM chart (e.g. Counters, | 07 | |

| | | | |
|---|---|---|---|
| | sequence detector for Moore and Mealy model). | | |
| 4 | **Introduction to Very High Speed Integrated Circuit Hardware Description Language (VHDL)**<br>Introduction to VHDL, Library, Packages, Entity, Architecture, Data Objects (Variables, Signals, and Constants), Data Types, Data Operators and VHDL Modeling styles with Programming Examples – Dataflow, Behavioral and Structural. Comparison of modeling styles. Concurrent Statements (When..Else), Sequential statements (If..Else, Loop) Comparison of Concurrent and Sequential statements. | 08 | |

**Laboratory:-**

| Module no | Contents | Workload in hours | |
|---|---|---|---|
| | | Theory | Lab |
| 1 | To Realize Half Subtractor, Full Subtractor using Basic Gates and Universal gates. | | 02 |
| 2 | Realize following functions using IC 74153<br>a)Half adder b) 8:1 Mux ( Σ m (0,2,4,7) ) | | 02 |
| 3 | Design and implement 3 bit up and 3 bit down Ripple Counter using IC7476. | | 02 |
| 4 | Design and implement 3 bit Synchronous Up Counter using IC7476. | | 02 |
| 5 | Design & simulate 4 bit up/down synchronous counter using Behavioral modeling in VHDL | | 02 |
| 6 | Design & simulate 4:1 Multiplexer using Dataflow modeling in VHDL | | 02 |
| 7 | Draw ASM chart for real life digital system ( e.g. Washing Machine, Vending Machine, Elevator control, ATM machine) | | 04 |
| 8 | Design & simulate Full adder using structural modeling in VHDL. | | 04 |

**Prepared By**
**Aditi Jahagirdar**
Course Coordinator

**Checked By**
**Dr. Anil Hiwale**
Course Advisor

**Approved By**
**Dr. Vrushali Kulkarni**
Chairman BOS

Head
School of Computer
Engg. & Technology,
Dr. Vishwanath Karad
MIT WPU, Pune-38

MIT-WPU
Approved by
Academic Council

## COURSE STRUCTURE

| Course Code | CS214 | | | |
|---|---|---|---|---|
| Course Category | Professional Core | | | |
| Course Title | Object Oriented Programming | | | |
| Teaching Scheme and Credits | L | T | Laboratory | Credits |
| Weekly load hrs | 3 | -- | 2 | 2+1= 3 |

**Pre-requisites:**

- Computer Science and Information Technology I and II

**Course Objectives:**

1. Understand basic concepts of Object Oriented Programming.
2. Learn Inheritance, Polymorphism and Exception Handling features of Object Oriented Programming.
3. Study concepts of Standard Template Library.

**Course Outcomes:**

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

1. Apply the basic concepts of Object Oriented Programming in application development.
2. Design and develop real world applications using inheritance, Polymorphism and Exception Handling features.
3. Explore and use Standard Template Library to simplify programming.

**Course Contents:**

1. Introduction to Object Oriented Programming
2. Polymorphism and Inheritance
3. File and Exception Handling
4. Templates and Standard Template Library (STL)

**Laboratory Exercises / Practicals:**

1. Classes and operator overloading
2. Inheritance and Polymorphism
3. Exception handling
4. File handling
5. Templates
6. Standard Template Library

**Learning Resources:**

**Reference Books:**

1. Herbert Schildt, 'C++ The Complete Reference', Fourth Edition, McGraw Hill Professional, 2011, ISBN-13: 978-0072226805
2. Robert Lafore, 'Object-Oriented Programming in C++', Fourth Edition, Sams

Publishing, ISBN: 0672323087, ISBN-13: 978-8131722824

3. Bjarne Stroustrup, 'The C++ Programming language', Third Edition, Pearson Education. ISBN: 9788131705216
4. K. R. Venugopal, Rajkumar Buyya, T. Ravishankar, 'Mastering C++', Tata McGraw-Hill, ISBN 13: 9780074634547

**Supplementary Reading:**

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

**Web Resources:**

http://ocw.mit.edu

**Web Links:**

https://nptel.ac.in/courses/106105151/
http://nptel.ac.in/syllabus/106106110/
http://ocw.mit.edu

**MOOCs:**

https://www.coursera.org/learn/c-plus-plus-a
https://www.mooc-list.com/tags/c-1

**Pedagogy:**

- Power Point Presentations
- Practical Demos
- Videos
- Expert lectures
- Workshop
- Co Teacher Scheme

**Assessment Scheme:**

**Class Continuous Assessment (CCA) : 50 Marks**

| Assignments | Test | Presentations | Case study | MCQ | Oral | Attendance |
|---|---|---|---|---|---|---|
| 20% | 30% | - | - | 30% | - | 20% |

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

| Practical | Oral based on practical | Site Visit | Mini Project | Problem based Learning | Any other (Mock 1 and Mock2) |
|---|---|---|---|---|---|
| 60% | - | - | - | - | 40% |

**Term End Examination: 50 Marks (100% weightage)**

**Syllabus:**

| Module No. | Contents | Workload in Hrs | |
|---|---|---|---|
| | | Theory | Lab |
| 1 | **Introduction to Object Oriented Programming (OOP)**<br>**Fundamentals of OOP:** Class, Object, Data Abstraction, Data Encapsulation, Inheritance, Polymorphism.<br>**Classes and Objects:** Creation, Accessing Class Members, Access Specifiers, Member Function Definition, Inline Function, Static Data Members, Function Overloading, Constructor and Destructor, Objects and Memory Requirements, Friend Functions. | 06 | |
| 2 | **Polymorphism and Inheritance**<br>**Operator Overloading**: Concept of Operator Overloading, Overloading Unary and Binary Operators, Prefix and Postfix Operator Implementation.<br>**Inheritance:** Introduction, Base and Derived Classes, Member Access Control, Inheriting Constructors and Destructors, Types of Inheritance, Overriding Member Functions, Ambiguity in | 09 | |

| | | | |
|---|---|---|---|
| | Multiple Inheritance, Virtual Base Class.<br>**Polymorphism and Virtual Functions:** Pointers to Objects, Pointers to Derived Class, Importance of Virtual Function, Pure Virtual Function, Abstract Class, Virtual Destructors, Early and Late Binding. | | |
| 3 | **File and Exception Handling**<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.<br>**Exception Handling:** Introduction, Exception Handling Mechanism - try, catch and throw, Multiple Exceptions, Re-throwing an exception, Exception and Inheritance. | 07 | |
| 4 | **Templates and Standard Template Library(STL)**<br>**Templates:** Function Template, Class Template.<br>Introduction to STL, Containers - Sequence Containers and Associative Containers, Container Adapters, Algorithms and Iterators - input, output, forward, bidirectional and random access. | 08 | |

**Laboratory Assignments:**

| Assignment No. | Contents | Workload in Hrs | |
|---|---|---|---|
| | | Theory | Lab |
| 1 | **Define a class Complex consisting following:**<br>Data members:<br>a. real<br>b. imaginary part<br>Member Functions:<br>a. One default constructor<br>b. Function getdata () to take the value of real and imaginary part.<br>c. Function show() to display<br>and<br>1. Four overloaded operator member functions<br>i. Operator+ to add two complex numbers.<br>ii. Operator * to multiply two complex numbers. | | 04 |

| | | | |
|---|---|---|---|
| | iii. Overloaded << and >> to print and read Complex Numbers.<br>2. Friend function to add two complex number by taking two reference variables of class complex and returning another reference. | | |
| 2 | A company pays its employees on a weekly basis. The employees are of four types: Salaried employees are paid a fixed weekly salary regardless of the number of hours worked, hourly employees are paid by the hour and receive overtime pay for all hours worked in excess of 40 hours, commission employees are paid a percentage of their sales and salaried-commission employees receive a base salary plus a percentage of their sales. For the current pay period, the company has decided to reward salaried-commission employees by adding 10% to their base salaries. The company wants to implement an OO application that performs its payroll calculations polymorphically. | | 04 |
| 3 | **Define a class Employee consisting following:**<br>Data members:<br>a. Employee ID<br>b. Name of Employee<br>c. Age<br>d. Income<br>e. City<br>f. Vehicle<br>Member Functions:<br>a. To assign initial values.<br>b. To display.<br>**Accept Employee ID, Name, Age, Income, City and Vehicle from the user. Create an exception to check the following conditions and throw an exception if the condition does not meet.**<br>1. Employee age between 18 and 55<br>2. Employee income between Rs. 50,000 – Rs. 1,00,000 per month<br>3. Employee staying in Pune/ Mumbai/ Bangalore / Chennai<br>4. Employee having 4-wheeler | | 02 |
| 4 | A shop maintains an inventory of items. It stores | | |

| | | | |
|---|---|---|---|
| | information of items like Item_Code, Item_Name, Quantity and Cost in a data file. Whenever Customer wants to buy an item, sales person inputs the Item_Code and/or Item_Name and the system searches in a file and displays whether it is available or not otherwise an appropriate message is displayed. If it is, then the system displays the item details and request for the quantity of items required. If the requested quantities of items are available, the total cost of items is displayed; otherwise the message is displayed as required items not in stock. After purchasing an item, system updates the file.<br><br>Design a system using a class called Items with suitable data members and member functions. Implement C++ program for the inventory system that will create a data file containing the Record of Items in the following form:<br><br>**Item_Code** \| **Item_name** \| **Quantity** \| **Cost in Rs.**<br>3 \| Pens \| 24 \| 10<br>17 \| Notebooks \| 46 \| 14.99<br><br>**Data Members:**<br>a) Item_Code<br>b) Item_Name<br>c) Quantity<br>d) Cost<br><br>**Member Function:**<br>a) Create file and store Record of Items<br>b) Search an Item in the file by Item_Code or Item_Name<br>c) Arrange the Items by Item_Code or Item_Name<br>d) Update the file | | 04 |
| 5 | Design a class Template to implement stack of integers consisting following member functions:<br>a) Create<br>b) Display<br>c) Push<br>d) Pop | | 02 |
| 6 | A shop maintains the inventory of items. It stores information of items like Item_Code, Item_Name, Quantity and Cost of it in a list of STL. Whenever Customer wants to buy an item, sales person inputs the Item_Code and/or | | 04 |

| | | | |
|---|---|---|---|
| | Item_Name and the system searches in a file and displays whether it is available or not otherwise an appropriate message is displayed. If it is, then the system displays the item details and request for the quantity of items required. If the requested quantity of items are available, the total cost of items is displayed; otherwise the message is displayed as required items not in stock. After purchasing an item, system updates the list.<br>Design a system using a class called Items with suitable data members and member functions. Implement menu driven C++ program for the inventory system using STL list.<br>**Data Members:**<br>a) Item_Code<br>b) Item_Name<br>c) Quantity<br>d) Cost<br>**Member Function:**<br>a) Create STL list and store Record of Items<br>b) Search an Item in the file by Item_Code or Item_Name(Searching)<br>c) Arrange the Items by Item_Code or Item_Name(Sorting)<br>d) Update the file(Insert and delete). | | |

| Prepared By | Checked By | Approved By |
|---|---|---|
| **Shakti Kinger** | **Sumedha Sirsikar** | **Dr. Vrushali Kulkarni** |
| Course Coordinator | Course Advisor | Chairman BOS |

Head
School of Computer
Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38.

MIT-WPU
Approved by
Academic Council

# COURSE STRUCTURE

| Course Code | CS215 | | | |
|---|---|---|---|---|
| Course Category | Professional Core | | | |
| Course Title | Computer Organization | | | |
| Teaching Scheme and Credits | L | T | Laboratory | Credits |
| Weekly load hrs | 3 | -- | -- | 2 |

**Pre-requisites:**

- Introduction to Electronics Engineering
- Digital Electronics and Logic Design

**Course Objectives:**

1. To acquire the knowledge of structure, function and evolution of computer systems.
2. To understand instruction level parallelism and internal processor organization.
3. To gain the conceptual knowledge of Cache memory and multiple processor organization.
4. To design Arithmetic Logical Unit and Control Unit of digital computers.

**Course Outcomes:**

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

1. Demonstrate computer architecture concepts related to design of modern processors and compare various generations of processors.
2. Design arithmetic functional units such as: Adder, Subtractor, and Multiplier and Division units.
3. Obtain the knowledge of processor structure and its functions for internal designing of processor organization.
4. Design the size of the cache for the various processor organizations.

**Course Contents:**

1. Computer Function, Interconnections and Evolution
2. Computer Arithmetic
3. Processor Organization and Control Unit
4. Memory and Parallel Processor Organizations

**Learning Resources:**

**Reference 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.

**Supplementary 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

**Web Resources:**

**Web Links:**
http://ebooks.lpude.in/computer_application/bca/term_4/DCAP206_INTRODUCTION_TO_COMPUTER_ORGANIZATION_AND_ARCHITECTURE_DCAP502_COMPUTER_ORGANIZATION_AND_ARCHITECTURE.pdf

**MOOCs:**

https://onlinecourses.nptel.ac.in/noc17_cs35
https://onlinecourses.nptel.ac.in/noc17_cs19

**Pedagogy:**

- Power point slides
- Chalk and Talk

**Assessment Scheme:**

**Class Continuous Assessment (CCA): 50 Marks**

| Assignments | Test | Tutorials | Case study | MCQ | Oral | Attendance |
|---|---|---|---|---|---|---|
| 20% | 30% | - | - | 30% | - | 20% |

**Term End Examination: 50 Marks (100% weightage)**

Syllabus:

Theory:

| Module No. | Contents | Workload in Hrs | |
|---|---|---|---|
| | | Theory | Tutorials |
| 1 | **Computer Function, Interconnections and Evolution** Computer Organization and Architecture, Structure and Function, A brief history of computer, Evolution of Intel microprocessor from 4004 to core i7, Comparison of various generations of microprocessor, Computer components and functions ,Characteristics of Reduced Instruction Set Architectures, CISC versus RISC Characteristics. | 07 | |
| 2 | **Computer Arithmetic** The arithmetic and logic unit, Integer Representation, Integer Arithmetic, Multiplication – Block diagram, Hardware implementation of unsigned binary multiplication, Multiplication of positive numbers, signed number multiplication, Booth's Algorithm, Division – Flowchart for unsigned binary division, Division Algorithms. Floating - Point Representation, IEEE standard. | 08 | |
| 3 | **Processor Organization and Control Unit** Instruction format, Types of Instruction and operations, common addressing techniques, Processor Structure and function - Processor and 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** Key characteristics of memory system, memory hierarchy, Cache Memory - Cache memory principles, mapping functions, example of mapping techniques. Multiple Processor Organization: Flynn's Taxonomy, Introduction to Clusters | 07 | |

**Prepared By**
**Trupti Baraskar**
Course Coordinator

**Checked By**
**Dr. Anjali Chandavale**
Course Advisor

**Approved By**
**Dr. Vrushali Kulkarni**
Chairman BOS

**Head**
**School of Computer Engg. & Technology, Dr. Vishwanath Karad**

MIT-WPU
Approved by
Academic Council

# COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **ES222** | | | |
| **Course Category** | **Engineering Sciences** | | | |
| **Course Title** | **Applied Mathematics –III** | | | |
| **Teaching Scheme and Credits** | **L** | **T** | **Laboratory** | **Credits** |
| **Weekly load hrs** | **3** | **1** | **--** | **2+1=3** |

**Pre-requisites**: Applied Mathematics-I , Applied Mathematics-II

**Course Objectives:**

1. To understand integral transform techniques and their applications.
2. To understand the concepts of correlation and regression.
3. To learn various probability distributions.
4. 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 and Z transforms.(CL III)
2. Use statistical methodology and tools in the problem-solving process.(CL IV)
3. Use probability models for various engineering problems.(CL IV)
4. Apply the knowledge of vector calculus for solving engineering problems.(CL III)

**Course Contents:**

1. Transform Techniques
2. Statistics
3. Probability
4. Vector Calculus

**Tutorial Exercises:**

1. Fourier Sine and Cosine Transforms.
2. Z-Transform and Inverse Z-Transform.
3. Standard deviation, Moments, Skewness, Kurtosis,
4. Correlation and Regression.
5. Bayes theorem, Probability density function and mathematical expectation.
6. Binomial, Poisson and Normal distribution.
7. Vector differentiation, gradient, divergence and curl.
8. Work done, Green's Lemma, 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. Kreyszig Erwin, "Advanced Engineering Mathematics" ,10th edition ,Wiley Eastern Limited 2015.
2. O' Neil Peter, "Advanced Engineering Mathematics" ,8th edition ,Cengage Learning 2015.
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:**

- Co-teaching
- Audio- video techniques
- Tutorials and class tests

**Assessment Scheme:**

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

| Assignments | Test | Tutorials | Case study | MCQ | Oral | Attendance |
|---|---|---|---|---|---|---|
| 20% | 30% | 30% | - | - | - | 20% |

**Term End Examination: 50 Marks (100% weightage)**

Syllabus:

| Module No. | Contents | Workload in Hrs | |
|---|---|---|---|
| | | Theory | Tutorial |
| 1 | **Transform Techniques:**<br>Fourier Transform: Fourier Integral theorem, Fourier Sine and Cosine Transforms, Inverse Fourier Transform.<br>Z-Transform: Definition, Properties, Z- transform of standard sequences and their inverse, solution of difference equations. | 08 | 02 |
| 2 | **Statistics:**<br>Measures of Central tendency, Dispersion, Moments, Skewness and Kurtosis, Correlation, Method of Least square Linear and multiple linear regression. | 08 | 02 |
| 3 | **Probability:**<br>Basic Probability Theory, Bayes' Theorem, Discrete and Continuous Random Variables, Probability Mass Function, Probability Density Function, Distribution Function, Mathematical Expectation, Probability Distributions, Binomial, Poisson and Normal Distributions. | 08 | 02 |
| 4 | **Vector Calculus:**<br>Vector Differential: Physical interpretation of Vector differentiation, Vector differential operator, Gradient, Divergence and Curl, Directional derivative, Vector identities.<br>Vector Integration: Lines, Surface and Volume, Integration, Work done, Green's Lemma, Stoke's and Divergence Theorem. | 08 | 02 |

**Prepared By**
**Vaishali Joshi**
Course Coordinator

**Checked By**
**Ramaa Sandu**
Course Advisor

**Approved By**
**Dr. Neeta Kankane**
Chairman BOS

Head
School of Computer
Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38.

MIT-WPU
Approved by
Academic Council

# COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CS221** | | | |
| **Course Category** | **Professional Core** | | | |
| **Course Title** | **Data Structures-I** | | | |
| **Teaching Scheme and Credits** | **L** | **T** | **Laboratory** | **Credits** |
| **Weekly load hrs** | **3** | **--** | **2** | **2+1=3** |

**Pre-requisites:**

1. Computer Science and Information Technology-I
2. Computer Science and Information Technology-II
3. Discrete Structure

**Course Objectives:**

1. To realize the concept of Abstract Data Type
2. To study memory representations and operations associated with different data structures
3. To study different sorting and searching methods

**Course Outcomes:**

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

1. To select appropriate data structures for problem solving
2. To implement various data structures
3. To compare and analyse different searching and sorting algorithms

**Course Contents:**

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

**Laboratory Exercises / Practicals:**

1.Set Operations
2. String Operations
3.Sparse Matrix Operations
4.Searching and Sorting on Student Database
5.Expression Conversion using Stack
6. Implementation of Queue
7. Operations on Singly Linked List

8. Polynomial Operations Using Circular Linked List

**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:**

- Chalk and Board
- PPT
- Two Teacher Method
- Video Lectures
- Discussion Forum
- Flipped Classroom

**Assessment Scheme:**

**Class Continuous Assessment (CCA)- 50 Marks**

| Assignments | Test | Presentations | Case study | MCQ | Oral | Attendance |
|---|---|---|---|---|---|---|
| - | 30% | - | - | 50% | - | 20% |

**Laboratory Continuous Assessment (LCA)-100 Marks**

| Practical | Oral based on practical | Site Visit | Mini Project | Problem based Learning | Any other (Mock 1 and Mock 2) |
|---|---|---|---|---|---|
| 60% | - | - | - | - | 40% |

**Term End Examination: 50 Marks (100% weightage)**

**Syllabus:**
**Theory:-**

| Module No. | Contents | Workload in Hrs | |
|---|---|---|---|
| | | Theory | Lab |
| 1 | **Introduction to Data Structures:**<br>Data, Data objects, data types, Abstract Data types (ADT) and Data Structure, Types of data structure<br>Introduction to algorithms, Algorithm design tools: Pseudo code and flowchart,<br>Analysis of Algorithms- Space complexity, Time complexity, Asymptotic notations | 04 | |
| 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, | 08 | |

MIT-WPU
Approved by
Academic Council

| | | | |
|---|---|---|---|
| | Addition, Simple Transpose and Fast transpose of sparse matrix<br><br>**Searching:** Linear search, Binary search.<br><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. | | |
| 3 | **Stacks:** Stack as an Abstract Data Type, Representation of Stack Using Sequential Organization, Applications of Stack-Expression Conversion and Evaluation, Recursion.<br><br>**Queues**: Queue as Abstract Data Type, Representation of Queue Using Sequential Organization , Circular Queue, Advantages of Circular queues, Application of Queue : Job scheduling. | 06 | |
| 4 | **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.<br><br>Circular Linked List, Doubly Linked List , Generalized Linked List (GLL)<br><br>**Case Study :** Garbage Collection | 09 | |

**Laboratory:-**

| Module No. | Contents | Workload in Hrs | |
|---|---|---|---|
| | | Theory | Lab |
| 1 | Write a C program for string operations- length, copy, concatenate(with pointers), palindrome, check substring, equal, reverse ( without pointers) | | 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 and sorting techniques. | | 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 Queuel. | | 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) | | 04 |
| 7 | Implement following polynomial operations using Circular Linked List: Create, Display, Addition and Evaluation. | | 04 |

**Prepared By**
**Dr. Sharmishtha Desai**
Course Coordinator

**Checked By**
**Vidya Deshpande**
Course Advisor

**Approved By**
**Dr. Vrushali Kulkarni**
Chairman BOS

Head
School of Computer
Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38.

MIT-WPU
Approved by
Academic Council

## COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CS222** | | | |
| **Course Category** | **Professional Core** | | | |
| **Course Title** | **Microprocessor and Interfacing Techniques** | | | |
| **Teaching Scheme and Credits** | **L** | **T** | **Laboratory** | **Credits** |
| **Weekly load hrs** | **3** | **-----** | **2** | **2+1=3** |

**Pre-requisites:**
1. Digital Electronics and Logic Design
2. Computer Organization

**Course Objectives:**

1. To learn the architecture and programming of 8086 Microprocessor.
2. To learn important peripherals and their interfacing with 8086 Microprocessor.
3. To study working of NDP and Motherboard of IBM PC.

**Course Outcomes:**

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

1. Understanding: Learn concepts of microprocessor architecture.
2. Applying: Write Assembly Language programs for various applications
3. Understanding: Understand working of motherboard and design systems using the concepts of interfacing

**Course Contents:**

1. 8086 Architecture
2. Memory and I/O Interfacing
3. Study of Peripherals
4. Math-Controller & Study of Motherboard

**Laboratory Exercises / Practical:**

1. Character String Display
2. Hex Number Display
3. Array Addition
4. String Operations
5. String Operations using FAR Procedure
6. NDP
7. 8086 DAC interfacing using 8255
8. 8086 interfacing with 8251

**Learning Resources:**

**Text Books:**

1. N. Mathivanan,"Microprocessors, PC Hardware and Interfacing", Prentice-Hall India, ISBN-81-203-2317-3.
2. Ray, K. Bhurchandi, "Advanced Microprocessors and peripherals: Arch, Programming & Interfacing", Tata McGraw Hill,2004 ISBN 0-07-463841-6.
3. Introduction to 64 bit Intel Assembly Language Programming for Linux, 2nd Edition, Ray Seyfarth, ISBN10:1478119209, ISBN-13: 9781478119203, 2012.

**Reference Books:**

1. Douglas Hall, "Microprocessors & Interfacing", McGraw Hill, Revised 2nd Edition, 2006 ISBN 0-07-100462-9

**Supplementary Reading:**

**Web Resources:**

http://nptel.ac.in/downloads/106108100/

**Web Links:**

https://www.tutorialspoint.com/assembly_programming/

**MOOCs:**

https://www.udemy.com/certificate-program-in-introduction-to-microprocessors/
https://edge.edx.org/courses/course-v1:BITSX+F241+2015-16_Semester_II/2c221095e36f4647b83e662d183c1984/

**Pedagogy:**

- White Board,
- Power Point Presentations
- Two Teachers method

**Assessment Scheme:**

**Class Continuous Assessment (CCA):50 Marks**

| Assignments | Test | Presentations | Case study | MCQ | Oral | Attendance |
|---|---|---|---|---|---|---|
| 20% | 30% | - | - | 30% | - | 20% |

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

| Practical | Oral based on practical | Site Visit | Mini Project | Problem based Learning | Any other (Mock 1 and Mock2) |
|---|---|---|---|---|---|
| 60% | - | - | - | - | 40% |

**Term End Examination: 50 Marks (100% weightage)**

**Syllabus :**

| Module No. | Contents | Workload in Hrs | |
|---|---|---|---|
| | | Theory | Lab |
| 1 | **8086 Architecture:** Architecture and Functional Pin description of 8086, Programmers model (Register Set) and Segmentation of 8086, logical to physical address translation, Addressing modes, Instruction set of 8086 in detail, 8086 Programming examples.<br>Assembly Language Programming, Assembler, Linker, Debugger, Directives, Procedures (Near & Far), Macros, Loop constructs | 07 | |
| 2 | **Memory and I/O Interfacing:** Memory/I/O Read/write cycle timing diagrams, Memory and I/O space of 8086. Memory organization: even and odd banks. Address decoding for memory/IO interfacing. Using NAND gate and Decoder.<br>Programmable Peripheral Interface 8255: Features, Block Diagram, Control & status registers, Operating modes & Interfacing Concept of ADC and DAC | 06 | |
| 3 | **Study of Peripherals:** Serial Communication- Synchronous &Asynchronous, Universal Synchronous Asynchronous Receiver Transmitter USART 8251: Features, Block Diagram, Control & status registers, Operating modes, Interfacing & Programming.<br>Programmable Interrupt Controller 8259: Features, Block Diagram, ICWs, Operating modes & Interfacing | 07 | |
| 4 | **Math-Controller & Study of Motherboard:** 8087(NDP) - Features, Block Diagram, Control & status registers, typical Instruction Set & Programming.<br>Study of IBM PC Motherboard, functional description of Blocks (Overview of 8237, 8254, 8279). | 06 | |

**Laboratory:-**

| Module No. | Contents | Workload in Hrs | |
|---|---|---|---|
| | | Theory | Lab |
| 1 | **Character String Display**<br>Accept a character string from user and display the same. | | 02 |
| 2 | **Packing a 2 digit unpacked HEX number**<br>Accept 2 Digit number from user and pack it to store as 2 Digit BCD number. | | 04 |
| 3 | **Array Addition**<br>Write X86/64 Assembly language program (ALP) to add array of N hexadecimal numbers stored in the memory. Accept input from the user. | | 02 |
| 4 | **String Operations**<br>Write X86/64 ALP for the following operations on the string entered by the user. Make your program user friendly by providing MENU like:<br>(a) Enter the string b) Calculate length of string c) Check palindrome d) Exit.<br>Display appropriate messages to prompt the user while accepting the input and displaying the result. Do not use string instructions. | | 04 |
| 5 | **8086 DAC interfacing using 8255**<br>Write 8086 ALP to interface DAC through 8255 and generate following waveforms on oscilloscope,<br>(i) Square wave - Variable Duty Cycle and Frequency.<br>(ii) Ramp wave - Variable direction<br>(iii) Trapezoidal wave<br>(iv) Stair case wave | | 04 |
| 6 | **8086 interfacing with 8251**<br>Perform an experiment to establish communication between two 8251 systems A and B. Program 8251 system A in asynchronous transmitter mode and 8251 system B in asynchronous receiver mode. Write an ALP to transmit the data from system A and receive the data at system B. The requirements are as follows: | | 02 |

| | | | |
|---|---|---|---|
| | **Transmission:**<br>Message is stored as ASCII characters in the memory. Message specifies the number of characters to be transmitted as the first byte.<br>**Reception:**<br>Message is retrieved and stored in the memory. Successful reception should be indicated. | | |

**Prepared By**
**Aditi Jahagirdar**
Course Coordinator

**Checked By**
**Shilpa Paygude**
Course Advisor

**Approved By**
**Dr. Vrushali Kulkarni**
Chairman BOS

Head
School of Computer
Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38.

MIT-WPU
Approved by
Academic Council

# COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CS223** | | | |
| **Course Category** | **Professional Core** | | | |
| **Course Title** | **Data and Mobile Communication** | | | |
| **Teaching Scheme and Credits** | **L** | **T** | **Laboratory** | **Credits** |
| **Weekly load hrs** | **3** | **-** | **2** | **2 + 1 = 3** |

**Pre-requisites:**

- CSIT I & II
- Computer Organization

**Course Objectives:**

1. To comprehend fundamentals of data communication
2. To study various analog and digital transmission techniques
3. To understand the flow and error control methods
4. To learn basics of cellular telephony

**Course Outcomes:**

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

1. Explain basic concepts of communication system.
2. Identify characterizing features of transmission techniques
3. Apply an appropriate techniques to solve the flow & error control problems
4. Understand wireless communication and cellular architecture

**Course Contents:**

1. Basics of Communication System
2. Digital Transmission
3. Data Flow and Error Control
4. Fundamentals of Mobile Communication

**Laboratory Exercises / Practical:**

1. LAN setup
2. Modulation Technique
3. PCM modulation
4. Error detection and correction
5. Sliding window protocol
6. Line coding techniques
7. PC to PC communication

**Learning Resources:**

**Text Books:**

1. Behrouz A. Forouzan, " Data Communications and Networking", 5th Edition, McGraw-Hill Publications.
2. Jochen H. Schiller, "Mobile Communications", 2nd Edition, Pearson Education.

**Reference Books:**

1. William Stallings, "Data and Computer Communications", 6th Edition, Prentice Hall of India Pvt.
2. William C. Y. Lee, " Mobile Cellular Telecommunications: Analog and Digital Systems", 2nd Edition, McGraw- Hill Publications.

**Supplementary Readings:**

1. Prakash C. Gupta, "Data Communication and Computer Network", PHI, 4th Edition.

**Web Resources:**

E-books

**Web links:**

http://www.linktionary.com/re/datacomm.html

**MOOCs:**

http://nptel.ac.in/courses/106105082/
https://www.coursera.org/learn/data-communication-network-services

**Pedagogy:**

- Power Point Presentation
- White-board and Pen

**Assessment Scheme:**

**Class Continuous Assessment (CCA)- 50 Marks**

| Assignments | Test | Presentations | Case study | MCQ | Oral | Attendance |
|---|---|---|---|---|---|---|
| 20% | 30% | - | - | 30% | - | 20% |

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

| Practical | Oral based on practical | Site Visit | Mini Project | Problem based Learning | Any other (Mock 1 and Mock 2) |
|---|---|---|---|---|---|
| 60% | - | - | - | - | 40% |

**Term End Examination: 50 Marks (100% weightage)**

**Syllabus :**

**Theory :-**

| Module No. | Contents | Workload in Hrs | |
|---|---|---|---|
| | | Theory | Lab |
| 1 | **Basics of Communication System:** Introduction to Data Communication, Analog and Digital Signal, Baseband Transmission, Transmission Impairment, Data rate limits, Data Transmission (parallel and serial: synchronous and asynchronous transmission), Analog Transmission: Analog-to-Analog conversion, Digital-to-Analog conversion. | 07 | |
| 2 | **Digital Transmission** Digital Transmission: Digital-to-Digital conversion (line coding, block coding, scrambling), Analog-to-Digital conversion (Pulse Code Modulation, Delta Modulation), Multiplexing techniques: Frequency Division Multiplexing, Time Division Multiplexing, Network Model, Networking Devices | 07 | |
| 3 | **Data Flow and Error Control** Error Detection and Correction: Types of Errors, Redundancy, Hamming Distance, Hamming Code, Cyclic Redundancy Check, Checksum, Framing: Fixed Size and Variable Size, Flow and Error Control, protocols: Noiseless and Noisy Channels. | 07 | |
| 4 | **Fundamentals of Mobile Communication** Introduction to Wireless communication, Spread Spectrum: Frequency Hopping Spread Spectrum and Direct Sequence Spread Spectrum, FDMA, TDMA, CDMA, Cellular Telephony: Frequency-Reuse Principle, Handoff, Roaming, Mobile Generations, Architecture of GSM. | 07 | |

Laboratory:-

| Module No. | Contents | Workload in Hrs | |
|---|---|---|---|
| | | Theory | Lab |
| 1 | **LAN setup**<br>Establish wired/wireless network using: UTP Cable, Crimping Tool, Connectors etc. | | 02 |
| 2 | **Modulation Technique**<br>Analyze and test Amplitude / Frequency Modulation Technique. | | 02 |
| 3 | **PCM modulation**<br>Analyze and test PCM modulation technique. | | 02 |
| 4 | **Error detection and correction**<br>Write a program for error detection and correction codes using Hamming Codes/CRC. | | 04 |
| 5 | **Sliding window protocol**<br>Write a program to implement sliding window protocol. | | 04 |
| 6 | **Line coding techniques**<br>Analyze and test different line coding techniques. | | 02 |
| 7 | **PC to PC communication**<br>Study PC to PC communication using RS232 or USB. | | 02 |

**Prepared By**
**Umesh Raut**
Course Coordinator

**Checked By**
**Dr. Balaji Patil**
Course Advisor

**Approved By**
**Dr. Vrushali Kulkarni**
Chairman BOS

Head
School of Computer
Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38.

MIT-WPU
Approved by
Academic Council

# COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CS231** | | | |
| **Course Category** | **Professional Core** | | | |
| **Course Title** | **Data Structure-II** | | | |
| **Teaching Scheme and Credits** | **L** | **T** | **Laboratory** | **Credits** |
| **Weekly load hrs** | **3** | **--** | **2** | **2+1=3** |

**Pre-requisites**:

- Data Structure-I

**Course Objectives:**

1. To study algorithms related to trees and graphs.
2. To understand the concept of symbol table.
3. To realize appropriate data structures to solve problems in various domains.

**Course Outcomes:**

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

1. Select appropriate data structures in problem solving.
2. Implement various algorithms related to trees and graphs.
3. Demonstrate the use of trees for symbol table implementation.

**Course Contents:**

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

**Laboratory Exercises / Practicals:**

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

**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:**

- Chalk and Board
- Power Point Presentations
- Two Teacher Method
- Video Lectures
- Discussion Forum
- Flipped Classroom

**Assessment Scheme:**

**Class Continuous Assessment (CCA)-50 Marks**

| Assignments | Test | Presentations | Case study | MCQ | Oral | Attendance |
|---|---|---|---|---|---|---|
| 20% | 30% | - | - | 30% | - | 20% |

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

| Practical | Oral based on practical | Site Visit | Mini Project | Problem based Learning | Any other (Mock 1 and Mock2) |
|---|---|---|---|---|---|
| 60% | - | - | - | - | 40% |

**Term End Examination: 50 Marks (100% weightage)**

**Syllabus:**

**Theory:-**

| Module No. | Contents | Workload in Hrs | |
|---|---|---|---|
| | | Theory | Lab |
| 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 | 09 | |
| 2 | **Graph-** Basic Terminology, Storage representation: Adjacency matrix, Adjacency list, Creation of Graph and Traversals, Minimum spanning Tree- Prim's and Kruskal Algorithms, Topological sorting | 06 | |
| 3 | **Hashing-** Introduction to hashing, Hash functions, Collision resolution strategies- Open Addressing and Chaining, Hash Table Overflow. **Heap-** Heap as a priority queue, Heap sort. | 04 | |
| 4 | **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.<br>**APIs for Data Structure-** Standard Template Library(STL) for data structures. | 09 | |

**Laboratory:-**

| Module No. | Contents | Workload in Hrs | |
|---|---|---|---|
| | | Theory | Lab |
| 1 | Implement binary tree using C++ and perform following operations: Creation of binary tree and traversal (recursive and non- recursive) | | 04 |
| 2 | Implement dictionary using binary search tree where dictionary stores keywords & its meanings. Perform following operations:<br>i. Insert a keyword<br>ii. Delete a keyword<br>iii. Create mirror image and display level wise<br>iv. Copy | | 04 |
| 3 | 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 & BFS traversals. | | 04 |
| 4 | 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. Business house wants to connect all its offices with a minimum total cost. Solve the problem using Prim's algorithm. | | 02 |
| 5 | Store data of students with roll no, name and grade. Implement linear probing with and without replacement. | | 02 |
| 6 | Implement AVL tree for mnemonics of assembly language and display using inorder traversal. | | 04 |

**Prepared By**
**Dr. Sharmishtha Desai**
Course Coordinator

**Checked By**
Deshpande
**Vidya Deshpande**
Course Advisor

**Approved By**
**Dr. Vrushali Kulkarni**
Chairman BOS

Head
School of Computer Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38.

MIT-WPU
Approved by
Academic Council

## COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CS232** | | | |
| **Course Category** | **Professional Core** | | | |
| **Course Title** | **Microprocessors and Microcontrollers** | | | |
| **Teaching Scheme and Credits** | **L** | **T** | **Laboratory** | **Credits** |
| **Weekly load hrs** | **3** | **-** | **2** | **2 + 1 = 3** |

**Pre-requisites:**

- Computer Organization
- Microprocessor and Interfacing Techniques

**Course Objectives:**

1. To learn the architecture and programming of Pentium Microprocessor.
2. To learn the architecture and programming of 8051 Microcontroller.
3. To understand the architectural design of advanced microprocessors and microcontrollers.

**Course Outcomes:**

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

1. Understand the advanced architectural features of various processors.
2. Analyze use of microprocessor or microcontroller depending on requirements of application.
3. Write assembly language programs for 8051 microcontroller based systems.

**Course Contents:**

1. Pentium Architecture
2. Memory Management in Protected Mode
3. Multitasking and Interrupts, Exceptions and I/O
4. 8051 Microcontroller

**Laboratory Exercises / Practicals:**

1. Counting of positive and negative numbers.
2. Sorting of numbers from an array.
3. Hex to BCD conversion.
4. Simulation of 'cat' command.
5. Simulation of 'cp' command.
6. Display contents of system registers in Pentium.
7. Timer programming in 8051.
8. Serial port programming in 8051.

**Learning Resources:**

**Text Books:**

1. James Antonakos , "The Pentium Microprocessor" , 2004, Pearson Education ISBN – 81-7808-545-3.
2. K.J.Ayala " The 8051 Microcontroller " ISBN 9788131511053.

**Reference Books:**

1. Intel architecture software developer's manual volume 3.
2. Intel architecture software developer's manual volume 1.
3. Intel 8051 datasheet.

**Supplementary Reading: -**

**Web Resources:**

E-books

**Web links:**

nptel.ac.in/courses/.../IIT.../Course_home2_5.htm
nptel.ac.in/courses/.../IIT.../Course_home4_35.htm

**MOOCs:**

nptel.ac.in/courses/.../IIT.../Course_home2_5.htm
nptel.ac.in/courses/.../IIT.../Course_home4_35.htm

**Pedagogy:**

- White Board
- Power Point Presentations
- Two Teachers method

**Assessment Scheme:**

**Class Continuous Assessment (CCA)- 50 Marks**

| Assignments | Test | Presentations | Case study | MCQ | Oral | Attendance |
|---|---|---|---|---|---|---|
| 20% | 30% | -- | -- | 30% | -- | 20% |

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

| Practical | Oral based on practical | Site Visit | Mini Project | Problem based Learning | Mock 1 and Mock 2 |
|---|---|---|---|---|---|
| 60% | -- | -- | -- | -- | 40% |

**Term End Examination: 50 Marks (100% weightage)**

**Syllabus :**

**Theory :-**

| Module No. | Contents | Workload in Hrs | |
|---|---|---|---|
| | | Theory | Lab |
| 1 | **Pentium Architecture :**<br>Pentium features, Operating Modes, Pentium super-scalar architecture - Pipelining, Branch prediction, Instruction and Data caches. Pentium programmer's model, Register set, Addressing modes and Instruction set. The Floating point Unit: features, pipeline stages & data types. | 07 | |
| 2 | **Memory Management in Protected Mode:**<br>Segmentation unit : Introduction, support registers, related instructions, segment descriptors, logical to linear address translations, protection by segmentation, privilege-levels, rules of inter-privilege level transfer for data and code segments .<br>Paging Unit: support registers, related data structures ,linear to physical address translation ,TLB ,page level protection. | 08 | |
| 3 | **Multitasking and Interrupts, Exceptions and I/O :**<br>Task Management -support registers, related data structures, Task switching. Interrupt and Exception Handling : IDT and Gate descriptors. I/O handling and I/O instructions in Pentium. | 07 | |
| 4 | **8051 Microcontroller:**<br>Features, Micro-controller MCS-51 family architecture. Programmers model-register set, register bank, SFRs, addressing mode, instruction set, Memory organization :on-chip and external memory components. Interrupt structure, Timers and their programming, Serial port and programming. | 08 | |

**Laboratory:-**

| Module No. | Contents | Workload in Hrs | |
|---|---|---|---|
| | | Theory | Lab |
| 1 | Write an ALP to find positive and negative numbers from an array of 32 bit numbers. | | 02 |
| 2 | Write an ALP to sort 8 bit numbers in ascending/descending order. | | 02 |
| 3 | Write an ALP to convert 4 digit HEX number to 5 digit BCD number. | | 02 |
| 4 | Write an ALP to simulate 'cat' command in linux. | | 02 |
| 5 | Write an ALP to simulate 'cp' command in linux. | | 02 |
| 6 | Write an ALP to display the contents of GDTR, IDTR, LDTR, TR and MSW . | | 02 |
| 7 | Write an 8051 ALP for rate generation using Timer0/Timer1 by using<br>a. Polling method<br>b. ISR method | | 02 |
| 8 | Write an 8051 ALP for serial port programming to transfer block of data using<br>a. Polling method<br>b. ISR method | | 02 |

**Prepared By**
**Ranjana Agrawal**
Course Coordinator

**Checked By**
**Shilpa Paygude**
Course Advisor

**Approved By**
**Dr. Vrushali Kulkarni**
Chairman BOS

Head
School of Computer
Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38.

MIT-WPU
Approved by
Academic Council

## COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | CS233 | | | |
| **Course Category** | **Professional Core** | | | |
| **Course Title** | **Software Engineering and Project Management** | | | |
| **Teaching Scheme and Credits** | **L** | **T** | **Laboratory** | **Credits** |
| **Weekly load hrs** | **3** | **-** | **-** | **2** |

**Pre-requisites:**

- Principles of Programming Languages and Functional Programming
- Object Oriented Programming

**Course Objectives:**

1. To identify the systematic way of Software Development and Software Lifecycle Process model.
2. To identify the principles of Agile Software Development and Practices.
3. To explain the Project Management principles and Project Metrics

**Course Outcomes:**

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

1. Analyze process models and its appropriate selection for Development of Software Projects.
2. Define scope of Project, design Software Requirement Specifications (SRS) and plan a project.
3. Make use of the principles and processes of Agile Methodology.
4. Choose modern tools for Software Development and Project Management.

**Course Contents:**

1. Software Process
2. Requirement Engineering
3. Agile Management and Practices
4. Software Project Management

**Learning Resources:**

**Text Books:-**

1. Roger S Pressman, "Software Engineering: A Practitioner's Approach", McGraw-Hill, ISBN:
   0073375977, Seventh Edition, 2014.
2. Joseph Phillips, "IT Project Management –On Track From Start to Finish", Tata McGraw-Hill.2009.
3. The Art of Agile Development James Shore, Shane Warden "O'Reilly Media, Inc." 2008.

**Reference Books:-**

1. Pankaj Jalote, "Software Engineering : A Precise Approach", Wiley India.2010.
2. P.C. Tripathi, P.N. Reddy, "Principles of Management", Tata McGraw Hill Education Private Limited. 2012.

**Supplementary Reading:**

1. Ian Sommerville, — Software Engineeringl, Addison and Wesley. 9th Ed., 2011.

**Web Resources:**

http://highered.mheducation.com/sites/0072853182/student_view0/index.html
https://poetiosity.files.wordpress.com/2011/04/art_of_agile_development.pdf

**Weblinks:**

https://www.sei.cmu.edu/training/p35.cfm
http://www.mhhe.com/engcs/compsci/pressman/

**MOOCs:**

http://nptel.ac.in/courses/106101061/1
http://nptel.ac.in/downloads/106105087/

**Pedagogy:**

- Chalk and Board
- Power Point Presentation
- Two Teacher Method
- Video Lectures
- Group Discussion

**Assessment Scheme:**

**Class Continuous Assessment (CCA):** 50 Marks

| Assignments | Test | Presentations | Case study | MCQ | Oral | Attendance |
|---|---|---|---|---|---|---|
| 20% | 30% | - | - | 30% | - | 20% |

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

| Practical | Oral based on practical | Site Visit | Mini Project | Problem based Learning | Any other (Mock 1 and Mock2) |
|---|---|---|---|---|---|
| 60% | - | - | - | - | 40% |

**Term End Examination: 50 Marks (100% weightage)**

**Syllabus:**

| Module No. | Contents | Workload in Hrs | |
|---|---|---|---|
| | | Theory | Lab |
| 1 | **Software Process**<br>Introduction to Software Engineering, Software Engineering Practice, Software Myths, Software Process, Perspective and Specialized Process Models.<br>Case Studies. | 08 | |
| 2 | **Requirement Engineering**<br>Software Requirements, User requirements, System requirements, Software Requirements Specification, Requirement Engineering Process, Requirements validation techniques, Requirement Traceability Matrix, Change Management, Software Design: Abstraction, Modularity, Cohesion & Coupling, Scenario based modeling, Introduction to Unified Modeling Language (UML) and Data Flow Diagram ( DFDs).<br>Case Studies. | 08 | |
| 3 | **Agile Management and Practices**<br>Agile manifesto, The Fundamentals of Agile Software Development, Aspects of Agile Approaches, Practices | 06 | |

# COURSE STRUCTURE

| Course Code | CS234 | | | |
|---|---|---|---|---|
| Course Category | Professional Core | | | |
| Course Title | Operating Systems | | | |
| Teaching Scheme and Credits<br>Weekly load hrs | L | T | Laboratory | Credits |
| | 3 | - | 2 | 2 + 1 = 3 |

**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 / Practical:**

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

**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=utf-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--ud923
http://nptel.ac.in/courses/106108101/

**Pedagogy:**

- Power Point Presentation
- White-board / Pen
- Two Teacher method

**Assessment Scheme:**

**Class Continuous Assessment (CCA)- 50 Marks**

| Assignments | Test | Presentations | Case study | MCQ | Oral | Attendance |
|---|---|---|---|---|---|---|
| 20% | 30% | - | - | 30% | - | 20% |

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

| Practical | Oral based on practical | Site Visit | Mini Project | Problem based Learning | Any other (Mock 1 and Mock2) |
|---|---|---|---|---|---|
| 60% | - | - | - | - | 40% |

**Term End Examination: 50 Marks (100% weightage)**

**Syllabus :**

**Theory :-**

| Module No. | Contents | Workload in Hrs | |
|---|---|---|---|
| | | Theory | Lab |
| 1 | **Overview of Operating System**<br>Operating System objectives and its evolution. Operating System structure: Layered, Monolithic, Microkernel Operating Systems. BASH shell scripting. | 06 | |
| 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. | 08 | |
| 3 | **Concurrency Control**<br>**Process Synchronization:** Principles of Concurrency, Requirements for Mutual Exclusion, Mutual Exclusion: Hardware Support, Operating System Support (Semaphores and Mutex).<br>**Classical synchronization problems:** Readers/Writers Problem, Producer and Consumer problem.<br>**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, | 06 | |

| | | | |
|---|---|---|---|
| | Memory Partitioning: Fixed Partitioning, Dynamic Partitioning, paging, segmentation, virtual memory.<br>**File Management:** Overview, File Organization and Access, File Directories, File Sharing, Record Blocking.<br>**I/O Management:** I/O Devices, Organization of the I/O Functions, I/O Buffering, Disk Scheduling. | | |

**Laboratory:-**

| Module No. | Contents | Workload in Hrs | |
|---|---|---|---|
| | | Theory | Lab |
| 1 | **Shell Programming**<br>Write a shell script to:-<br>• Display odd-even numbers user specified limit.<br>• Convert a string from upper case to lower case or vice versa | | 02 |
| 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. | | 02 |
| 3 | **CPU Scheduling**<br>Write a menu driven program to simulate the following CPU scheduling algorithms :-<br>• First Come First Serve (FCFS).<br>• Round Robin (RR). | | 04 |
| 4 | **Deadlocks**<br>Write a program to simulate Bankers algorithm for deadlock avoidance. | | 04 |
| 5 | **Multi-Threading**<br>Write a program using POSIX threads (pthread ) to perform arithmetic operations | | 02 |
| 6 | **Page Replacement Algorithms**<br>Write a menu driven program to simulate the following page replacement algorithms.<br>• First In First Out (FIFO).<br>• Least Recently Used (LRU). | | 04 |

**Prepared By**
**Madhura Phatak**
Course Coordinator

**Checked By**
**Vidya Deshpande**
Course Advisor

**Approved By**
**Dr. Vrushali Kulkarni**
Chairman BOS

Head
School of Computer
Engg. & Technology,
Dr. Vishwanath Karad
MIT-WPU, Pune-38

MIT-WPU
Approved by
Academic Council

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

MIT-WPU

# COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CET3015B** | | | |
| **Course Category** | **Core Engineering** | | | |
| **Course Title** | **Full Stack Development Technologies** | | | |
| **Teaching Scheme and Credits** | **Lecture** | **Tutorial** | **Laboratory** | **Credits** |
| **Weekly load hrs** | **2 hr/wk** | **--** | **4 hr/wk** | **2+2=04** |

**Pre-requisites**:
- Principles of Programming Languages
- Computer Networks

**Co-requisite**
- Database Management Systems

**Course Objectives:**

1. **Knowledge:**
   i. To understand best practices for web-site project development.
   ii. To understand the frontend and backend technologies for web application development.

2. **Skills**
   i. To acquire skills for developing web applications using frontend and backend technologies.
   ii. To acquire skills for deployment processes for real world web-based applications.

3. **Attitude**
   i. To use best practices for developing a dynamic and responsive website.
   **ii.** To use various technology stack such as MEAN and MERN for developing a website.

**Course Outcomes:**

After completion of the course, the students will be able to:
1. To apply best practices to design and develop dynamic and responsive web pages.
2. To select and apply appropriate frontend technologies for responsive User Interface (UI) development
3. To design and develop web applications using various technology stacks.
4. Test and deploy real world web-based applications on different platforms.

**Course Contents:**

1. **Introduction to World Wide Web**: HTML, CSS, BOOTSTRAP, XML, JSON.
2. **Client-Side Scripting**: Javascript Ajax.
3. **UI development libraries:** React.
4. **Server-Side Technology: PHP** database handling and session handling, Basic REST API development using Express and Node.
5. **Content Management Systems:** WordPress/Joomla introduction.
6. **Full stack development:** MERN software stack for building dynamic web sites and web applications.

MIT-WPU
Approved by
Academic Council
23 JUL 2022

Dr.Prasad Khandekar
Dean

**Laboratory Exercises / Practical:**

1. Git repository and version control.
2. Responsive web page using Bootstrap front end framework (HTML5, CSS using Bootstrap).
3. Client Side Form Validations using JavaScript, DOM real-time update, JQuery to develop Ajax based applications.
4. PHP CRUD operations.
5. Interactive User interface design using React.
6. Full stack web application development using MERN Stack.
7. Developing REST APIs
8. Mini Project based on technology stacks learned.

**Learning Resources:**

**Text Books:**

1. Full-Stack JavaScript Development by Eric Bush ISBM details
2. Mastering Full Stack React Web Development by Tomaz Dyl
3. Ralph Moseley & M. T. Savaliya, "Developing Web Applications", Wiley publications.

**Reference Books:**

1. Hands-On Full Stack Web Development with Aurelia : Develop modern and real-time web applications with Aurelia and Node.js by Diego Jose Arguelles Rojas, Erikson Haziz Murrugarra Sifuentes, 2018, Packt
2. Full-Stack JavaScript Development Develop, Test and Deploy with MongoDB, Express, Angular and Node on AWS Eric Bush, Maura van der Linden, 2016
3. Modern Full-Stack Development Using TypeScipt, React, Node.js, Webpack, Docker by Zammetti, Frank
4. Achyut Godbole & Atul Kahate, "Web Technologies: TCP/IP to Internet Application Architectures", McGraw Hill Education publications, ISBN, 007047298X, 9780070472983

**Supplementary Reading:**

1. https://www.linkedin.com/pulse/how-become-full-stack-developer-roadmap-jennifer-winget/
2. https://www.geeksforgeeks.org/how-to-become-a-full-stack-web-developer-in-2021/
3. https://www.hackerearth.com/blog/full-stack/
4. https://github.com/kamranahmedse/developer-roadmap

**Web Resources:**

1. The Full Stack Developer Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer by Chris Northwood, Apress, 2018
2. PHP And MongoDB Web Development Beginners Guide Book by Rubayeet Islam, PACKT, 2019
3. Full Stack Javascript by Azat Mardan Apress Publication, 2015
4. Learning PHP, MySQL & JavaScript by Robin Nixon O'REILLY, 2014

MIT-WPU Approved by Academic Council Date 23 JUL 2022

Dr.Prasad Khandekar
Dean

**Web links:**

1. https://www.pmi.org/learning/library/agile-project-management-scrum-6269
2. https://www.w3schools.com/whatis/whatis_fullstack.asp
3. https://www.geeksforgeeks.org/what-is-full-stack-development/
4. https://www.tutorialspoint.com/angularjs/index.htm

**MOOCs:**

1. Introduction to Modern Application Development - NPTEL
2. Full Stack Developer (Summer Training) - IIT Kanpur
3. Full Stack Developer Nanodegree Udacity
4. Full Stack Mobile App Development – Coursera

**Pedagogy:**

1. PowerPoint Presentation
2. Video Lectures
3. Flipped Classroom Activity
4. Open source Tools
5. Project Based Learning

**Assessment Scheme:**

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

| Mid Term | Component 1 (Active Learning) | Component 2 | Component 3 | Component 4 |
|---|---|---|---|---|
| 30 Marks | 20 Marks | 20 Marks | 20 Marks | 10 Marks |

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

| Practical Performance | Active learning / Mini Project/Additional implementation/ On paper design | End term practical /oral examination |
|---|---|---|
| 20 Marks | 15 Marks | 15 Marks |

**Term End Examination: Not Applicable**

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs Theory |
|---|---|---|
| 1 | **Introduction to World Wide Web**<br>**Introduction to web technology**<br>Internet and WWW, website planning and design issues, web development solution stacks<br>**Hyper Text Mark-up Language (HTML)**<br>Structure of HTML document, HTML elements: headings, colors & fonts, links, lists, tables, images and forms.<br>Difference between HTML and HTML5.<br>**Cascading Style Sheets**<br>Introduction to Style Sheet, Need of CSS, basic syntax and structure, Inline, Internal and External CSS, CSS Box Model, Inserting CSS in an HTML page, CSS selectors.<br>**BOOTSTRAP Technology for responsive web page development.**<br>**XML and JSON**<br>**HTTP protocol**<br>GET, POST, PUT methods. | 07 |
| 2 | **Client-Side Scripting**<br>**JavaScript:** Introduction to JavaScript (JS), Core features, JS in an HTML (Embedded, External).<br>**Document Object Model (DOM):** DOM levels, DOM Objects and their properties and methods, Manipulating DOM.<br>**JQuery Ajax** | 07 |
| 3 | **Server-Side Technology and Content Management Systems**<br>**Server-Side Scripting and its need**<br>**PHP Hyper-Text Pre-processor (PHP)**<br>Introduction to PHP, Form handling in PHP, Database Connectivity using MySQL and PHP, Cookies and Session Tracking.<br>**Content Management Systems**<br>WordPress/Drupal/Joomla | 08 |
| 4 | **Advanced Technology Stacks**<br>**MERN stack**<br>Introduction to web development stacks, React, Express Framework, Mongo DB database, Node JS, Sample case study using MERN.<br>**Web Services**<br>REST APIs (Representational State Transfer) using Express and Node. | 08 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date

Dr.Prasad Khandekar
Dean

**Laboratory:**

| Assignment No. | Content | Workload in Hrs |
|---|---|---|
| | | Lab |
| 1 | Created a public git repository for your team and submit the repo URL as the solution to this assignment, Learn Git concept of Local and Remote Repository, Push, Pull, Merge and Branch. | 04 |
| 2 | Design and develop a responsive web page using Bootstrap front end framework. Web pages should contain HTML5 elements (Use all possible formatting for example font, colour etc.). Web page should include various images, links within the page, links to other pages for navigation, new tabs. | 04 |
| 3 | Write a program to perform following form validations using JavaScript:<br>a) All fields mandatory,<br>b) Phone number, Email Address, Zip code Validation etc.<br>Include JavaScript to access and manipulate Document Object Model (DOM) objects in an HTML web page.<br>Include JQuery to develop to develop your application as an Ajax based application. | 04 |
| 4 | Write server side script in PHP to perform form validation and create database application using PHP and MySQL to perform insert, update, delete and search operations. | 06 |
| 5 | Design and develop an interactive user interface using React. | 10 |
| 6 | Develop a set of REST API using Express and Node. | 08 |
| 7 | Develop a full stack web application using MERN stack to perform CRUD operations. | 12 |
| 8 | Mini Project (based on technology stacks learned) | 12 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date ...../...../.....

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

# COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CET4001B** | | | |
| **Course Category** | **Professional Elective 1** | | | |
| **Course Title** | **Big Data Technologies** | | | |
| **Teaching Scheme and Credits** | **Lecture** | **Tutorial** | **Laboratory** | **Credits** |
| **Weekly load hrs** | **3 hr/wk** | **--** | **2 hr/wk** | **3+1=04** |

**Pre-requisites:**

- Database Management System
- Data Warehousing and Data Mining

**Course Objectives:**

**1. Knowledge**

i. Understand the various aspects and life cycle of Big Data.
ii. Learn the concepts of NoSQL for Big Data.

**2. Skills**

i. Design an application for distributed systems on Big Data.
ii. To understand and analyse different storage technologies required for Big Data.

**3.Attitude**

i. To explore the technological foundations of Big Data Analytics
ii. To understand the role of various visualization techniques and explore the various Big Data visualization tools.

**Course Outcomes:**

1. Recognize the characteristics of Big Data
2. Ability to demonstrate information retrieval of Big Data
3. Analyse the HADOOP and Map Reduce technologies associated with big data
4. Perform analytics to learn the usage of distributed processing framework
5. To investigate the impact of different visualizations for real world applications.

**Course Contents:**

**Laboratory Exercises:**

1. Create a sample database using MongoDB and implement the CRUD Operations.
2. Create read update delete insert
3. Execute any 10 queries on a suitable sample MongoDB database to demonstrate various query criteria. Explore different commands.
4. Perform database connectivity with MongoDB as backend and any front end from PHP/python/Java for a suitable application domain.
5. DATA WRANGLING USING PYTHON (Combining and Merging DataSets – Reshaping and Pivoting – Data Transformation – String Manipulation, Regular Expressions).
6. Perform installation of Hadoop.
7. Install MapReduce in Hadoop and perform analysis of performance gain. Consider any real-world scenario.
8. Demonstrate querying on suitable dataset using PIG

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date

Dr.Prasad Khandekar
Dean

9. Data Visualization using Python- Matplotlib package – Plotting Graphs – Controlling Graph – Adding Text – More Graph Types
   a) Perform basic data visualizations using D3.js or any other big data visualization tool. (Displaying basic objects like circle, line, rectangle and performing basic operations like transformations, Animation etc.)
   b) For suitable datasets of any application domain demonstrate big data analytics using D3.js or any other big data visualization tool.
10. Mini Project: Design and implement any distributed (hadoop) database application for Big Data using PHP/python/Java as front end and MongoDB as backend. Demonstrate database operations and illustrate visualization using suitable tools.

**Learning Resources:**

**Text Book:**

1. Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", Wiley Publication, 2015.

**Reference Books:**

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015.
2. Chris Eaton, Dirk deroos et al., "Understanding Big data", McGraw Hill, 2012.
3. Tom White, "HADOOP: The definitive Guide" , O Reilly 2012.
4. Vignesh Prajapati, "Big Data Analytics with R and Hadoop", Packet Publishing 2013.
5. Jy Liebowitz, "Big Data and Business analytics",CRC press, 2013.
6. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, "Big Data for Dummies", John Wiley & Sons, Inc., 2013.
7. Paul Zikopoulos, Dirkde Roos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, "Harness the Power of Big Data the IBM Big Data Platform", Tata McGraw Hill Publications, 2012.
8. Arshdeep Bahga, Vijay Madisetti, "Big Data Science & Analytics: A Hands-On Approach ", VPT, 2016
9. Bart Baesens "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)", John Wiley & Sons,2014

**Supplementary Reading:**

**Web Resources:**

1. Tom Plunkett, Brian Macdonald et al, "Oracle Big Data Handbook", Oracle Press, 2014.

**Web links:**

1. https://www.javatpoint.com/big-data-technologies
2. https://plotly.com/python/
3. https://cehs.usu.edu/itls/files/course-syllabi/4130-data-visualization.pdf

MIT-WPU Approved by Academic Council 23 JUL 2022

Dr.Prasad Khandekar
Dean

4. https://www.tableau.com/sites/default/files/media/designing-great-visualizations.pdf
5. http://www.bigdatauniversity.com/

**MOOCs:**

1. Online courses for self-learning

**Pedagogy:**

1. PowerPoint Presentation
2. Video Lectures
3. Flipped Classroom Activity
4. Open source Tools
5. Project Based Learning

**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 learning / Mini Project/Additional implementation/ On paper design | End term practical /oral examination |
|---|---|---|
| 10 Marks | 10 Marks | 10 Marks |

**Term End Examination: 40 Marks**

**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Theory |
| 1 | **Introduction to Big Data**<br>What is Big Data, overview of Big Data Analytics, Evolution of Big Data, Challenges with Big Data, Why Big Data? traditional database systems vs big data systems, 9 V's of Big Data, importance of Big Data and real-world challenges. Architecture of Big Data systems, Big Data applications, Data Analytics Life Cycle, Business Intelligence vs. Big Data | 09 |
| 2 | **NoSQL databases for Big Data**<br>What is MongoDB? Why MongoDB? Terms Used in RDBMS and MongoDB, structured versus unstructured data, NoSQL movement and | 09 |

Approved by Academic Council
23 JUL 2022

Dr.Prasad Khandekar
Dean

| | | |
|---|---|---|
| | concept of NoSQL database, comparative study of SQL and NoSQL, Types and examples of NoSQL database- key value store, document store, columnar databases, graph databases. Characteristics of NoSQL, NoSQL data modelling, advantages of NoSQL, CAP theorem, BASE properties, Sharding – characteristics, advantages, types. NoSQL using MongoDB – mongo DB shell, data types, CRUD operations, querying, aggregation framework operators, indexing | |
| 3 | **Hadoop and MapReduce for Big Data**<br>Why Hadoop? Why not RDBMS? RDBMS versus Hadoop, Distributed Computing Challenges, History of Hadoop, Hadoop Overview, Use Case of Hadoop, Hadoop Distributors, HDFS (Hadoop Distributed File System), Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN (Yet Another Resource Negotiator), Introduction to MAPREDUCE Programming, Mapper, Reducer, Combiner, Petitioner, Searching, Sorting<br>HDFS - Introduction, Concepts, Design, HDFS interfaces, HDFS Read Architecture, HDFS Write Architecture, | 09 |
| 4 | **Technologies for Big Data**<br>Categorization of Big Data Technologies: Data Storage- Hadoop Ecosystem, Data Mining- RapidMiner, Data Analytics- Kafka, KNIME, Spark, Block chain, Data Visualization- Plotly.<br>Elements of Hadoop ecosystem -<br>PIG: Introduction to PIG, Execution Modes of Pig, Grunt, Pig Latin Editors, Comparison of Pig with Databases, Pig Latin, Pig on Hadoop,<br>Hive Architecture, Comparison with Traditional Database, HiveQL, HBase<br>Overview of Apache Spark Ecosystem, Spark Architecture | 09 |
| 5 | **Tools for Data Visualization for Big Data Analytics**<br>Introduction to Big Data visualization, what is Data Visualization? Why Visualization? challenges in Big Data visualization, use of color in Visualization, Types of plots, analytical techniques used in Big Data visualization, case studies<br>Case study: Google Analytics /Twitter Analytics<br>PowerBI | 09 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

**Laboratory:**

| Assignment No. | Content | Work Load In Hrs |
|---|---|---|
| | | Lab |
| 1 | DATA WRANGLING USING PYTHON<br>Combining and Merging Data Sets – Reshaping and Pivoting – Data Transformation – String, Manipulation, Regular Expressions. | 02 |
| 2 | Data Acquisition by Scraping for web applications (XML & HTML) | 02 |
| 3 | Data operations on Time Series data | 02 |
| 4 | Data Visualization using Python- Matplotlib package – Plotting Graphs – Controlling Graph – Adding Text – More Graph Types | 02 |
| 5 | Data Visualization using D3.js | 02 |

MIT-WPU
Approved by
Academic Council
Date 23/11/2022

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

# COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CET4002B** | | | |
| **Course Category** | **Engineering Science** | | | |
| **Course Title** | **Software Design Modelling and Testing** | | | |
| **Teaching Scheme and Credits** | **Lecture** | **Tutorial** | **Laboratory** | **Credits** |
| **Weekly load hrs** | **3 hr/wk** | **--** | **2 hr/wk** | **3+1=04** |

**Pre-requisites:**

- Software Engineering and Project Management
- Object Oriented Methodology

**Course Objectives:**

1. **Knowledge**
   - **i.** To provide the knowledge of software Design methodologies strategies.
   - ii. To understand how testing methods can be used as an effective tool in quality assurance of software.
2. **Skills**
   - i. To understand the different design methodologies and implement for the system.
   - **ii.** To provide skills to design test case plan for testing software.
3. **Attitude**
   - **i.** To acquaint with the different testing methodologies and tools

**Course Outcomes:**

1. To the transform Requirement document into an appropriate design.
2. Apply appropriate UML diagrams and notations to design the product.
3. Identify the bugs and create various test cases based on the application
4. To understand the and apply testing techniques in the software development

**Course Contents:**

1. Software Design
2. Static Modelling
3. Dynamic Modelling
4. Software Testing
5. Software Testing types and methodologies

**Laboratory Exercises:**

1. Develop a use case diagram for the given system by identifying the actors and use cases and associate the use cases with the actors by drawing a use case diagram. Use UML tool.
2. Perform the following tasks and draw the class diagram using UML tool. Represent the individual classes, and objects Add Methods Represent relationships and other classifiers like interfaces
3. Draw the sequence diagram using UML tool to show message exchanges
4. For the same problem draw Activity Diagram and State Chart Diagram

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

5. Draw Component Diagram and Deployment Diagram for the above given problem statement.
6. Write the test plan, test cases and generate test scripts using any automated testing tool.
7. Test any Web application using an automated testing tool.

**Learning Resources:**

1. Jim Arlow, Ila Neustadt, —UML 2 and the unified process –practical object-oriented analysis and design‖ Addison Wesley, Second edition, ISBN 978-0201770605
2. Gardy Booch, James Rambaugh, Ivar Jacobson, —The unified modelling language user guide‖ , Pearson Education, Second edition, 2008, ISBN 0-321-24562-8
3. Desikan and G. Ramesh, "Software Testing: Principles and Practices", Pearson Education.

**Reference Books:**

1. Gardy Booch, James Rambaugh, Ivar Jacobson, —The unified modeling language user guide‖ , Pearson Education, Second edition, 2008, ISBN 0-321-24562-8
2. Dan Pilone, Neil Pitman "UML 2.0 in a Nutshell", (In a Nutshell (O'Reiily)) Paperback)
3. Aditya P. Mathur, "Fundamentals of Software Testing", Pearson Education.,
   Effective Methods of Software Testing, William E Perry, 3rd Edition, Wiley Publishing Inc

**Supplementary Reading:**

**Web Resources:**

1. https://www.pdfdrive.com/uml-uml-20-tutorial-e16736680.html
2. https://ebookpdf.com/roger-s-pressman-software-engineering
3. https://dhomaseghanshyam.files.wordpress.com/2016/02/gomaasoftwaremodellinganddesign.pdf
4. https://balu051989.files.wordpress.com/2011/06/the-unified-modeling-language-user-guideby-grady-booch-james-rumbaugh-ivar-jacobson.pdf
5. http://index-of.co.uk/Engineering/Software%20Engineering%20(9th%20Edition).pdf

**Web links:**

1. http://www.mhhe.com/engcs/compsci/pressman/

**MOOCs:**

1. https://nptel.ac.in/courses/106105153/33
2. https://nptel.ac.in/courses/106105153/35

**Pedagogy:**

1. Power Point Presentation
2. Smart-board / Pen
3. Two Teacher method

MIT-WPU
Approved by
Academic Council
Date 23 JUL 2022

Dr.Prasad Khandekar
Dean

**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 learning / Mini Project/Additional implementation/ On paper design | End term practical /oral examination |
|---|---|---|
| 10 Marks | 10 Marks | 10 Marks |

**Term End Examination : 40 Marks**

**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Theory |
| 1 | **Software Design**<br>Introduction to software design, Unified Process, From analysis to Design. Concept of Modelling, 4+1 view Architecture, Introduction to OMG standards MDA, UML 2.0, Introduction to UML -Basic building blocks, Extensibility mechanisms like stereotypes, tagged values, constraints. | 09 |
| 2 | **Static Modeling**<br>object and class concepts, links and association concepts, generalization and inheritance concepts, navigations in class models, advanced object and class concepts, association ends, n-ary association, aggregation, abstract classes, Class diagrams, Object diagrams, , Composite structure diagrams, Package diagrams, Component Diagram - Interfaces and Components, Deployment Diagram | 09 |
| 3 | **Dynamic Modeling**<br>Use case diagram, Activity diagram, Advance state machine diagram, Interaction: Interaction overview diagram, sequence diagram, Timing diagram, Communication diagram | 08 |
| 4 | **Software Testing**<br>Introduction: Software Testing, Failure, error, bug, defect, Testing Principles, defect management, SDLC Vs STLC, Software Testing Life Cycle: Requirements Analysis/Design, Traceability Matrix, Test Planning, Objective, Scope of Testing, Schedule, Approach, Roles & Responsibilities, Assumptions, Risks & Mitigations, Entry & Exit Criteria, | 10 |

MIT-WPU
Approved by
Academic Council
Date 23 JUL 2022

Dr.Prasad Khandekar
Dean

| | | |
|---|---|---|
| | Test Automation, Deliverables. DRE (Defect Removal Efficiency), Test Case Generation, Test plan, Test Metrics. | |
| 5 | **Software Testing Types and Methodologies**<br>Testing strategies, white box and black box testing, Cyclomatic Complexity, basis path testing, , graph based testing, equivalence testing, Boundary value Analysis, Functional/NonFunctional Testing: Memory Test , Scalability Test, Compatibility Test, Security Test, Cookies Test, Session Test, Recovery Test, Installation Test, Ad-hoc Test, Web App testing,mobile testing Manual Testing, Automation Testing , , Automated testing, tools | 09 |

**Laboratory:**

| Assignment No. | Contents | Workload in Hrs |
|---|---|---|
| | | Lab |
| 1 | Develop a use case diagram for the given system by identifying the actors and use cases and associate the use cases with the actors by drawing a use case diagram. Use UML tool. | 02 |
| 2 | Perform the following tasks and draw the class diagram using UML tool. Represent the individual classes, and objects Add methods Represent relationships and other classifiers like interfaces. | 02 |
| 3 | Draw the sequence diagram using UML tool to show message exchanges | 02 |
| 4 | For the same problem draw Activity Diagram and State Chart Diagram | 02 |
| 5 | Draw Component Diagram and Deployment Diagram for the above given problem statement. | 02 |
| 6 | Write the test plan, test cases and generate test scripts using any automated testing tool. | 02 |
| 7 | Test any Web application using an automated testing tool. | 04 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY RESEARCH SOCIAL INNOVATION & PARTNERSHIPS

MIT-WPU

# COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CET4003B** | | | |
| **Course Category** | **Core Engineering** | | | |
| **Course Title** | **Computer Graphics and 3D Modelling** | | | |
| **Teaching Scheme and Credits** | **Lecture** | **Tutorial** | **Laboratory** | **Credits** |
| **Weekly load hrs.** | **3 hr/wk** | **--** | **02 hr/wk** | **3+1=04** |

**Pre-requisites**:

- Engineering Graphics

**Course Objectives:**

**1.Knowledge**

i. To learn basic primitives and various algorithms for generating graphical figures
ii. To get familiar with mathematics behind graphical transformations and apply various techniques regarding projections

2. **Skills**

i. To understand various filling and clipping algorithms
ii. To understand color models in computer graphics

3. **Attitude**

i. To learn animation and multimedia creation

**Course Outcomes:**

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

1. Apply knowledge of mathematics, logic and data structures to design computer graphics
2. Understand mathematics behind graphical transformations and apply various techniques regarding projections
3. Implement various filling and clipping algorithms
4. Use color models in computer graphics
5. Create animation and multimedia

**Course Contents:**

1. Basic Concepts of Computer Graphics
2. Transformations
3. Polygon, Windowing and Clipping
4. 3D Modelling
5. Introduction to Multimedia and Animation

**Laboratory Exercises:**

1. Draw line and basic geometric shapes
2. Draw Line using DDA / Bresenham's line drawing algorithms
3. Draw circle using Bresenham's / Mid-point Circle Drawing algorithms
4. 2-D Transformations
5. Polygon Filling
6. Line Clipping
7. Animation

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

**Learning Resources:**

**Text Books:**

1. Computer Graphics – Donald Hearn & M. Pauline Baker, Pearson Education.
2. Computer Graphics – A Programming Approach – Steven Harrington – 2nd Ed, McGraw Hill International Editions.
3. Gonzalez, Woods, "Digital Image Processing" Addison Wesley.

**Reference Books:**

1. J. Foley, V. Dam, S. Feiner, J. Hughes, — Computer Graphics Principles and Practice, 2nd Edition, Pearson Education, 2003, ISBN 81 – 7808 – 038 – 9.
2. D. Rogers, J. Adams, — Mathematical Elements for Computer Graphics, 2nd Edition, Tata McGraw Hill Publication, 2002, ISBN 0 – 07 – 048677 – 8.
3. F.S. Hill JR, "Computer Graphics Using Open GL", Pearson Education.
4. Alan H. Watt and Mark Watt, "Advanced Animation and Rendering Techniques: Theory and Practice", Addison-Wesley, ACM Press, ISBN: 0201544121.

**Supplementary Reading**

**Web Resources:**

1. https://www.geeksforgeeks.org/getting-started-with-opengl/

**Web links:**

1. http://nptel.ac.in/courses/106102065/
2. https://nptel.ac.in/courses/117/105/117105083/

**MOOCs:**

1. https://www.edx.org/learn/computer-graphics

**Pedagogy:**

1. PowerPoint Presentation
2. White-board / Pen / Smart board
3. Two Teacher method
4. Video Lectures
5. Flipped Classroom Activity

**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 learning / Mini Project/Additional implementation/ On paper design | End term practical /oral examination |
|---|---|---|
| 10 Marks | 10 Marks | 10 Marks |

**Term End Examination: 40 Marks**

MIT-WPU
Approved by
Academic Council
Date 23 JUL 2022

Dr.Prasad Khandekar
Dean

**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs Theory |
|---|---|---|
| 1 | **Basic Concepts of Computer Graphics**<br>Introduction to Computer Graphics, Applications of computer graphics, Graphics primitives, concept of pixel, frame buffer, resolution, Graphics file format, aspect ratio.<br>**Line Drawing Algorithms:** Digital Differential Analyzer (DDA), Bresenham algorithm.<br>**Circle Drawing Algorithm:** DDA, Bresenham, Midpoint Circle algorithm. | 09 |
| 2 | **Transformations**<br>**2-D transformations:** Introduction, translation, scaling, reflection, shearing and rotation, homogeneous coordinates, Coordinate Transformations, composite transformations - Rotation about an arbitrary point and reflection about an arbitrary line/axis, other transformations.<br>**3-D transformations:** Introduction, 3-D transformations - Translation, scaling, rotation and shear, rotation about an arbitrary axis. | 09 |
| 3 | **Polygon, Windowing and Clipping**<br>**Polygons:** Introduction to polygon, types: convex, concave and complex. Inside test.<br>**Polygon Filling:** flood fill, seed fill, scan line fill.<br>**Windowing and clipping:** viewing transformations, 2-D clipping: Cohen – Sutherland line Clipping algorithm, Sutherland Hodgeman Polygon clipping algorithm. | 09 |
| 4 | **3D Modelling**<br>**Colour models:** Properties of Light, CIE chromaticity Diagram, RGB, HSV, CMY.<br>**Illumination Models:** Ambient Light, Diffuse reflection, Specular Reflection, and the Phong model, combined diffuse and Specular reflections with multiple light sources, warn model,<br>**Shading Algorithms:** Halftone, Gauraud and Phong Shading. **Hidden Surfaces** Introduction, Back face detection and removal, Algorithms: Depth buffer (z), Depth sorts (Painter), Area subdivision (Warnock). | 09 |
| 5 | **Introduction to Multimedia and Animation**<br>**Introduction to Multimedia:** Text (DOC, PDF), Image (TIFF, JPEG, GIF), Audio (WAV, AVI, MPEG) Video (MOV, MPEG) file formats<br>**Animation:** Basics of animation, types of animation, principles of animation, Methods of controlling animation, frame-by-frame animation techniques, real-time animation techniques | 09 |

MIT-WPU
Approved by
Academic Council
Date 23 JUL 2022

Dr.Prasad Khandekar
Dean

**Laboratory:**

| Assignment No. | Contents | Workload in Hrs |
|---|---|---|
| | | Lab |
| 1 | Write C/C++ program to draw line and basic geometric shapes using standard library functions. | 04 |
| 2 | Write C/C++ program to draw line using DDA / Bresenham's line drawing algorithms. | 04 |
| 3 | Write C/C++ program to draw circle using Bresenham's / Mid-point Circle Drawing algorithms. | 04 |
| 4 | Write C/C++ program to perform following 2-D Transformations:<br>1. Scaling 2. Translation 3. Rotation 4. Reflection 5. Shearing | 04 |
| 5 | Write C++ program to draw a concave polygon and fill it with desired color using flood/seed/scan line fill algorithm. | 04 |
| 6 | Write C++ program to implement Cohen Southerland line clipping algorithm. | 04 |
| 7 | a) Create a simple animation using OpenGL:<br>i) Clock with pendulum or<br>ii) Vehicle locomotion<br>b) Animation using any open source tool. | 06 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

# COURSE STRUCTURE

| Course Code | CET4004B | | | |
|---|---|---|---|---|
| Course Category | Professional Elective I | | | |
| Course Title | Wireless and Mobile Device Security | | | |
| Teaching Scheme and Credits | Lecture | Tutorial | Laboratory | Credits |
| Weekly load hrs | 3 hr/wk | -- | 2 hr/wk | 3+1=04 |

**Pre-requisites**:
- Computer Networks
- Information & Cyber Security

**Course Objectives:**

**1. Knowledge**
i. To understand wireless networks technologies and applications
ii. To study Ad-Hoc networks architecture and challenges

**2. Skills**
i. To know Sensor networks architecture and applications
ii. To understand basic security needs and issues in wireless networks

**3.Attitude**
i. To understand mobile device security architecture and security dynamics

**Course Outcomes:**

After completion of this course students will be able to

1. **Knowledge:**
i. Compare different wired and wireless technologies

**2.Skill:**
i. Simulate and analyse wireless Ad-Hoc networks for different protocols
ii. Analyse the security threats in wireless sensor networks

**3.Attitude:**
i. Devise and Configure wireless security in Wi-Fi networks
ii. Configure or Program security needs in mobile devices

**Course Contents:**

1. Introduction Wireless Networks
2. Ad-Hoc Wireless Networks
3. Wireless Sensor Networks
4. Security in Wireless Networks
5. Mobile device security aspects

MIT-WPU
Approved by
Academic Council
Date 23 JUL 2022

Dr.Prasad Khandekar
Dean

**Learning Resources:**

**Text Books:**

1. C. Siva Ram Murthy, B.S. Manoj, "Adhoc Wireless Networks Architectures and Protocols", PHI, ISBN - 9788131706885, 2007.
2. Nekoley Elenkov, "Android Security internals", No Starch Press, ISBN-10: 1-59327-581-1 ISBN-13: 978-1-59327-581

**Reference Books:**

1. KiaMakki, Peter Reiher, "Mobile and Wireless Network Security and Privacy ", Springer, ISBN 978-0-387-71057-0, 2007.
2. Hakima Chaouchi, Maryline Laurent-Maknavicius , "Wiress and Mobile Networks Security", Wiley publication, ISBN 978-1-84821-117-9
3. Noureddine Boudriga, "Security of Mobile Communications", ISBN 9780849379413, 2010.
4. Kitsos, Paris; Zhang, Yan, "RFID Security Techniques, Protocols and System-On-Chip Design", ISBN 978-0-387-76481-8, 2008.
5. Johny Cache, Joshua Wright and Vincent Liu," Hacking Wireless Exposed: Wireless Security Secrets & Solutions ", second edition, McGraw Hill, ISBN: 978-0-07-166662-6, 2010
6. Tim Speed, Darla Nykamp,Mari Heiser,Joseph Anderson,Jaya Nampalli, "Mobile Security: How to Secure, Privatize, and Recover Your Devices", Copyright © 2013 Packt Publishing, ISBN 978-1-84969-360-8

**Supplementary Reading:**

**Web Resources:**

1. http://whatis.techtarget.com/definition/mobile-security
2. http://techgenix.com/security/mobile-wireless-security/

**Web links:**

1. https://en.wikipedia.org/wiki/Mobile_security

**MOOCs:**

1. https://www.ntnu.edu/studies/courses/TTM4137#tab=omEmnet
2. http://nptel.ac.in/courses/106105160/37
3. https://www.eccouncil.org/
4. https://www.csoonline.com/article/2122635/mobile-security/wireless-security--the-basics.html

**Pedagogy:**

1. Power Point Presentation,
2. White-board / Pen,
3. Demos of Security tools,
4. Online Quizzes, Video
5. Clips,
6. Oral Questions and Answers.

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

**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 learning / Mini Project/Additional implementation/ On paper design | End term practical /oral examination |
|---|---|---|
| 10 Marks | 10 Marks | 10 Marks |

**Term End Examination: 40 Marks**

**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs Theory |
|---|---|---|
| 1 | **Introduction Wireless Networks** Introduction to Wireless LAN, PAN, MAN, WAN- Technical issues, Network Architecture, Advantages. Overview of IEEE 802.11, 802.15, 802.16- Architecture, Features and applications. Mac protocols- CSMA-CA, Hidden station and exposed station problems. Mobile cellular networks - Generations overview, features and applications. Cellular architecture system, Handoffs and Handover. Introduction to NFC, Introduction to Ultra-Wide Band Communication. | 09 |
| 2 | **Ad-Hoc Wireless Networks** Ad-Hoc Wireless Networks: Properties and Challenges, Applications and Issues in MAC design in Ad-Hoc wireless networks, Design Goals of MAC. Routing design issues in Ad-Hoc networks. Classifications of Routing protocols, Table Driven: DSDV, WRP, CGR. On Demand: AODV and DSR, TORA protocol, Introduction to Multicast Routing Protocols | 09 |
| 3 | **Wireless Sensor Networks** Introduction, Applications, Challenges in design issues in sensor networks, Architecture of sensor networks: Layered Architecture, Clustered Architecture, Overview of Data Dissemination techniques, Introduction to | 09 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

| | | |
|---|---|---|
| | Data Gathering techniques. Overview of Positioning, Localization and Synchronization in Sensor networks, LoRaWANs, RFID technologies. | |
| 4 | **Security in Wireless Networks**<br>Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks and other attacks, Key Management in Adhoc Wireless Networks, Requirements of a Secure Routing Protocol for Ad Hoc Wireless Networks, Overview of WiFi security, Issues in WiFi Security, Access Point security, Authentication in Wireless networks, Security in IPV4 and IPv6 protocols. | 09 |
| 5 | **Mobile Device Security**<br>Introduction to Device management and security, Android device architecture, Android Security Model, Device Permissions, Details of Device Security: Controlling OS Boot-Up and Installation, Verified Boot, Disk Encryption, Screen Security, Secure USB Debugging, device Backup, NFC Secure Elements. | 09 |

**Laboratory:**

| Assignment No | Contents | Work Load In Hrs<br>Lab |
|---|---|---|
| 1 | Install and Configure Network Simulator tool such as Network Simulator 2 or NetSim or QualNet and study its components and eco system. | 4 |
| 2 | Write a program to simulate two nodes wireless network. You may use NetSim or NS2 or QualNet for this experiment. | 2 |
| 3 | Write a program to simulate routing in mobile Ad-Hoc network with multiple nodes. You may use NetSim or NS2 or QualNet for this experiment. | 2 |
| 4 | Study the security permissions for applications in android phones. Either demonstrate Android security permission configurations or Write the android app to demonstrate permissions usage control in android phones. | 4 |
| 5 | Write an android program to encrypt and decrypt text file. Use Bouncy castle library API or Java cryptography API. | 2 |
| 6 | Write a program for user authentication application in Java or Python. Send OTP (one time passwords) to your mobile phones from this application and validate that OTP. It should tell of OTP is correct or wrong. Also add timing restriction in the application. | 2 |
| 7 | Configure access point and manage the access control for security. Access point is a networking hardware device that allows a Wi-Fi device to connect to a wired network. | 2 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

| | | |
|---|---|---|
| 8 | Study, comparison and configuration of different types of Access points routers such CISCO, TP Link, DLink, Link Sys, NetGear. Study Technical specification of such a Wi-Fi router. | 2 |
| 9 | Install, Configure and Demonstrate any one Wi-Fi traffic analyzer using sniffing tools such as WireShark, airCrack, AirSnort, etc. | 2 |
| 10 | Consider Android and iPhone device. Analyse, experiment all aspects of device security in these mobile devices. Compare and contrast pros and cons. | 4 |
| 11 | Write an Android Application to create secured mobile wallet with cryptographic algorithms | 4 |
| 12 | Home Automation (Monitoring and Control) with ZigBee Devices: Scenario Description: ZigBee allows small, low-cost devices to quickly transmit small amounts of data such as temperature readings for thermostats, on/off requests for light switches, or keystrokes for a wireless keyboard. The scenario shows an application of ZigBee technology for Home Automation. It demonstrates the monitoring and control capability that can be achieved with ZigBee. | 2 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

# COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CET2007B** | | | |
| **Course Category** | **Professional Core** | | | |
| **Course Title** | **Artificial Intelligence and Expert Systems** | | | |
| **Teaching Scheme and Credits** | **Lecture** | **Tutorial** | **Laboratory** | **Credits** |
| **Weekly load hrs** | **03 hr/wk** | **--** | **02 hr/wk** | **3+1=3** |

**Pre-requisites**:
- Mathematics
- Fundamentals of Data Structure

**Course Objectives:**

**1. Knowledge:**
1. To understand the concept of Artificial Intelligence (AI)
2. To learn various search strategies for AI

**2. Skills:**
1. To develop a mind to solve real world problems with optimality
2. To explore knowledge representation techniques, planning and expert systems.

**3. Attitude:**
1. Ability to solve real life problems using concepts of AI

**Course Outcomes:**
1. Identify and apply suitable Intelligent agents for various AI applications
2. Design smart systems using different informed search / uninformed search or heuristic approaches.
3. Apply suitable knowledge representation techniques for designing expert systems.
4. Apply different artificial intelligence techniques to solve real world problems.

**Course Contents:**
1. Introduction to Artificial Intelligence and Search Strategies
2. Knowledge Representation and Planning
3. Knowledge Inference and Expert System
4. Uncertain Knowledge and Reasoning
5. Advanced topics and Applications of AI

**Laboratory Exercises:**

1. Implement problem solver using A* algorithm: 8 puzzle, pacman, : (PyPlot Game project)
2. Implement game play with adversarial search using minimax algorithm: eg. Tic tac toe, Chess
3. Write a program to solve Constraint Satisfaction problem (Map coloring problem and crypt-arithmetic problem solver, Sudoku)
4. Implement a Unification algorithm and test it for various input cases.
5. Demonstrate reasoning/inferencing using logic programming: Prolog / Swi-Prolog / JESS (Java Expert System Shell)

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

6. Implement a local search algorithm or genetic algorithm using e.g. chess, n-queens, travelling salesman problem
7. Write a program to build a fuzzy system. eg. controller for air conditioning system, tipping problem
8. Implement a chatbot using techniques of Natural Language Processing
9. Implement a Neural network for a real-life application
10. Mini Project

**Learning Resources:**

**Text Books:**

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson, Education, 2003.
2. E. Rich and K. Knight, Artificial Intelligence, Tata McGraw Hill, 1992.

**Reference Books:**

1. Ethem Alpaydin, Introduction to Machine Learning, PHI, 2013
2. Santanu Patttanayak, Intelligent Projects using Python, Packt Publications
3. Dan W Patterson,Introduction to Artificial Intelligence & Expert Systems, PHI., 2010
4. S Kaushik, Artificial Intelligence, Cengage Learning, 1st ed.2011.

**Supplementary Reading:**

**Web Resources:**

1. https://www.cse.iitk.ac.in/users/cs365/2016/
2. https://www.khanacademy.org/computing/computer-science/
3. https://www.hackerrank.com/contests

**Weblinks:**

1. www.nptel.ac.in/course.php,
2. https://videoken.com,
3. https://www.tutorialspoint.com

**MOOCs:**

1. https://www.edx.org/course/artificial-intelligence-ai-columbiax-csmm-101x-0

**Pedagogy:**

1. PowerPoint Presentation
2. Video Lectures
3. Flipped Classroom Activity
4. Group Discussion
5. White Board

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

**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 learning / Mini Project/Additional implementation/ On paper design | End term practical /oral examination |
|---|---|---|
| 10 Marks | 10 Marks | 10 Marks |

**Term End Examination: 40 Marks**

**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Theory |
| 1 | **Introduction to Artificial Intelligence and Search Strategies**<br>History and Introduction to AI, Intelligent Agent, Types of agents, Environment and types, Typical AI problems<br>Search Strategies: Problem solving and formulating a problem, State Space Search - Uninformed and Informed Search Techniques, Heuristic function, A*, AO* algorithm, Hill climbing, Constraint satisfaction method, Game Playing: Minimax algorithm, alpha beta cut offs | 10 |
| 2 | **Knowledge Representation and Planning**<br>Propositional logic and predicate logic, Knowledge Representation structure such as frame, Conceptual dependencies, Semantic networks and script, Resolution in predicate logic, Unification algorithm, Forward and Backward chaining, Planning: Forward and Backward planning, Goal Stack Planning, Hierarchical Planning. | 09 |
| 3 | **Knowledge Inference and Expert System**<br>Basics of Probability, Markov Model, Statistical reasoning, Bayes' Theorem and its use, Bayesian learning and network. Expert systems: Architecture of Expert system, Role of Expert system, Inference engine, Knowledge acquisition, Typical Expert systems- MYCIN, Expert systems shells, Applications of Expert systems. | 09 |
| 4 | **Uncertain Knowledge and Reasoning**<br>Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use, Representing Knowledge in an Uncertain Domain, | 09 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

| | | |
|---|---|---|
| | The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Exact Inference, in Bayesian Networks | |
| 5 | **Advanced topics and Applications of AI**<br>Applications of AI, Artificial Neural Network, Deep learning, Fuzzy logic, Natural Language Processing, Introduction to Machine Learning, Introduction to Robotics and Computer Vision, Applications of AI in Business. | 08 |

**Laboratory:**

| Assignment No | Contents | Workload in Hrs |
|---|---|---|
| | | Lab |
| 1 | Implement problem solver using A* algorithm to solve 8 puzzle problem. | 4 |
| 2 | Implement game play with adversarial search using mini_max algorithm: eg. Tic tac toe, chess | 2 |
| 3 | Write a program to solve Constraint Satisfaction problem (Map coloring problem and crypt-arithmetic problem solver, Sudoku) | 2 |
| 4 | Implement a Unification algorithm and test it for various input cases. | 2 |
| 5 | Implement a local search algorithm or genetic algorithm for eg chess, n-queens, travelling salesman problem | 4 |
| 6 | Implement a chat bot using techniques of Natural Language Processing | 4 |
| 7 | Develop expert system using prolog. | 4 |
| 8 | Implement a Neural network for a real life application | 4 |
| 9 | AI Mini Project | 4 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

# COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CET3004B** | | | |
| **Course Category** | **Programme Core Engineering** | | | |
| **Course Title** | **Information and Cyber Security** | | | |
| **Teaching Scheme and Credits** | **Lecture** | **Tutorial** | **Laboratory** | **Credits** |
| **Weekly load hrs.** | **3 hr/wk** | **--** | **02 hr/wk** | **3+1=4** |

**Pre-requisites**:
- Operating Systems
- Computer Networks

**Course Objectives:**

**1. Knowledge:**
i. To focus on the models, tools, and techniques for enforcement of security with some emphasis on the use of cryptography. Students will learn security from multiple perspectives.
ii. To educate students on the fundamental principles and techniques of computer and network security.

**2. Skills**
i. Acquire background on hash functions; authentication; firewalls; intrusion detection techniques
ii. Gain hands-on experience with programming and simulation techniques for security protocols

**3. Attitude**
**i.** Understand the tradeoffs and criteria/concerns for security countermeasure development.
ii. Learn to apply methods for authentication, access control, intrusion detection and prevention

**Course Outcomes:**

1. Analyze and resolve security issues in networks and computer systems to secure an IT infrastructure.
2. Apply methods for authentication, access control, intrusion detection and prevention
3. Develop policies and procedures to manage enterprise security risks.
4. Evaluate and communicate the human role in security systems with an emphasis on ethics, social engineering vulnerabilities and training.
5. Identify software security vulnerabilities, summarize and mitigate security risks associated with integrating systems.

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

**Course Contents:**

1. Foundations of Information Security
2. Mathematical Foundations and Public Key Cryptography
3. Authentication and Digital Signatures
4. Network and Cyber Security
5. Cybersecurity Techniques, Tools and Laws

**Laboratory Exercises:**

1. Implementation of classical cryptographic technique.
2. Implementation of Feistal Cipher structure
3. Implementation of S-AES symmetric key algorithm.
4. Implementation of RSA asymmetric key algorithm.
5. Implementation of integrity of message using MD5 or SHA
6. Implementation of Diffie-Hellman Key Exchange Algorithm.
7. Implementation of Digital signature using DSA.
8. Demonstration of Email Security using - PGP or S/MIME for Confidentiality, Authenticity and Integrity.
9. Demonstration of secured web applications system using SSL certificates and its deployment in Apache tomcat server
10. Configuration and demonstration of Intrusion Detection System using Snort.
11. Configuration and demonstration of NESSUS tool for vulnerability assessment.

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

**Learning Resources:**

**Reference Books:**

1. Michael E. Whitman and Herbert J. Mattord , "Principles of Information Security", Cengage Learning; ISBN: 1285448367
2. Christof Paa and Jan Pelzl, "Understanding Cryptography: A Textbook for Students and Practitioners", Springer; ISBN: 3642041000
3. William Stallings and Lawrie Brown, "Computer Security: Principles and Practice", Prentice Hall. Swiderski, Frank and Syndex, "Threat Modeling", Microsoft Press.
4. ohn W. Rittinghouse, William M. Hancock, "Cyber Security Operations Handbook", ElsevierPub.
5. Deborah G Johnson, "Computer Ethics", 4th Edition, Pearson Education Publication. 7. Earnest A. Kallman, J.P Grillo, "Ethical Decision making and IT: An Introduction with Cases", McGraw Hill Publication.

**Supplementary Reading:**

**Web Resources:**

1. https://www.newhorizons.com/promotions/cybersecurity-ebooks

**MOOCs and Weblinks:**

1. COURSERA, NPTEL, etc.
2. https://nptel.ac.in/courses/106106129
3. https://www.udemy.com/course/hands-on-penetration-testing-labs-30/

**Pedagogy:**

1. At the start of course, the course delivery pattern, prerequisite of the course will be discussed. Lectures will be conducted with the aid of multi-media projector, Smart board, etc. One internal Mid-Term Test will be conducted as a part of internal theory class continuous assessment.
2. Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.
3. Surprise tests/Quizzes/Seminar/Active Learning will be conducted having a share of marks in the overall internal evaluation.
4. The course includes a laboratory, where students have an opportunity to implement the concepts being taught in lectures.
5. Lab. Experiments shall be performed in the laboratory related to course contents.

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

**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 learning / Mini Project/Additional implementation/ On paper design | End term practical /oral examination |
|---|---|---|
| 10 Marks | 10 Marks | 10 Marks |

**Term End Examination: 40 Marks**

**Syllabus: Theory**

| Module No. | Contents | Workload in Hours |
|---|---|---|
| | | Theory |
| 1 | **Foundations of Information Security** Information Security fundamentals, it's need, Confidentiality, Integrity, Availability (CIA triad), Security Policies, Procedures, Guidelines, Standards Administrative Measures and Technical Measures, Attacks, Vulnerability, Security Goals, Security Services and Defence mechanisms **Cryptographic Techniques** Conventional substitution and transposition ciphers, One-time Pad, Block cipher and Stream Cipher, Cipher modes of operations Steganography. Symmetric Cryptographic Techniques: DES, AES | 09 |
| 2 | **Mathematical Foundations and Public Key Cryptography** Mathematics for Security: Modular Arithmetic, Euler's theorem, Fermat Theorem, Euclidean Algorithm, Miller-Rabin Algorithm, Primality Test, Chinese Remainder Theorem, Discrete Logarithm, Asymmetric Key Cryptography: RSA algorithms. Hash algorithms: MD5, SHA1. | 09 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

| | | |
|---|---|---|
| 3 | **Authentication and Digital Signatures**<br>Use of Cryptography for authentication, Secure Hash function, Key Management and Distribution: Symmetric Key Distribution, Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public Keys Cryptographic Key Infrastructures, Diffie-Hellman Key Exchange, Digital Certificates x509. Authentication Protocols:Remote, Mutual Authentication, Authentication Methods: Password, Two way methods, Biometric Authentications, Kerberos Security | 09 |
| 4 | **Network and Cyber Security**<br>Networks Security Fundamentals, Layer-wise Security concerns, Firewalls: Packet filtering, Stateless and Stateful, Intrusion detection systems: host based, network based IDS, Secured Socket Layer Security, IP level IPSEC security, Email Security: PGP, S/MIME.<br>**Cyber Security:** Definition and origin, Cyber Crime and information security, Types of Cyber Crime, Classification of Cyber Criminals, Tools used in Cyber Crime, Challenges, Strategies, The Legal Perspective-Indian/Global Perspective, Types of Attack, Social Engineering, Cyber stalking, Ransomware. | 09 |
| 5 | **Cybersecurity Techniques, Tools and Laws**<br>Introduction, Proxy servers and Anonymizers, Phishing, Password Cracking tools, Key-loggers and Spywares, DoS and DDoS, Viruses, Worms, Trapdoors, Salami attack, Man-in-the- middle attacks, Covert channels, SQL injection, Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics. Cybercrime and Legal perspectives, Cyber laws Indian context, The Indian IT Act-Challenges, Amendments, Challenges to Indian Law and cybercrime Scenario in India, Indian IT Act and Digital Signatures. | 09 |

**Laboratory:**

| Assignment No. | Contents | Workload in Hours |
|---|---|---|
| | | Lab. |
| 1 | Write a program using JAVA or Python or C++ to implement any classical cryptographic technique. | 02 |
| 2 | Write a program using JAVA or Python or C++ to implement Feistal Cipher structure | 02 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

| | | |
|---|---|---|
| 3 | Write a program using JAVA or Python or C++ to implement S-AES symmetric key algorithm. | 02 |
| 4 | Write a program using JAVA or Python or C++ to implement RSA asymmetric key algorithm. | 02 |
| 5 | Write a program using JAVA or Python or C++ to implement integrity of message using MD5 or SHA | 02 |
| 6 | Write a program using JAVA or Python or C++ to implement Diffie Hellman Key Exchange Algorithm. | 02 |
| 7 | Write a program using JAVA or Python or C++ to implement Digital signature using DSA. | 02 |
| 8 | Demonstrate Email Security using - PGP or S/MIME for Confidentiality, Authenticity and Integrity. | 04 |
| 9 | Demonstration of secured web applications system using SSL certificates and its deployment in Apache tomcat server | 04 |
| 10 | Configuration and demonstration of Intrusion Detection System using Snort. | 04 |
| 11 | Configuration and demonstration of NESSUS tool for vulnerability assessment. | 04 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

# COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CET2002B** | | | |
| **Course Category** | **Professional Core** | | | |
| **Course Title** | **Database Management Systems** | | | |
| **Teaching Scheme and Credits** | **Lecture** | **Tutorial** | **Laboratory** | **Credits** |
| **Weekly load hrs** | **3 hr/wk** | **–** | **2 hr/wk** | **3+1=4** |

**Pre-requisites:**

- Fundamentals of Data Structures
- Discrete Mathematics and Graph Theory
- Software Engineering and Project Management

**Course Objectives:**

**1. Knowledge**

i. Understand the fundamental concepts of database management System
ii. To provide a strong formal foundation in database concepts, DBMS architectures recent technologies and best industry practices.

**2. Skills**

i. To learn the SQL database system.
ii. To program PL/SQL including stored procedures, stored functions, cursors and packages.

**3. Attitude**

i. To design the database system for real world applications.
ii. To access, modify, program and authenticate the database system.

**Course Outcomes:**

After the completion of course, students will be able to

1. Understand the different data models and develop Database system for real world applications
2. Improve the Database design by normalization
3. Make use of SQL and construct relevant queries to retrieve the data
4. Implement relational Database design from any data model
5. Handle basic issues of transaction processing and concurrency control

**Course Contents:**

**Laboratory Exercises:**

1. Case Study on ER and Conversion of ER into Tables
2. SQL- DDL commands (Create, Alter, Drop, Truncate Rename, Describe), DCL (Grant, Revoke)
3. SQL- DML (Insert, Update, Delete), SQL Select- Logical IN, Negation, NULL, Comparison Operators. Where Clause, Between AND, Exists, ALL, LIKE
4. SQL Queries on Joins (Inner, Outer, Natural, Self)
5. SQL Queries on: Functions-Single Row, Aggregate Functions, Data Sorting, Subquery, Group by-Having, Set Operations, View. TCL Commands

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

6. PLSQL Procedures and Functions
7. PLSQL Triggers
8. PLSQL Cursors
9. Design XML schema write XQUERY to display the data.
10. Create a JSON document and write the JSON query to display the data.
11. Mini Project

**Learning Resources:**

**Text Books:**

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts 6th Ed, McGraw Hill, 2010.
2. Elmasri R. and Navathe S.B., "Fundamentals of Database Systems", 4th Edition, Pearson Education.

**Reference Books:**

1. Ramakrishnan, R. and Gherke, J., "Database Management Systems", 3rd Ed., McGraw-Hill.
2. Connolly T, Begg C.,Database Systems: A Practical Approach to Design, Implementation, and Management, 6th Edition

**Laboratory Reference Books:**

1. Ivan Bayross, "SQL, PL/SQL: The Programming Language of Oracle", 3rd Edition BPB Publication
2. Reese G., Yarger R., King T., Williums H, "Managing and Using MySQL", O'Reilly Media, Inc., ISBN: 9780596002114, 2nd Edition

**Supplementary Reading:**

**Web Resources:**

1. https://www.mysql.com/
2. http://www.oracletutorial.com/
3. https://www.oreilly.com/library/view/managing-using/0596002114/

**Weblinks:**

1. https://www.db-book.com/db6/slide-dir/
2. https://www.mysqltutorial.org/

**MOOCs:**

1. https://nptel.ac.in/courses/106105175
2. https://www.coursera.org/learn/Database-management

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

**Pedagogy:**

1. White Board
2. PowerPoint Presentations
3. Expert Lecturers
4. Blended Teaching Learning
5. Flipped Classroom, Think Pair Share
6. Project Based Learning

**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 learning / Mini Project/Additional implementation/ On paper design | End term practical /oral examination |
|---|---|---|
| 10 Marks | 10 Marks | 10 Marks |

**Term End Examination: 40 Marks**

**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Theory |
| 1 | **Introduction to DBMS and Data Modelling**<br>DBMS Vs File Systems, Database System Architecture, Database Architectures: Centralized, Client-Server, Parallel, Distributed, Data Abstraction, Data Independence, Data Definition and Data Manipulation Languages, Data Models , E-R diagram: Components of E-R Model, Conventions, Keys, EER diagram Components, Reduce E-R diagram into tables | 09 |
| 2 | **Relational Database Design and Normalisation**<br>Relational Model: Attributes, Tuple, Domain, CODD's rule Relational Integrity, Referential Integrities, Enterprise Constraints, Normalisation: 1NF, 2NF, 3NF, BCNF, Functional Dependency, Decomposition<br>**Query Processing:** Overview, Measures of Query cost, Selection and Join operations, Evaluation of Expressions<br>Introduction to Query optimization: Estimation, Transformation of Relational Expression | 09 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

| | | |
|---|---|---|
| 3 | **Relational Algebra and Database Programming**<br>Relational Algebra, Basic Operations, Relational calculus: Tuple Calculus, Domain Calculus, Introduction to SQL, Characteristics and advantages of SQL, SQL Data Types, DDL Commands, DCL Commands. **SQL Queries**: DML Queries with Select Query Clauses, Creating, Modifying, Deleting. **Views**: Creating, Dropping, Updating, Indexes, SQL DML Queries, Set Operations, Predicates and Joins, Set membership, Grouping and Aggregation, Aggregate Functions, Nested Queries | 09 |
| 4 | **Advanced Database Programming**<br>**PL/SQL Concepts**: PL/SQL Functions and Procedures, Cursors, Database Triggers. Query Processing and Optimization.<br>Complex Data Types: Semi structure data: XML, Document Type Definitions (DTDs), XML Schemas, XPATH, XSL, XSLT<br>Unstructured data: JSON, Data types, Application of DBMS | 09 |
| 5 | **Transaction Management and Concurrency Control**<br>ACID properties, transactions, schedules and concurrent execution of transactions, Serializability: View, Conflict.<br>Concurrency control lock based protocol (simple, 2 phase: Rigorous 2 phase, Strict 2 phase), Cascade-less Schedule, Recoverable Schedule, Deadlocks: Prevention Techniques (Wait Die, Wound Wait), Detection Techniques, Database Recovery: Failure classification Recovery and atomicity: Log-based recovery, Shadow paging. | 09 |

**Laboratory:**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Lab |
| 1 | Case Study on ER and Conversion of ER into Tables | 04 |
| 2 | SQL- DDL commands( Create, Alter, Drop, Truncate Rename, Describe) ,DCL(Grant, Revoke) | 02 |
| 3 | SQL- DML (Insert, Update, Delete), SQL Select- Logical IN, Negation, NULL, Comparison Operators. Where Clause, Between AND, Exists, ALL, LIKE | 04 |
| 4 | SQL Queries on Joins(Inner, Outer, Natural, Self) | 02 |
| 5 | SQL Queries on: Functions-Single Row, Aggregate Functions, Data Sorting, Subquery, Group by-Having, Set Operations, View. TCL Commands | 02 |
| 6 | PLSQL Procedures and Functions | 02 |
| 7 | PLSQL Triggers | 02 |
| 8 | PLSQL Cursors | 04 |
| 9 | Design XML schema write XQUERY to display the data. | 02 |
| 10 | Create a JSON document and write the JSON query to display the data. | 02 |
| 11 | Mini Project | 04 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

# COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CET3006B** | | | |
| **Course Category** | **Professional Core** | | | |
| **Course Title** | **Machine Learning** | | | |
| **Teaching Scheme and Credits** | **Lecture** | **Tutorial** | **Laboratory** | **Credits** |
| **Weekly load hrs** | **03 hr/wk** | **--** | **2 hr/wk** | **3+1=4** |

**Pre-requisites**:
- Artificial Intelligence

**Course Objectives:**

**1.Knowledge:**
i. To learn data preparation techniques for Machine Learning methods
ii. To understand advance supervised and unsupervised Learning methods

**2.Skills:**
i. To apply suitable pre-processing techniques on various datasets for Machine Learning applications.
ii. To design and implement various advanced supervised and unsupervised learning methods

**3.Attitude;**
i. To be able to choose and apply suitable ML techniques to solve the problem
ii. To compare & analyse various advanced supervised and unsupervised learning methods.

**Course Outcomes:**

**After completion of the course the students will be able to:**
1. Analyze and apply different data preparation techniques for Machine Learning applications
2. Identify, Analyze and compare appropriate supervised learning algorithm for given problem
3. Identify, Analyze and Compare Unsupervised and semi supervised algorithms
4. Design and implement Machine Learning techniques for real-time applications

**Course Contents:**
1. Introduction to ML
2. Supervised Learning: Classification
3. Unsupervised Learning: Clustering
4. Performance Analysis and Model Evaluation
5. Trends in ML

**Laboratory Exercises:**
1. Demonstrate feature selection techniques for a dataset from UCI ML library.
2. Implement exploratory data analysis for IRIS dataset.
3. Implementation of Tree based Classifiers.
4. Implementation of SVM, Comparison with Tree Based Classifier
5. Implementation of Ensemble, Random Forests. Analyze the Performance.
6. Implementation and Comparison of various clustering techniques such as Spectral and DBSCAN.
7. Demonstrate perform analysis on a given dataset to find accuracy, precision, recall and confusion matrix for supervised learning algorithms.
8. Mini-Project based on suitable Machine Learning dataset

Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

**Learning Resources:**

**Text Books:**

1. E. Alpaydin, Introduction to Machine Learning, PHI, 2004.
2. Peter Flach: Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press, Edition 2012.
3. T. Mitchell, Machine Learning, McGraw-Hill, 1997.
4. Josh Patterson, Adam Gibson, "Deep Learning: A Practitioners Approach", O"REILLY, SPD, ISBN: 978-93-5213-604-9, 2017 Edition 1st

**Reference Books:**

1. C. M. Bishop: Pattern Recognition and Machine Learning, Springer 1st Edition-2013.
2. Ian H Witten, Eibe Frank, Mark A Hall: Data Mining, Practical Machine Learning Tools and Techniques, Elsevier, 3rd Edition.
3. Shaishalev-shwartz, Shai Ben-David: Understanding Machine Learning from Theory to algorithms, Cambridge University Press, ISBN-978-1-107-51282-5, 2014.

**Supplementary Reading:**

1. AurelienGeron, "Hands-on Machine Learning with Scikit-learn and Tensor flow, O'Reilly Media

**Web Resources:**

1. Popular dataset resource for ML beginners: http://archive.ics.uci.edu/ml/index.php

**Web links:**

1. https://www.kaggle.com/datasets
2. http://deeplearning.net/datasets/

**MOOCs:**

1. https://swayam.gov.in/nd1_noc20_cs29/preview
2. https://swayam.gov.in/nd1_noc20_cs44/preview

**Pedagogy:**

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

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

**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 learning / Mini Project/Additional implementation/ On paper design | End term practical /oral examination |
|---|---|---|
| 10 Marks | 10 Marks | 10 Marks |

**Term End Examination: 40 Marks**

**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Theory |
| 1 | **Introduction to ML**<br>Data Preparation, Data Encoding Techniques, Data Pre-processing techniques for ML applications.<br>Feature Engineering: Dimensionality Reduction using PCA, Exploratory Data Analysis, Feature Selection, | 10 |
| 2 | **Supervised learning techniques: Classification**<br>Regression Analysis: Residual Analysis, Multiple Linear Regression, Logistic regression<br>Distance Based Models: Nearest Neighbor Classification<br>Tree Based Models: Decision Trees<br>Probabilistic Model: Naïve Bayes Classifier<br>Support Vector Machine: Maximum Margin Classifier, Kernels, SVM, Case Study | 09 |
| 3 | **Unsupervised learning: Clustering**<br>Distance based clustering algorithms - K-means Clustering, Hierarchical, clustering, K-Medoids and density-based clustering, Measures of quality of clustering. Implementation using Sklearn. | 09 |
| 4 | **Performance Analysis and Model Evaluation**<br>Model Evaluation and Selection, , bias, variance, Ensemble classifiers, Bagging and Boosting, Training versus Testing Samples, Positive and Negative Class, Confusion Matrix for Model Evaluation, Model | 08 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

| | | |
|---|---|---|
| | Selection, Implementation and Evaluation using Scikit- learn library. Improving Classification Accuracy of Class-Imbalanced Data | |
| 5 | **Trends in Machine Learning** Bayesian Belief Networks, Concepts and Mechanisms, Genetic Algorithms, Reinforcement Learning, Active Learning, Transfer Learning, Advance ML applications. | 09 |

**Laboratory:**

| Assignment No. | Content | Workload in Hrs |
|---|---|---|
| | | Lab |
| 1 | Demonstrate feature selection techniques for a dataset from UCI ML library. | 04 |
| 2 | Implement exploratory data analysis for IRIS dataset. | 04 |
| 3 | Implementation of Tree based Classifiers (any two) | 04 |
| 4 | Implementation of SVM, Comparison with Tree Based Classifier | 04 |
| 5 | Implementation of Ensemble, Random Forests. Analyze the Performance. | 04 |
| 6 | Implementation and Comparison of various clustering techniques such as Spectral and DBSCAN. | 04 |
| 7 | Demonstrate perform analysis on a given dataset to find accuracy, precision, recall and confusion matrix for supervised learning algorithms. | 02 |
| 8 | Mini-Project based on suitable machine learning dataset | 06 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

# COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CET3016B** | | | |
| **Course Category** | **Professional Core** | | | |
| **Course Title** | **Analysis of Algorithms** | | | |
| **Teaching Scheme and Credits** | **Lecture** | **Tutorial** | **Laboratory** | **Credits** |
| **Weekly load hrs** | **03 hr/wk** | **01 hr/wk** | **--** | **03+01=04** |

**Pre-requisites**:
- Fundamentals of Data Structures
- Advanced Data Structures

**Course Objectives:**

**1.Knowledge:**
i. Study the performance analysis of algorithms.
ii. Select algorithmic strategies to solve given problem.

**2. Skills:**
i. Explore solution space to solve the problems.

**3. Attitude:**
i. Provide the knowledge about complexity theory.

**Course Outcomes:**
1. After completion of this course students will be able to:
2. Analyse the algorithm complexity using asymptotic notations and describe the divide-and-conquer paradigm and recite algorithms that employ this paradigm.
3. Describe greedy and dynamic programming algorithmic strategies and analysis algorithms that employ this paradigm.
4. Illustrate the solution space using backtracking and branch and bound algorithmic techniques.
5. Describe the concept of complexity theory.

**Course Contents:**
1. Fundamentals of Algorithms & Divide and Conquer Strategy
2. Greedy Strategy and Dynamic Programming
3. Backtracking and Branch–N-Bound
4. Complexity Theory

**Tutorial Exercises:**
1. Problem Solving/ Questions on Algorithms Analysis
2. Problem Solving/ Implementation Divide and Conquer
3. Problem Solving/ Implementation on Greedy Strategy
4. Problem Solving/ Implementation on Dynamic Programming
5. Problem Solving/ Implementation on Backtracking
6. Problem Solving/ Questions on Branch N Bound
7. Problem Solving/ Questions on Complexity Theory

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

**Learning Resources:**

**Text Books:**

1. Thomas H Cormen and Charles E.L Leiserson, "Introduction to Algorithm" Third Edition, PHI
2. Horowitz,Sahni&Rajasekaran, "Fundamentals of Computer Algorithms", 2ND Edition. University Press.

**Reference Books:**

1. Gilles Brassard and Paul Bartley, "Fundamental of Algorithms", PHI, New Delhi.
2. AnanyLevitin, "Introduction to the Design and Analysis of Algorithms" Pearson Education
3. Parag Dave, Himanshu B Dave," Design and analysis of Algorithms",2/ePearson
4. S. Dasgupta, C. H. Papadimitriou, and U. V. Vazirani," Algorithms", 1 edition, McGraw-Hill Education;

**Supplementary Reading:**

1. Jon Kleinberg, EvasTardos, "Algorithm Design", Pearson Education
2. S. Srihar , " Design and Analysis of Algorithm", Oxford University Press

**Web Resources:**

1. https://nptel.ac.in/courses/106106131/
2. https://nptel.ac.in/syllabus/106101060/
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/lecture-notes/

**Web links:**

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/lecture-videos/

**MOOCs:**

1. https://swayam.gov.in/nd1_noc19_cs47/preview
2. https://www.edx.org/course/algorithm-design-analysis-pennx-sd3x
3. https://www.coursera.org/specializations/algorithms

**Pedagogy:**

1. Power Point Presentation
2. Video Lectures
3. Flipped Classroom Activity
4. Think Pair & Share
5. Model Based Learning
6. Chalk and Board

**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**

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Theory |
| 1 | **Proof Techniques**: Contradiction, Mathematical Induction, Direct proofs, Proof by counter example, Proof by contraposition.<br>Analysis of Algorithm: Efficiency- Analysis framework, asymptotic notations – big O, theta and omega.<br>Analysis of Non-recursive and recursive algorithms: Solving Recurrence Equations using Masters theorem and Substitution method.<br>Brute Force method: Introduction to Brute Force method & Exhaustive search, Brute Force solution to 8 queens' problem. | 10 |
| 2 | **Divide and conquer** - Merge Sort, Quick sort, Large Integer multiplication, solving recurrences (substitution method & Master's theorem).<br>**Greedy strategy**: Principle, control abstraction, Knapsack problem, Job sequencing with Deadlines, Huffman Encoding. | 09 |
| 3 | **Dynamic Programming**: Principle of optimality, 0/1 Knapsack, Largest Common Subsequence, Multistage Graph problem (using Forward computation), Traveling Salesman Problem. | 09 |
| 4 | **Backtracking:** Recursive backtracking algorithm, Iterative backtracking method, 8-Queen problem, Hamiltonian Cycle, 0/1 Knapsack Problem<br>**Branch –N -Bound:** Branch–N-Bound method, Control abstractions for Least Cost Search, Bounding, FIFO branch and bound, LC branch and bound. | 09 |
| 5 | **Complexity Theory**<br>Computational Complexity, P, NP, NP Complete, NP Hard, Satisfiability problem, NP Complete Problems: Clique, Vertex Cover.<br>Basics of approximation, Randomized algorithm, Parallel Algorithms. | 08 |

**Tutorial:**

| Assignment No. | Contents | Work Load In Hrs |
|---|---|---|
| | | Lab |
| 1 | Problem solving/ questions on algorithms analysis | 02 |
| 2 | Problem solving/ implementation divide and conquer | 02 |
| 3 | Problem solving/ implementation on greedy strategy | 02 |
| 4 | Problem solving/ implementation on dynamic programming | 02 |
| 5 | Problem solving/ implementation on backtracking | 02 |
| 6 | Problem solving/ questions on branch –n-bound | 02 |
| 7 | Problem solving/ questions on complexity theory | 03 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

# COURSE STRUCTURE

| Course Code | CET3002B | | | |
|---|---|---|---|---|
| Course Category | Professional Core | | | |
| Course Title | Embedded System & Internet of Things Laboratory | | | |
| Teaching Scheme and Credits | Lecture | Tutorial | Laboratory | Credits |
| Weekly load hrs. | -- | -- | 04 hr/wk | 02 |

**Prerequisites:**

1. Programming and Problem Solving
2. Microprocessor Architecture and Interfacing
3. Computer Network

**Laboratory Objectives:**

**1.Knowledge:**

i. To understand IoT development boards and Operating systems
ii. To understand sensor interfacing with development boards

**2.Skills:**

i. To understand actuators interfacing with development boards
ii. To understand architecture protocols to disseminate sensor data

**3. Attitude:**

i. To understand web and cloud technologies use to empower IoT applications
ii. To understand integration and deployment issues through Mini real life IoT project design

**Laboratory Outcomes:**

By the end of the course, students will be able to

1. Demonstrate IoT platforms and installations, such as Raspberry-Pi/Beagle board//Node MCU ESP/ Arduino.
2. Demonstrate use of sensors with Raspberry-Pi/Beagle board//Node MCU ESP/ Arduino.
3. Demonstrate use of actuators with Raspberry-Pi/Beagle board//Node MCU ESP/ Arduino.
4. Use protocols such as MQTT/ CoAP and tools to demonstrate architecture of IOT system.
5. Demonstrate cloud and database systems to log IoT data such as Amazon / Google / MySQL etc.
6. Proof of concept for real life social or business IoT project which displays abilities such as requirements, design, implementation, analysis and deployment concerns.

**Laboratory Exercises:**

1. Study of IoT platforms, Architecture and OS setup installations
2. Interfacing Sensors
3. Interface Simple Actuators such as Stepper Motor
4. Traffic Control Using Raspberry-Pi
5. Obstacle Detection using IR Sensors
6. IoT MQTT/COAP protocol
7. Cloud System Interface using ThingSpeak or Ubidots
8. Web server installation and access in IoT platform
9. Mini IoT project design and presentation/ Simulations

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

**Learning Resources**

**Reference Books**

1. Beginning Arduino by Micheal McRoberts Publishers: Technology in Action
2. IoT Fundamental by Devid Hanes Publishers: CISCO
3. Raspberry Pi Cookbook for Python Programmers by Tim Cox Publishers: PACKT
4. The Official RaspberryPi Project Book
5. Beginning Sensor Networks with Arduino and Raspberry Pi by Charles Bell Publishers: Technology in Action
6. The Internet of Things by Hakima Chaouchi Publishers: ISTE and Willey

**Web Resources:**

**Web links:**

1. https://www.tinkercad.com/
2. https://www.netacad.com/courses/packet-tracer
3. https://gatecse.in/theory-of-computation
4. https://www.youtube.com/watch?v=eqCkkC9A0Q4
5. https://www.youtube.com/watch?v=58N2N7zJGrQ
6. https://www.slideshare.net/Shiraz316/theory-of-computation-69977770

**MOOCs:**

1. https://onlinecourses.nptel.ac.in/noc19_ma15/course
2. https://onlinecourses.nptel.ac.in/noc17_cs34/preview

**Web Links for IoT Laboratory**

1. https://www.tutorialspoint.com/internet_of_things/
2. http://raspberrypi.org/magpi https://tutorials-raspberrypi.com/
3. https://dzone.com/iot-developer-tutorials-tools-news-reviews
4. http://beagleboard.org/getting-started
5. https://randomnerdtutorials.com/getting-started-with-the-beaglebone-black/
6. http://www.toptechboy.com/beaglebone-black/
7. https://www.edureka.co/blog/iot-tutorial/ https://www.javatpoint.com/iot-healthcare
8. https://data-flair.training/blogs/iot-tutorials-home/
9. https://core-electronics.com.au/tutorials/raspberry-pi-workshop-for-beginners.html
10. https://www.arduino.cc/en/Tutorial/HomePage?from=Main.Tutorials

**Assessment Scheme:**

**Laboratory Continuous Assessment (LCA): 100 Marks**

| Practical Performance | Active learning / Mini Project/Additional implementation/ On paper design | End term practical /oral examination |
|---|---|---|
| 30 Marks | 40 Marks | 30 Marks |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

**Laboratory:**

| Assignment No | Contents | Work Load In Hrs |
|---|---|---|
| | | Lab |
| 1 | Study of IoT architecture, development platforms and various ARM SOCs such as Raspberry Pi/ ESP8266 boards/ Beagle board/ TinkerCAD Arduino Uno etc. To perform OS installations used to build IoT devices. | 04 |
| 2 | To Interface following sensors such as Temperature or Ultrasonic or Gas sensors with Raspberry-Pi/Beagle board/ TinkerCAD Arduino etc. and display readings on console. | 04 |
| 3 | To interface simple actuators such as DC/ Servo / Stepper motor, relays etc. with Raspberry Pi/ ESP8266 boards / Beagle board/ TinkerCAD Arduino Uno. | 04 |
| 4 | Consider a suitable scenario of traffic signalling considering a crossroad and demonstrate traffic control using Raspberry-Pi/Beagle board/ TinkerCAD Arduino etc. | 04 |
| 5 | To simulate an operation of obstacle detection and notifying it with buzzer or LED using Raspberry-Pi/Beagle board/ TinkerCAD Arduino etc. | 04 |
| 6 | To demonstrate MQTT/COAP protocols using message broker to subscribe and publish sensor data using Raspberry Pi/ ESP8266 boards / Beagle board/ TinkerCAD Arduino Uno. | 04 |
| 7 | To sense the data from sensors and send it to cloud system in simple text files, excel sheets or databases system using Raspberry Pi/ ESP8266 boards / Beagle board/ Arduino Uno. You may use ThingSpeak or Ubidots cloud for this lab. | 04 |
| 8 | To install web server such as Apache Web Server in IoT platform and write web application to access the server (IoT device as Web Server) | 04 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

| | | |
|---|---|---|
| 9 | **Mini Project Design: Real life IoT application design and Online Presentation**<br>Students are required to design and build a mini project for any suitable IoT application domains such as in the Healthcare, Manufacturing, Agriculture and Food, Insurance, Governance, Forest conservation, Transportation and Vehicles, Process management, Real estate and land records, Energy, Retails, Logistics, Education etc. Students group should submit the demonstration and prepare the 15-20 page plagiarism free report in pdf format. | 08 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

# COURSE STRUCTURE

| Course Code | CET4005B | | | |
|---|---|---|---|---|
| Course Category | Engg. Programme: Core Engg. | | | |
| Course Title | Cognitive Computing & Natural Language Processing | | | |
| Teaching Scheme and Credits | Lecture | Tutorial | Laboratory | Credits |
| Weekly load hrs | 3 hr/wk | -- | 2hr/wk | 3+1 = 4 |

**Pre-requisites**:
- Theory of Computation
- Big Data Technologies
- Artificial Intelligence

**Course Objectives:**

1. **Knowledge:**
   - i. To understand foundations and design principles of Cognitive Computing for application development
2. **Skills:**
   - i. To learn and apply concepts of Natural Language Processing.
   - ii. To understand approaches to syntax and semantics in NLP.
   - iii. To understand language models in NLP.
3. **Attitude:**
   - i. To study tools and technologies for Cognitive application.

**Course Outcomes:**

On completion of course, students should be able to
1. To understand Cognitive System designing process.
2. To understand the linguistic foundations of NLP.
3. To apply language modelling Techniques of NLP to real world problems.
4. To design and develop Cognitive application.

**Course Contents:**

1. Foundations and Design Principles of Cognitive Systems
2. Introduction to NLP
3. Semantic Parsing and Discourse Processing
4. Language Models and Applications of NLP
5. Tools & Technologies for Cognitive Computing

**Laboratory Exercises:**

1. Study and exploration of NLTK
2. Text Preprocessing
3. BoW and N-gram model

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

4. Speech to text and Text to speech conversion
5. Name Entity Recognition
6. Sentiment Analysis
7. Text Summarization
8. Machine Translation
9. Mini Project

**Learning Resources:**

**Reference Books:**

1. Judith H Huiwitz, Marcia Kaufman, Adrian Bowels, "Cognitive Computing and Big Data Analytics", WILEY publication
2. Jurafsky, David, and James H. Martin. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition. Upper Saddle River, NJ: Prentice-Hall, 2000. ISBN: 0130950696.
3. Manning, Christopher D., and Hinrich Schütze. Foundations of Statistical Natural Language Processing. Cambridge, MA: MIT Press, 1999. ISBN: 0262133601.
4. Daniel M. Bikel and Imed Zitouni, Multilingual natural Language Processing Applications: From Theory to Practice, Pearson Publication.
5. Tanvier Siddiqui, U.S. Tiwary, Natural Language Processing and Information Retrieval

**Supplementary Reading:**

1. Handbook of Natural Language Processing, CRC Press, second edition
2. Steven Bird, Ewam Klein, Edward Loper, "Natural Language Processing with Python", O'Reilly publication

**Web Resources:**

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

**Web links:**

1. www.nltk.org
2. cloud.ibm.com

**MOOCs:**

1. https://nptel.ac.in/courses/106/105/106105158/
2. https://nptel.ac.in/courses/106/106/106106211/

**Pedagogy:**

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

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

**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 learning / Mini Project/Additional implementation/ On paper design | End term practical /oral examination |
|---|---|---|
| 10 Marks | 10 Marks | 10 Marks |

**Term End Examination: 40 Marks**

**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Theory |
| 1 | **Foundations and Design Principles of Cognitive Systems**<br>Cognitive computing as new generation, Uses, gaining insights from data, understanding cognition, Understanding complex relationships. Kahneman's theory for Cognitive computing, Artificial intelligence-the foundation<br>Design Principles of Cognitive Systems: Components of cognitive systems, Building the Corpus, Bringing data into the cognitive system, Machine learning, Hypothesis generation and scoring, Presentation and visualization services | 07 |
| 2 | **Introduction to NLP**<br>Introduction to NLP, NLP Pipeline,<br>Lexical Analysis: Words and Their Components, Regular Expressions, Text Normalization,<br>Morphological Analysis: Morphological Models, Finite-State Automata, Morphological Parsing, Parts of Speech and Named Entities- Hidden Markov Models<br>Syntax Analysis: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Models for Ambiguity Resolution in Parsing, Efficient parsing for context-free grammars (CFGs). Statistical parsing and probabilistic CFGs (PCFGs). | 11 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr. Prasad Khandekar
Dean

| | | |
|---|---|---|
| 3 | **Semantic Parsing and Discourse Processing**<br>Semantic Analysis: Lexical semantics, Structural Ambiguity, Entity and Event Resolution Predicate-Argument Structure Word-sense disambiguation. Meaning Representation, Vector Semantics and Embeddings.<br>Discourse Processing: Introduction, Cohesion, Reference Resolution, Discourse Coherence and Structure | 07 |
| 4 | **Language Models and Applications of NLP**<br>Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Types of Language Models, Multilingual and Cross lingual Language Modeling, Multilingual Issues<br>Deep Learning Architectures for Sequence Processing<br>Machine Translation: Introduction, Machine Translation Approaches-Direct Machine Translation, Rule-based Machine Translation, Corpus-based Machine Translation Semantic or Knowledge-based MT systems | 11 |
| 5 | **Tools & Technologies for Cognitive Computing**<br>Introduction to Chatbot, Introduction to Tools & Technologies for Cognitive Computing, IBM Watson as a case study – architecture, components of DeepQA, Hypothesis generation, Watson APIs, Process of building a Cognitive application.<br>Introduction to Conversational agents: Dialog flow, wit.ai., Siri, Alexa<br>Case study – Cognitive healthcare application | 09 |

**Laboratory:**

| Assignment No | Contents | Workload in Hrs |
|---|---|---|
| | | Lab |
| 1 | Study and exploration of Natural Language Tool Kit (NLTK) in Python | 02 |
| 2 | Text pre-processing(Tokenization, Stemming, Lemmatization, Stop word removal, PoS tagging) | 04 |
| 3 | N-gram, BoW Model | 02 |
| 4 | Speech to Text and Text to Speech Conversion | 02 |
| 5 | Named Entity Recognition | 02 |
| 6 | Sentiment Analysis | 04 |
| 7 | Text Summarization | 04 |
| 8 | Machine Translation | 04 |
| 9 | Mini project | 06 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

# COURSE STRUCTURE

| Course Code | CET4006B | | | |
|---|---|---|---|---|
| Course Category | Professional Elective II | | | |
| Course Title | Data Privacy | | | |
| Teaching Scheme and Credits | Lecture | Tutorial | Laboratory | Credits |
| Weekly load hrs | 3 hr/wk | -- | 02 hr/wk | 3+1 = 04 |

**Pre-requisites:**

- Information Security

**Course Objectives:**

**1.Knowledge:**

i. Understand the mathematics required for cryptographic algorithms
ii. Describe data privacy preserving techniques

**2.Skills:**

i. Implement cryptographic algorithms
ii. Implement data privacy preserving techniques

**3.Attitude:**

i. Demonstrate the use of privacy preserving techniques in real life examples

**Course Outcomes:**

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

1. To recognize the importance of data privacy in real life
2. To explain the mathematics required for cryptographic algorithms
3. To implement different privacy preserving techniques
4. To create privacy preserving application

**Course Contents:**

1. Introduction to Data Privacy
2. Mathematics for Cryptography
3. Internet Cryptography
4. Lattice-Based Cryptography
5. Homomorphic Encryption

**Laboratory Exercises:**

1. Implement and Simulate Key Exchange between two entities using Diffie–Hellman Key Exchange algorithm and protocol.
2. Implement a client and a server on two different computers. Perform the communication between these two entities by using RSA (for key exchange) and AES 256 cryptosystem (for encryption)

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

3. Implement a Random Number Generator and test its randomness using NIST Statistical test suite.
4. Implement a Prime Number Generator.
5. Implement Toy AES algorithm using any language of your choice
6. Implement Toy RSA algorithm using any language of your choice.
7. Download and Configure Java Kerberos System
8. Implement Merklee Tree and using it for file integrity checks.
9. Implement Differential Privacy
10. Mini-Project: (Students can select any one topic from the following)
    1. Privacy-Preserving Online Notes.
    2. Privacy-Preserving DB for storing and retrieval of Patient Databases.
    3. Privacy-Preserving DB for storing and retrieval for Travel data.
    4. Privacy-Preserving Calendar Application.
    5. Privacy-Preserving DB for storing and retrieval of financial data.

**Learning Resources:**

**Text Books:**

1. Nataraj Venkataramanan, Ashwin Shriram, "Data Privacy: Principles and Practice", CRC Press, 1st Edition, 2017
2. Oded Goldreich , "The Foundations of Cryptography - Volume 1 and Volume 2", Cambridge University Press, 2004
3. Jonathan Katz , Vadim Lyubashevsky, "Lattice-based Cryptography (Chapman & Hall/CRC Cryptography and Network Security Series)", 1st Edition
4. Frederik Armknecht and Colin Boyd and Christopher Carr and Kristian Gjøsteen and Angela Jäschke and Christian A. Reuter and Martin Strand ,"A Guide to Fully Homomorphic Encyption"
5. Frederik Armknecht1 , Colin Boyd2 , Christopher Carr2 , Kristian Gjøsteen3 , Angela J¨aschke1 , Christian A. Reuter1 , and Martin Strand , "A Guide to Fully Homomorphic Encryption" https://eprint.iacr.org/2015/1192.pdf
6. Guide to Basic Annonymization Techniques, Personal Data Protection Commission, Singapore, 2018

**Reference Books:**

1. Josef Pieprzyk, Thomas Hardjono, Jennifer Seberry, "Fundamentals of Computer Security", Springer, 2010
2. Jonathan Katz, Yehuda Lindell, " Introduction to Modern Cryptography: Principles and Protocols (Chapman & Hall/CRC Cryptography and Network Security Series)"
3. David Naccache, Pascal Paillier, "Public Key Cryptography", Springer, 2002

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

**Supplementary Reading:**

**Web Resources:**

**Web links:**

1. Dong Pyo Chi and Jeong Woon Choi and Jeong San Kim and Taewan Kim, Lattice Based Cryptography for Beginners, https://eprint.iacr.org/2015/938.pdf
2. Steven D Galbraith, Mathematics of Public Key Cryptography. Version 2.0, https://www.math.auckland.ac.nz/~sgal018/crypto-book/main.pdf

**MOOCs:**

1. https://www.coursera.org/learn/privacy-law-data-protection
2. https://www.linkedin.com/learning/topics/data-privacy
3. https://www.coursera.org/learn/data-security-privacy
4. https://www.udemy.com/course/data-security-and-privacy-training/
5. https://www.koenig-solutions.com/data-privacy-security-certification-training

**Pedagogy:**

1. Power Point Presentation
2. White-board / Pen

**Assessment Scheme:**

**Class Continuous Assessment CCA: 30 Marks**

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

**Lab Continuous Assessment LCA: 30 Marks**

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

**Term End Examination: 40 Marks**

MIT-WPU
Approved by
Academic Council
Date...../...../.....

Dr.Prasad Khandekar
Dean

**Syllabus: Theory**

| Module No. | Content | Workload in Hrs |
|---|---|---|
| | | Theory |
| 1 | **INTRODUCTION TO DATA PRIVACY**<br>Data privacy and its importance, protecting sensitive data, privacy and anonymity, Use cases: Need for sharing data – Data Mining and analysis, Software application testing, business operations, Nature of data – multidimensional, transactional, longitudinal, graph, time series, Methods of protecting data – Cryptography, Anonymization, Tokenization | 09 |
| 2 | **MATHEMATICS FOR CRYPTOGRAPHY**<br>Mathematics for Symmetric Crypto Systems – prime numbers, modular arithmetic, Mathematics for Key Sharing Algorithms – Discrete Logarithms. Diffie Hellman and its variants – Anonymous, Fixed, Ephemeral<br>Mathematics for Asymmetric Keypair Cryptography (RSA, ElGamal, Pailliers, Elliptic Curve), totient functions, Euclidean and extended Euclidean algorithm, Euler's theorem, Fermat's Theorem, multiplicative inverses, Discrete Logarithms | 09 |
| 3 | **INTERNET CRYPTOGRAPHY**<br>HTTPS and Perfect Forward Secrecy, Signal Encryption Protocol. Hash Functions – MD family, SHA family, Hash Chains, Merkle Tree<br>Entity Authentication and Authorization Systems - Kerberos, Key Management Protocols - ISAKMP and IKE | 09 |
| 4 | **LATTICE-BASED CRYPTOGRAPHY**<br>Brief Introduction to Linear Algebra, Mathematics of Lattice-Based Cryptography, Lattice, Bases, Vectors. Closest Vector Problem, Shortest Vector Problem. | 09 |
| 5 | **HOMOMORPHIC ENCRYPTION**<br>Homomorphic Encryption using Lattice Cryptography: CKKS, BFV. Homomorphic Encryption using Number Theory, Fundamentals of Differential Privacy System, Oblivious Transfer System and Protocol: Two-party and Multiparty settings. | 09 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

**Laboratory:**

| Assignment No. | Contents | Workload in Hrs |
|---|---|---|
| | | Lab |
| 1 | Implement and Simulate Key Exchange between two entities using Diffie–Hellman Key Exchange algorithm and protocol. | 04 |
| 2 | Implement a client and a server on two different computers. Perform the communication between these two entities by using RSA (for key exchange) and AES 256 cryptosystem (for encryption) | 04 |
| 3 | Implement a Random Number Generator and test its randomness using NIST Statistical test suite. | 02 |
| 4 | Implement a Prime Number Generator. | 02 |
| 5 | Implement Toy AES algorithm using any language of your choice | 04 |
| 6 | Implement Toy RSA algorithm using any language of your choice. | 02 |
| 7 | Download and Configure Java Kerberos System | 02 |
| 8 | Implement Merklee Tree and using it for file integrity checks. | 04 |
| 9 | Implement Differential Privacy | 02 |
| 10 | Mini-Project: (Students can select any one topic from the following)<br>1. Privacy-Preserving Online Notes.<br>2. Privacy-Preserving DB for storing and retrieval of Patient Databases.<br>3. Privacy-Preserving DB for storing and retrieval for Travel data.<br>4. Privacy-Preserving Calendar Application.<br>5. Privacy-Preserving DB for storing and retrieval of financial data. | 04 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

# COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CET4007B** | | | |
| **Course Category** | **Professional Elective II** | | | |
| **Course Title** | **Block chain Technology** | | | |
| **Teaching Scheme and Credits** | **Lecture** | **Tutorial** | **Laboratory** | **Credits** |
| **Weekly load hrs** | **03 hr/wk** | **--** | **2 hr/wk** | **3+1=4** |

**Pre-requisites:**

- Fundamentals of Data Structures

**Course Objectives:**

**1. Knowledge:**

i. To familiarize the students with functional/operational aspects of the cryptocurrency Ecosystem.

**2.Skills:**

i. To explain the working of bitcoin and Blockchain Architecture.

**3.Attitude:**

i. To explore the most prominent smart contract platform - Ethereum and Hyperledger

**Course Outcomes:**

After completion of the course the students will be able to

1. understand the functional/operational aspects of cryptocurrency Ecosystem.
2. describe the working of bitcoin and Blockchain Architecture.
3. elaborate Ethereum and Hyper ledger platforms.

**Course Contents:**

1. Blockchain Fundamentals
2. Bitcoin Mechanics
3. Blockchain Architecture
4. Ethereum Technology
   Hyperledger Fabric

**Learning Resources:**

**Text Books:**

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton University Press (July 19, 2016)

**Reference Books:**

1. Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly, ISBN-13: 978-1449374044

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

**Supplementary Reading:**

**Web Resources:**

1. DR. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger," 2014
2. https://www.tutorialspoint.com/ethereum/ethereum_tutorial.pdf
3. https://www.hyperledger.org/wp-content/uploads/2017/08/ Hyperledger_Arch_WG_ Paper_1_Consensus.pdf
4. Satoshi Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System"

**Web links:**

1. https://blockgeeks.com/guides/ethereum/
2. https://blockgeeks.com/guides/7-of-the-best-ethereum-wallets/
3. https://solidity.readthedocs.io/en/v0.4.24/
4. https://www.coindesk.com/learn/ethereum-101/who-created-ethereum
5. https://blog.clairvoyantsoft.com/hyperledger-fabric-components-and-architecture-b874b36c4af5
6. https://medium.com/swlh/hyperledger-chapter-2-hyperledger-frameworks-modules-cabf50e12105

**MOOCs:**

1. https://nptel.ac.in/courses/106105184/
2. https://www.coursera.org/learn/blockchain-basics
3. https://www.edureka.co/blockchain-training

**Pedagogy:**

1. Power Point Presentation
2. White-board / Pen
3. Two Teacher method

**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 learning / Mini Project/Additional implementation/ On paper design | End term practical /oral examination |
|---|---|---|
| 10 Marks | 10 Marks | 10 Marks |

**Term End Examination: 40 Marks**

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

**Syllabus: Theory**

| Module No. | Content | Workload in Hrs |
|---|---|---|
| | | Theory |
| 1 | **Blockchain Fundamentals History:** Traditional financial arrangements, The trouble with credit cards online, From Credit to (Crypto) Cash.<br>Introduction to Cryptography & Cryptocurrencies:<br>Cryptographic Hash Functions, Hash Pointers and Data Structures, Digital Signatures, Public Keys as Identities. Centralization vs. Decentralization, Distributed consensus, Byzantine Generals Problem, Non Cryptocurrency Applications, Use Cases: Supply Chain Management, Finance, Health Care, Remittance, Land Records, Voting and election, Loyalty Programs, Go Green (Renewable Energy) | 09 |
| 2 | **Bitcoin Cryptocurrency**<br>Introduction to Bitcoin, Bitcoin users - Full Client, Light Client, Web Client.<br>Implicit Consensus, Bitcoin consensus algorithm, Stealing Bitcoins, Validation Algorithms: Proof of work, Proof of Stake, Proof of Authority, Proof of Activity, Proof of Burn, Proof of Capacity. Block Reward, Transaction fees, Bitcoin transactions, Bitcoin Scripts, Bitcoin blocks, Bitcoin network. Bitcoin Security-Security principles, User Security Best Practices. | 09 |
| 3 | **Blockchain Architecture**<br>Introduction, Structure of a Block, Block Header, Block Identifiers - Block Header Hash and Block Height, The Genesis Block, Linking Blocks in the Blockchain, Types of blockchain, Merkle Trees and Simplified Payment Verification (SPV), Blockchain P2P architecture.<br>Bitcoin Mining- The task of Bitcoin miners, Mining Hardware- CPU mining, GPU mining, FPGA mining, ASIC mining. | 09 |
| 4 | **Ethereum Blockchains**<br>Ethereum Virtual Machine, Smart contract, wallets for Ethereum, Ethereum Programming Language – Solidity, Mining in Ethereum, uses and benefits of Ethereum, Introduction to Ethereum Development Tools, Ethereum Clients, Ethereum Languages, Ethereum Wallets, Ethereum Accounts, Ethereum Keypairs, Ethereum Platform. | 09 |

MIT-WPU
Approved by
Academic Council
Date 23 JUL 2022

Dr.Prasad Khandekar
Dean

| | | |
|---|---|---|
| 5 | **Hyperledger Fabric**<br>Hyperledger architecture, Consensus in Hyperledger, Hyperledger frameworks, Hyperledger Fabric, Sawtooth, Indy, Hyperledger tools Caliper and Hyperledger library Ursa, Blockchain as-a-service deployment model of Hyperledger Cello.<br>**Blockchain Security**: Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity preservation, attacks on Blockchains: Sybil attacks, selfish mining and 51% attacks; Advent of Algorand, and Sharding based consensus algorithms to prevent the attacks<br>**Emerging Trends:** Cloud-based blockchain, Multichain, Geth , Stellar , Ripple, R3 Corda, Blockchain API, Blockchain Sandboxes | 09 |

**Laboratory:**

| Assignment No. | Contents | Work Load In Hrs |
|---|---|---|
| | | Lab |
| 1 | Basic demonstration of blockchain technology<br>URL: https://andersbrownworth.com/blockchain/<br>https://blockchaindemo.io/ | 02 |
| 2 | Demonstrate Solidity programming of simple smart contract<br>URL:<br>https://www.tutorialspoint.com/solidity/solidity_first_application.htm | 02 |
| 3 | Install Ganache blockchain test network and deploy solidity smart contract<br>URL: https://www.trufflesuite.com/ganache | 02 |
| 4 | Demonstrate setup of myEtherWallet and connect it to Ganache Network<br>URL:<br>https://www.tutorialspoint.com/ethereum/ethereum_myetherwallet.htm | 02 |
| 5 | Demonstrate Setup of geth client to access Ethereum blockchain<br>URL: https://www.sitepoint.com/an-introduction-to-geth-and-running-ethereum-nodes/ | 02 |
| 6 | Demonstrate geth client to create genesis block on your own block chain. Further demonstrate transfer of balance from one address to another address<br>URL: https://www.edureka.co/blog/ethereum-private-network-tutorial | 02 |

MIT-WPU
Approved by
Academic Council
Date 23 JUL 2022

Dr.Prasad Khandekar
Dean

| | | |
|---|---|---|
| 7 | Demonstrate Smart contract with remix complier and deploy it on local remix JavascriptVM<br>URL: http://remix.ethereum.org/ | 02 |
| 8 | Demonstrate the blockchain in Python<br>URL:https://www.tutorialspoint.com/python_blockchain/python_blockchain_creating_multiple_transactions.htm<br>https://www.geeksforgeeks.org/create-simple-blockchain-using-python/ | 02 |
| 9 | Demonstrate blockchain in Java<br>URL: https://www.baeldung.com/java-blockchain | 02 |
| 10 | Demonstrate Cryptocurrency<br>Bitcoin is a digital currency and digital payment system. It is operated by a network of individuals like you and me, and has no central authority. This demo will guide you through briefly through the bitcoin transactions.<br>URL: https://coindemo.io/ | 02 |
| 11 | Blockchain explorer for Bitcoin and Ethereum- Study and understand the various statistics observations related to bitcoin and Ethereum cryptocurrencies<br>https://www.blockchain.com/explorer<br>https://etherscan.io/ | 02 |
| 12 | Imstall MetaMask Cryptocurrancy Client in Crome as Extension and demonstrate currency transfer operations using Robsten Test Network<br>https://ropsten.etherscan.io/<br>https://metamask.io/ | 02 |
| 13 | Install and Getting Started with the Bitcoin core client. Write a program to get a Bitcoin and create transaction. | 02 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

# COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CET4008B** | | | |
| **Course Category** | **Professional Elective** | | | |
| **Course Title** | **User Interface User Experience Design** | | | |
| **Teaching Scheme and Credits** | **Lecture** | **Tutorial** | **Laboratory** | **Credits** |
| **Weekly load hrs** | **3 hr/wk** | **--** | **2 hr/wk** | **3 + 1 = 4** |

**Pre-requisites**:

- Software Engineering and Project Management
- Software Design Modelling and Testing

**Course Objectives:**

1. **Knowledge:**
   i. To understand and learn principles of UI Design
   ii. To understand User Experience Design, its design principles and use appropriate tool for a given problem
2. **Skills:**
   i. To design a interactive User Interface for a satisfactory User Experience
   ii. To evaluate and test a User Interface
3. **Attitude:**
   i. To be able to understand new trends and methods in User Experience Design.

**Course Outcomes:**

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

1. Analyse user interface design using User Interface Design Principles. CL-1, 3 (Knowledge & Application)
2. Use usability design methods and principles for real world applications. CL-1, 3 (Knowledge & Application)
3. Understand and apply User Experience Design Principles using appropriate tool. CL-1, 3 (Knowledge & Application)
4. Sketch a design proposal for User Experience Design and use appropriate tools for it. CL-1, 3 (Knowledge & Application)

**Course Contents:**

1. User Interface Design Principles
2. Usability Engineering, Evaluation and Testing
3. User Experience Design Process and Research
4. User Experience Ecosystem Design:
5. Designing UX for tomorrow

**Laboratory Exercises:**

1. Critical Analysis of Interfaces
2. To conduct User Research and develop Personas and User Scenarios.

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

3. To create Wireframes and design screens.
4. To create interactive prototype.
5. To conduct heuristic evaluation.
6. User Testing Using Open Source Tool
7. Design of Product Interface

**Learning Resources:**

**Text Books:**

1. Dix, Alan J.; Finlay, Janet E.; Abowd, Gregory D.; Beale, Russell; Human-Computer Interaction, Pearson Education; 3 editions (2003)
2. Dumas, Joseph S.; Redish, Janice C.; Practical Guide to Usability Testing; Exeter: Intellect (1999)

**Reference Books:**

1. Nielson, Jackob; Usability Engineering; Morgan Kaufmann (1994)
2. Winograd, Terry (Editor); Bringing Design to Software, Addison-Wesley, 1996 ISBN 0201854910

**Supplementary Reading:**

1. Alan Cooper, "The Essential of User Interface Design", Wiley – Dream Tech Ltd., 2002.

**Web Resources:**

1. Wilbent. O. Galitz ,"The Essential Guide To User Interface Design", John Wiley& Sons, 2007.
2. Introduction to good usability by peterpixel Peter Conradie (2008)

**Weblinks:**

1. https://medium.theuxblog.com/11-best-prototyping-tools-for-ui-ux-designers-how-to-choose-the-right-one-c5dc69720c47
2. https://www.motocms.com/blog/en/25-ux-design-tools/
3. http://courses.ischool.berkeley.edu/i213/s10/assignments/design-assignment-4.html

**MOOCs:**

1. https://nptel.ac.in/courses/124107008/

**Pedagogy:**

1. PowerPoint Presentation
2. White-board / Pen
3. Two Teacher method
4. Flipped Classroom method

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

**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 learning / Mini Project/Additional implementation/ On paper design | End term practical /oral examination |
|---|---|---|
| 10 Marks | 10 Marks | 10 Marks |

**Term End Examination: 40 Marks**

**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs Theory |
|---|---|---|
| 1 | **User Interface Design Principles**<br>**User Interface Design**, Benefit of good interface design, Goals of UID, Process of UI design, Design Stages: Wireframe, mock-ups and prototype, Fidelity of Prototype – high/medium and low, digital and html prototype<br>User Centered Design and Process, Mental and conceptual model, Personas, User Stories and Scenarios,<br>**Usability Design Principles**, Shneidermans Golden Rules, Form vs Function, Gestalt Principles of Design, Visual Design – Color Theory, Typography, Using graphics and illustrations, Use of Good Writing in UI Design, Microcopy<br>**User Interface Elements**, User Controls/ Patterns – Input Controls, Navigation Components, Information Components, Containers,<br>Role of Metaphors, Idioms and Affordances,<br>**Types of Disabilities** to design for, accessibility in design<br>Case studies : A good and a bad User Interface Design | 09 |
| 2 | **Usability Engineering, Evaluation and Testing**<br>**Usability Engineering:** Usability Engineering and its benefits to Users and Organization,<br>**Usability Standards**: International Standards for Usability, Disadvantages of Standards, Guidelines for internationalization, localization and multi locale interfaces, Human Errors<br>**Usability Evaluation:** | 09 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

| | | |
|---|---|---|
| | Human information processing and human memory, Fitt's law, Hick's law, Types of Evaluation: Heuristic evaluation, cognitive walkthroughs, User Studies and Field Studies.<br>**Usability Testing:** Planning and Conducting Usability Testing, User testing using think aloud protocol, A/B testing, Heatmaps with tools like Hotjar User Testing<br>**Documentation :** User documentation- manuals, tutorials, information in the interface | |
| 3 | **User Experience Design Process and Research**<br>Definition of User Experience (UX), UI and UX, 7 Laws of UX design, Elements of UX design. Conceptualization and Ideation<br>User Experience Research: Conducting research, UX research best practices and methods, Empathy Mapping, Qualitative and Quantitative User Research, Behavioral and Attitudinal User Research, Card Sorting and Tress testing methods for User Research,Data gathering Methods and Sources<br>Sketching the UX. Designing, Ideating, & Information Architecture, Prototyping, 5 Visual Design principles in UX design and its benefits, Development, Design Documentation.<br>The effects of good UED design<br>Flows in UX design, Integrating User Context in Design Process using Task Flows, User Flows, User Experience Metrics – HEART Framework<br>Case Study : User Experience | 09 |
| 4 | **User Experience Ecosystem Design :**<br>Designing UE Ecosystem, Ecosystem design for interoperability, Adaptive and Receptive Design, User Experience Map Methods: Empathy maps, customer journey maps, experience maps, and service blueprints.<br>UX strategy and Four major project categories, Content strategy,<br>Design Thinking and its phases, Design Thinking, Lean UX and Agile, Case Study | 09 |
| 5 | **Designing UX for tomorrow**<br>Emerging technologies in UX Design: Voice UI, Touchless gesture control, Intelligent UX, Conversational UX, Immersive Media and Fluid UX<br>Designing for Web and Mobile Interfaces, IoT applications, Blockchain and data driven UX<br>Industry Specific UX design: FinTech, Education, Health Care, E commerce and Industrial Websites,<br>Designing for Wearable Devices, Designing for Augmented Reality, Virtual Reality and Mixed Reality, Tomorrows Challenges in UX design | 09 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

**Laboratory:**

| Sr. No. | Assignment | Workload in Hrs |
|---|---|---|
| | | Lab |
| 1 | **Critical Analysis of Interfaces:** Analyse any one interface (website or mobile app) that you have interacted with that could be designed better. Focus on the interface design problems, rather than their engineering faults or business problems. Comment on its learnability, usability, consistency and metaphors. | 02 |
| 2 | **To conduct User Research and develop Personas and User Scenarios.** Conduct user research for a project of your choice. Use the research data to develop two personas and create user stories that are reliable representations of the target users. | 02 |
| 3 | **To create Wireframes and design screens.** Problem Statement: Create Wireframes: Create a wireframe with proper layout structure and content. Design 3-4 screens and the interface has to comprise of assortment of elements (text, images, tables, menus, etc.) on each screen keeping in mind the user interface design principles | 02 |
| 4 | **To create interactive prototype.** Create interactive prototypes to simulate the final product using website designing tools (Adobe XD ). | 02 |
| 5 | **To conduct heuristic evaluation.** For the given website/ application, review Nielsen's 10 usability heuristics as per the evaluation sheet attached and make notes on severity evaluation. Also shape the user interface using standard UI guidelines to enhance the user experience through typography, colors, layouts, illustrations etc. | 02 |
| 6 | User Testing Using Open Source Tool | 02 |
| 7 | Design an interactive interface for an application with special needs | 04 |

MIT-WPU
Approved by
Academic Council
Date 23 JUL 2022

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

# COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CET2006B** | | | |
| **Course Category** | **Professional Core / Engineering Science** | | | |
| **Course Title** | **Software Engineering and Project Management** | | | |
| **Teaching Scheme and Credits Weekly load hrs** | **Lecture** | **Tutorial** | **Laboratory** | **Credits** |
| | **3 hr/wk** | **--** | **2 hr/wk** | **3 + 1 = 4** |

**Pre-requisites**:

- Principles of Programming Languages and Functional Programming
- Object Oriented Programming

**Course Objectives:**

1.**Knowledge:**

1. To understand the Software Development and Software Lifecycle Process model.
2. To understand and learn different software modeling techniques.

2. **Skills:**

1. To understand and analyze the project management principle for software development.
2. To evaluate the system functionality using testing.

3. **Attitude:**

1. To be able to understand new trends and methods in User Experience Design.

**Course Outcomes:**

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

1. Analyze process models and its appropriate selection for Development of Software Projects.(Knowledge & Application)
2. Use software design methods and principles for real world applications., 3(Knowledge & Application)
3. Understand and apply Project Management Principles using appropriate tool. (Knowledge & Application)
4. Choose modern tools for Software Development and Project Management.

**Course Contents:**

1. Software Engineering
2. Software Design
3. Software Project Management
4. Testing
5. Trends in Software Engineering

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

**Laboratory Exercises / Practical:**

1. Prepare/Write the software requirement document(SRS) for given problem statement.
2. Perform the Structured Systems Analysis and Design (SSAD)- Draw the DFD MODEL (Level 0, Level 1 and Level 2). Choose an open source tool for the same.
3. Object Oriented Analysis and design using UML diagrams: Use case, Class Diagram, Object diagram.
4. Object Oriented Analysis and design using UML diagrams: Activity diagram, Sequence Diagram.
5. Object Oriented Analysis and design using UML diagrams: Timing diagram, Communication diagram, state machine diagram.
6. Draw Gantt Chart for software project management.
7. Choose an appropriate testing tool and implement for black box. automation testing.
8. Study any DevOps tool for project management.

**Learning Resources:**

**Text Books:**

1. Software Engineering, Ian Sommerville
2. Software Engineering a Practitioner's Approach, Roggers S. Pressman and Bruce R. Maxim.

**Reference Books:**

1. The Essentials of Modern Software Engineering: Free the Practices from the Method Prisons! Ivar Jacobson, Harold "Bud" Lawson, Pan-Wei Ng, Paul E. McMahon and Michael Goedicke.
2. Fundamentals of Software Engineering, Carlo Ghezzi, Jazayeri Mehdi and Mandrioli Dino.
3. Software Requirements and Specification: A Lexicon of Practice, Principles and Prejudices, Michael Jackson.
4. The Unified Development Process, Ivar Jacobson, Grady Booch and James Rumbaugh.

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

**Supplementary Reading:**

1. Ian Sommerville, — Software Engineering, Addison and Wesley. 9th Ed., 2011.

**Web Resources:**

1. http://highered.mheducation.com/sites/0072853182/student_view0/index.html
2. https://poetiosity.files.wordpress.com/2011/04/art_of_agile_development.pdf

**Web links:**

1. https://www.sei.cmu.edu/training/p35.cfm
2. http://www.mhhe.com/engcs/compsci/pressman/

**MOOCs:**

1. http://nptel.ac.in/courses/106101061/1
2. http://nptel.ac.in/downloads/106105087/

**Pedagogy:**

1. PowerPoint Presentation
2. White-board / Pen
3. Two Teacher method
4. Flipped Classroom method

**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 learning / Mini Project/Additional implementation/ On paper design | End term practical /oral examination |
|---|---|---|
| 10 Marks | 10 Marks | 10 Marks |

**Term End Examination: 40 Marks**

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs Theory |
|---|---|---|
| 1 | **Software Engineering**<br>What is Software Engineering, Importance of Software Engineering, Software engineering process, Software Process models - Process and Project, Software development Process Models, Waterfall, Prototyping, Iterative development, Rational Unified Process, Spiral Model, Agile Model, Software Myths,<br>**Requirement Engineering:** Software Requirements, User requirements, System requirements, Software Requirements Specification, Requirement Engineering Process, SRS<br>Functional Specification and Non-functional specifications, | 10 |
| 2 | **Software Design:** Abstraction, Modularity, Cohesion & Coupling, Scenario based modeling, SSAD (ER diagram, Data Flow Diagram DFD), OOAD (Unified Modeling Language UML).<br>**Static modeling**<br>Class diagrams- Finding analysis and Design Classes, Object diagrams, Composite structure diagrams, Package diagrams, Interfaces and Components, Deployment Diagram,<br>**Dynamic Modeling**<br>Use case diagram, Activity diagram- Interaction & Interaction overview diagram, sequence diagram, Timing diagram, Communication diagram, Advance state machine diagram | 10 |
| 3 | **Software Project Management**<br>Project Management Principles, Process and Project Metrics, Function Point analysis, LOC, Make/Buy Decision, COCOMO II -Project Planning, SWOT analysis, Functions of manager, Team building & development, Risk Management. | 08 |
| 4 | **Testing**<br>Testing concepts, Principles of software testing, verification and validation, V-test model, defect management Testing strategies, unit, integration and system testing, acceptance, alpha, beta, performance, security testing, white box and black box testing, basis path testing, equivalence testing, graph base testing, Test cases and test plan. | 07 |
| 5 | **Trends in Software Engineering**<br>**Agile Practices:** Agile manifesto, The Fundamentals of Agile Software Development, Aspects of Agile Approaches, Practices and Processes, Techniques in Agile Projects, Extreme Programming, | 10 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

| | | |
|---|---|---|
| | **Devops:** Introduction-Definition, Devops Tool chain, Why Devops?, Goals, Benefits,<br>Relationship to Agile and Devops (continuous delivery), Devop Tools.<br>Role of Software engineering in IoT applications, data science applications, cloud computing and cyber security applications. | |

**Laboratory:**

| Assignment No. | Contents | Workload in Hrs |
|---|---|---|
| | | Lab |
| 1 | Prepare/Write the software requirement document(SRS) for given problem statement. | 02 |
| 2 | Perform the Structured Systems Analysis and Design (SSAD)- Draw the DFD MODEL (Level 0, Level 1 and Level 2).<br>Choose an open source tool for the same. | 02 |
| 3 | Object Oriented Analysis and design using UML diagrams: **Use case, Class Diagram, Object diagram.** | 02 |
| 4 | Object Oriented Analysis and design using UML diagrams: **Activity diagram, Sequence Diagram.** | 02 |
| 5 | Object Oriented Analysis and design using UML diagrams: **Timing diagram, Communication diagram, state machine diagram** | 02 |
| 6 | Draw Gantt Chart for software project management. | 02 |
| 7 | Choose an appropriate testing tool and implement for black box. automation testing. | 04 |
| 8 | Study any DevOps tool for project management. | 04 |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

# COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CET2010B** | | | |
| **Course Category** | **Engineering Core** | | | |
| **Course Title** | **TY Mini Project** | | | |
| **Teaching Scheme and Credits** | **Lecture** | **Tutorial** | **Laboratory** | **Credits** |
| **Weekly load hrs.** | **--** | **--** | **4 hr/wk** | **2** |

**Pre-requisites:**

- Programming Skills
- Software Engineering and Project Management

**Course Objectives:**

1. To apply the knowledge of fundamental concepts learned during the curriculum to formulate the problem statement and develop a computer based system using appropriate algorithms
2. To examine and utilize modern skills, techniques and tools for computing practice leading to lifelong learning
3. To incorporate SDLC to identify appropriate processes, components and make use of modern engineering tools to evaluate, test and analyse the developed computer based system
4. To understand key ethical and social issues while reaching optimum solution for the problem statement and demonstrate work ethics in teams to effectively manage conflicts
5. To present ideas and concepts clearly in an organized manner

**Course Outcomes:**

On completion of course, students should be able to:

1. Demonstrate the ability to apply knowledge of fundamental concepts to formulate the problem statement and find optimum solution
2. Analyse a problem and identify the computing requirements for its solution
3. Design and develop computer based system by making use of appropriate modern \ engineering tools.
4. Resolve key ethical and social issues affecting the problem statement and demonstrate team Ethics.
5. Present ideas and concepts clearly in an organized manner

**Assessment Scheme:**

The students are directed to form groups and all members of the group jointly work towards the implementation of the mini project. The selection of the mini project and topic finalization is based on the approval of review committee. Every group is required to work towards the aims and objectives to well define the problem statement. For the same they will perform literature survey and propose an architecture/high level design of the mini project. The group will develop the working module of the proposed design with appropriate analysis and results of the system or sub system in the area of Computer Science and Engineering.

The term work evaluation will be done by the review team in consultation with the guide. Oral presentation will be based on the mini project work completed by the candidates.

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date ...../...../

Dr.Prasad Khandekar
Dean

**Laboratory Continuous Assessment (LCA): 100 Marks**

| Practical Performance | Active learning / Mini Project/Additional implementation/ On paper design | End term practical /oral examination |
|---|---|---|
| 30 Marks | 40 Marks | 30 Marks |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr. Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

# COURSE STRUCTURE

| Course Code | CET3017B | | | |
|---|---|---|---|---|
| Course Category | Professional Core | | | |
| Course Title | TY Seminar | | | |
| Teaching Scheme and Credits | Lecture | Tutorial | Laboratory | Credits |
| Weekly load hrs | -- | -- | 04 hr/wk | 02 |

**Course Objectives:**

**1.Knowledge:**

i. To learn the basic principles of communication with active, empathetic listening, speaking and writing techniques.

**2.Skills:**

i. To explore research with new technologies.
ii. To build independent thinking on real-time issues.

**3.Attitude:**

i. To use presentation standards and guidelines effectively.

**Course Outcomes:**

On completion of the course, student will be able –

1. To grasp the technical skills with writing, reading, analysis, visuals and inhibit good communication skills.
2. To write a technical report summarizing state-of-the-art on an identified topic.
3. To use multiple thinking strategies to examine real-world issues.
4. To explore and enhance the use of various presentation tools and techniques.

**Assessment Scheme:**

The students will have to deliver the seminar on any technical state-of-the-art topic approved by the guide. The presentation should cover introduction, motivation, literature survey, mathematical modelling, data-table discussion (if applicable) and conclusion and future work.

It is appreciated and strongly recommended that the student should select the domain of his/her seminar and identify the literature confined to the domain. Thorough literature study based on the broad identified topic has to be carried out. Selection of seminar topic in multidisciplinary domain will be strongly recommended and supported.

To bring the quality and appropriateness of the seminar work it is mandatory for the seminar guides to maintain a progressive record of the meetings. During meeting with the seminar guides, it is expected that it should include the discussion agenda, weekly outcomes achieved, corrective actions and comments on the progress report as per the plan submitted by the students.

The reports should be prepared using MSdoc/Latex application tool and submitted in the school.

**Laboratory Continuous Assessment (LCA): 100 Marks**

| Practical Performance | Active learning / Mini Project/Additional implementation/ On paper design | End term practical /oral examination |
|---|---|---|
| 30 Marks | 40 Marks | 30 Marks |

MIT-WPU
Approved by
Academic Council
23 JUL 2022
Date...../...../.....

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

**SOP Seminar:**

1. Identify the Faculties to be eligible as Seminar guides.
2. Mapping the expertise of the Seminar guides with the respective domains.
3. The identified domains are communicated to the students.
4. Each student is instructed to submit at least 03 seminar topics as per the domain list.
5. The Seminar ideas are scrutinized by domain experts.
6. One of the idea is selected with its feasibility, current scenario, etc. and the topic is finalized. First review R1 for the Seminars is conducted by a panel of Seminar Coordinators.
7. The Seminar title and the Seminar guide is communicated to the students.
8. The students are required to report to their guides on a weekly basis and maintain a log
9. book for the same. Log book is a record of the discussions and decisions taken collaboratively by the guides and the students.
10. The students incorporate the suggestions from R1 and accordingly design/ devise the details to be presented in review R2.
11. Final Seminar submission includes complete documentation of the Seminar Report.
12. Seminar Report consists of Technical Contents-Literature Review, Research gap study, Methodology/Techniques, Conclusion, Applications, References etc.)
13. Plagiarism check to be performed before submitting the final Seminar Report.
14. Students may also submit/publish a journal/conference paper on the state-of-art-study.
15. It is mandatory to all students to actively participate & attend all the Seminar sessions.
16. Final evaluation of the Seminars, review R3 is conducted by a panel of domain experts.

MIT-WPU
Approved by
Academic Council
Date 23/11/2022

Dr.Prasad Khandekar
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

MIT-WPU
॥ विश्वशान्तिर्ध्रुवा ॥

# 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

4/8/23

MIT-WPU
Approved by
Academic Council
08 JUN 2023
Date...../...../.....

| | | |
|---|---|---|
| **Course Code** | **CET4061B** | |
| **Course Category** | **Project** | |
| **Course Title** | **Capstone Project** | |
| **Teaching Scheme and Credits**<br>**Weekly load hrs** | **Laboratory** | **Total Credits** |
| | **12 hr/wk** | **6** |

**Capstone Project - Midterm along with * Throughout Guide Assessment**

**Course Objectives:**

1. **Knowledge**
   i. To apply knowledge of mathematics and fundamental concepts to formulate the problem statement
   ii. Understand the computing requirements to find its solution
2. **Skill.**
   i. Understand key ethical and social issues affecting the problem statement
   ii. incorporate SDLC to identify appropriate processes, components and make use modern engineering tools
3. **Attitude**
   i. To present orally ideas and concepts clearly in an organized manner

**Course Outcomes:**

1. Demonstrate the ability to apply knowledge of mathematics and fundamental concepts to formulate the problem statement
2. Analyze a problem and identify and define the computing requirements for its solution.
3. Aware of key ethical and social issues affecting the problem statement
4. Design a computer based system, process, component or program as well as design non-computing requirements.
5. Demonstrate the design of computing system by making use of appropriate modern engineering tools
6. Orally communicate ideas and concepts clearly and in an organized manner and write clear system documentation reflecting the solution on paper

MIT-WPU
Approved by
Academic Council
08 JUN 2023
Date...../...../.....

Dr. Dinesh Seth
Dean

**Assessment:**

The students are directed to form groups and all members of the group jointly work towards the implementation of the project. The selection of the project and topic finalization is based on the approval of review committee. Every group is required to submit interim project report at the end of the first term. The report should include aims, objectives, literature survey, problem statement and proposed architecture/ high level design of the project and the project plan.

The term work evaluation will be done by the examiners in consultation with the guide. Oral examination will be based on the project work completed by the candidates. The project report must also be presented during the oral examination.

| Midterm Assessment Marks | | | | Total | Credits |
|---|---|---|---|---|---|
| **Problem Statement** | **Requirements Gathering** | **System Design** | **Individual contribution with Module Design** | | |
| 5 Marks | 5 Marks | 10 Marks | 20 Marks | 40Marks | 2 |

**Capstone Project – End Term along with *Throughout Guide Assessment**

**Course Objectives:**

1. **Knowledge**
   i. To develop a computer based system using appropriate algorithms to reach an optimum solution
   ii. To examine and utilise modern skills, techniques and tools for computing practice leading to lifelong learning
2. **Skill**
   i. To evaluate, test and analyse developed computer based system
   ii. To demonstrate work ethics in teams to effectively manage conflicts
3. **Attitude**
   i. To compose well-supported documentation of the work and inculcate oral defence skills

**Course Outcomes:**

1. Develop a computer based system using appropriate algorithms to reach an optimum solution
2. Examine and utilise modern skills, techniques and tools for computing practice leading to lifelong learning
3. Evaluate, test and analyse developed computer-based system
4. Demonstrate work ethics in teams to effectively manage conflicts
5. Compose well-supported documentation of the work and inculcate oral defence skills

MIT-WPU
Approved by
Academic Council
08 JUN 2023
Date...../...../.....

Dr. Dinesh Seth
Dean

**Course outline and policy:**

The Student will undertake one project over the academic year, which will involve the analysis, design of a system or sub system in the area of Computer Science and Engineering.

The group will submit at the end of semester.

A. The Workable project.
B. Project report in the form of bound journal complete in all respect – 1 copy for the Institute and 1 copy of each student in the group for certification.

The term work will be accessed by the examiners in consultation with the guide. Oral examination will be based on the project work completed by the candidates. Project report work completed by candidates. Project report must also be presented during the oral examination. The project report contains the details.

1. Problem definition
2. Requirement specification
3. System design details (UML diagrams)
4. System implementation – code documentation – dataflow diagrams/ algorithm, protocols used.
5. Test result and procedure – test report.
6. Platform choice use.
7. Conclusions.
8. Appendix tools used, References.

| **End Term Assessment Marks** | | **Total** | **Credits** |
|---|---|---|---|
| Individual Assessment | Group Assessment (LCA) | | |
| **40 Marks** | **60 Marks** | **100 Marks** | **4** |
| *** Throughout Guide Assessment: 60 Marks** | | | |
| **Total = Midterm [ 40 Marks ] +External assessment [100 Marks] + Internal Project Guide Assessment [60 Marks ] = 200 MARKS** | | | |

MIT-WPU
Approved by
Academic Council
08 JUN 2023
Date...../...../.....

Dr. Dinesh Seth
Dean

# COURSE STRUCTURE

| Course Code | CET3018B | | | |
|---|---|---|---|---|
| Course Category | Professional Core | | | |
| Course Title | Distributed Computing | | | |
| Teaching Scheme and Credits<br>Weekly load hrs | Lecture | Tutorial | Laboratory | Credits |
| | 3 hr/wk | -- | 2hrs/wk | 3+1=4 |

**Pre-requisites**:
- Computer Networks
- Operating systems

**Course Objectives:**

**1. Knowledge:**

i. To study principles of distributed computing.
ii. To understand the concept of cloud computing.

**2. Skills:**

i. To study and implement various distributed algorithms used in distributed system design for distributed computing.
ii. To implement middleware technologies.

**3. Attitude:**

i. To apply middleware communication technologies to solve real-life problems.
ii. To enable multi-platform systems on a single machine.
iii. To apply cloud computing to address real-life computational and storage requirements

**Course Outcomes:**

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

1. Configure and set-up distributed computing environments, by the usage of modern tools.
2. To understand the importance of communication middleware in distributed computing
3. Describe the synchronization and communication mechanisms in Distributed Computing.
4. Comprehend the distributed mutual exclusion algorithms and deadlocks in distributed systems
5. Understand the concept of cloud computing and virtualization.

**Course Contents:**

1. Introduction to Distributed Systems, Distributed Computing
2. Communication in Distributed Systems for Distributed Computing
3. Synchronization in Distributed systems
4. Distributed Mutual Exclusion and Deadlock Detection in Distributed Systems
5. Introduction to Cloud Computing

MIT-WPU Approved by Academic Council 08 JUN 2023 Date...../...../.....

Dr. Dinesh Seth
Dean

**Laboratory Exercises:**

1. Write a program to implement Echo server using socket programming
2. Design a distributed application using RMI.
3. Design a distributed application using RPC.
4. Write a C program to implement Lamport's Logical Clock Algorithm.
5. Write a C Program to Implement Bully Election Algorithm.
6. Implement a Network File System
7. Install VM-Ware Workstation on a windows or Ubuntu server platform as per requirement.
8. CASE STUDY: Applications of Cloud Computing
9. Create a resource for one of the cloud services like AWS Lambda or Azure Storage account, comprehend its usage and delete the same

**Learning Resources:**

1. Coulouris, George, Jean Dollimore, and Tim Kindberg. "Distributed Systems: Concepts and Design" Edition 5.
2. Ajay D. Kshemkalyani, Mukesh Singhal, "Distributed Computing Principles, Algorithms, and Systems", Cambridge University Press
3. Cloud Computing: Architecting Next-Gen Transformation Paradigms, 4th Edition, Author: Dr. Kumar Saurabh, Publish Year: November 2018.
4. Curriculum Enhancement - Distributed Computing- NICE Interactive Solutions India Pvt. Ltd., Author: Ashish Khatri, supported by: Siddharth Barman, Uttam Chakraborty, Tripati Gupta and Javed Shaikh

**Reference Books:**

1. Van Steen, Maarten, and A. Tanenbaum. "Distributed systems principles and paradigms." Network 2 (2002): 28.

**Supplementary Reading:**

**Web Resources:**

**Weblinks:**

1. https://eclass.uoa.gr/modules/document/file.php/D245/2015/DistrComp.pdf
2. https://repository.dinus.ac.id/docs/ajar/George-Coulouris-Distributed-Systems-Concepts-and-Design-5th-Edition.pdf

**MOOCs:**

1. https://onlinecourses.nptel.ac.in/noc21_cs87/preview
2. https://www.coursera.org/courses?query=distributed%20systems
3. https://nptel.ac.in/courses/106106168

**Pedagogy:**

1. PowerPoint Presentation
2. White-board / Pen

MIT-WPU
Approved by
Academic Council
08 JUN 2023
Date...../...../.....

Dr. Dinesh Seth
Dean

**Assessment Scheme:**

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

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

| Mid Term | Component 1 (Active Learning) | Component 2 |
|---|---|---|
| 15 Marks | 10 Marks | 5 Marks |
| **Practical Performance** | **Active learning / Mini Project/Additional implementation/ On paper design** | **End term practical /oral examination** |
| 10 Marks | 10 Marks | 10 Marks |

**Term End Examination : 40 Marks**

**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs Theory |
|---|---|---|
| 1 | **Introduction to Distributed Systems, Distributed Computing**<br>Definition, Characterization of distributed systems and Distributed Communication- Trends in distributed systems, Focus on resource sharing, Challenges.<br>Types of distributed systems.<br>System Models - Introduction, Physical models, Architectural models, Fundamental models. A Model of Distributed Computations. Distributed Shared Memory. | 08 |
| 2 | **Communication in Distributed Systems for Distributed Computing**<br>Primitives for Distributed Communication.<br>Introduction to middleware. Message Oriented Communication, TCP and UDP characteristics and differences, Multicast Communication.<br>Remote Methods Invocation[RMI] , Remote Procedure Call [RPC] | 08 |
| 3 | **Synchronization in Distributed Systems**<br>Clock synchronization -Physical Clocks, Logical Clocks.<br>Clock Synchronization Algorithms.Scalor time, Vector time.<br>Logical clocks - Lamport's Logical Clocks, Vector Clocks. Physical clock Synchronization- NTP. | 08 |
| 4 | **Distributed Mutual Exclusion and Deadlock Detection in Distributed Systems.**<br>**Distributed Mutual Exclusion Algorithms**<br>A Centralized Algorithm, A Decentralized algorithm, Traditional Election Algorithms. Lamports Algorithm, Ricart-Agarwala Algorithm, Token Based Algorithms | 09 |

MIT-WPU Approved by Academic Council 08 JUN 2023 Date...../...../.....

Dr. Dinesh Seth
Dean

| | | |
|---|---|---|
| | **Deadlocks in Distributed Systems**<br>System model, Models of Deadlocks, Chandy–Misra–Haas algorithm for the AND and OR model. Recovery mechanisms like Check pointing, Roll Back and Log based. Consensus and Agreement algorithms. | |
| 5 | **Introduction to Cloud Computing**<br>Introduction, Roots of Cloud Computing: From Mainframes to Cloud, Benefits of Cloud Computing SOA, Web services, Role of Networks in Cloud Computing: Cloud types and service models, Primary Cloud Service models, Cloud Services brokerage, Primary cloud deployment models, cloud computing reference model, The greenfield and brownfield deployment options, SLAs, Frequently used cloud services across industry, Basic serverless cloud architecture, Basic microservice based cloud architecture | 12 |

**Laboratory:**

| Sr No | Title of the assignment | Workload in hrs |
|---|---|---|
| 1 | Write a program to implement Echo server using socket programming | 04 |
| 2 | Design a distributed application using RMI. | 04 |
| 3 | Design a distributed application using RPC. | 04 |
| 4 | Write a C program to implement Lamport's Logical Clock Algorithm. | 04 |
| 5 | Write a C Program to Implement Bully Election Algorithm. | 04 |
| 6 | Implement a Network File System | 04 |
| 7 | Install VM-Ware Workstation on a windows or Ubuntu server platform as per requirement. | 04 |
| 8 | CASE STUDY : Applications of Cloud Computing | 02 |
| 9 | Create a resource for one of the cloud services like AWS Lambda or Azure Storage account, comprehend its usage and delete the same | 01 |

MIT-WPU
Approved by
Academic Council
08 JUN 2023
Date...../...../.....

Dr. Dinesh Seth
Dean

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

# COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CET3011B** | | | |
| **Course Category** | **Professional Core** | | | |
| **Course Title** | **System Software and Compiler Design** | | | |
| **Teaching Scheme and Credits** | **Lecture** | **Tutorial** | **Laboratory** | **Credits** |
| **Weekly load hrs** | **3 hr/wk** | **--** | **2 hr/wk** | **3+1=4** |

**Pre-requisites**:

- Data Structure –I
- Theory of Computation

**Course Objectives:**

1. **Knowledge**
   i. To demonstrate the fundamentals of a translator.
   ii. To explain pre-processing, linking and loading concepts.
2. **Skills**
   i. To construct a scanner for high level languages.
   ii. To analyse the process of parsing and code generation for high level languages.
3. **Attitude**

**Course Outcomes:**

Students will be able:

i. To analyse and synthesize a translator.
ii. To develop a pre-processor, linker and loader schemes.
iii. To apply the knowledge of Lex tool & Yacc tool to develop a scanner & parser
iv. To design syntax directed translation and Intermediate code generation schemes for high level languages
v. To apply the code optimization techniques and generate code for high level language program

**Course Contents:**

1. Introduction to System Software and Assembler
2. Macros, Loaders and Linkers
3. Introduction to compilers Lexical Analysis and Syntax Analysis
4. Semantic Analysis and Intermediate Code Generation
5. Code Optimization and Code Generation

**Laboratory Exercises:**

1. Design suitable data structures and implement Pass 1 of 2 Pass Assembler for pseudo machines in JAVA.
2. Design suitable data structures and implement Pass 2 of 2 Pass Assembler for pseudo machines in JAVA.
3. Design suitable data structures and implement Pass 1 of 2 Pass Macro processor.
4. Design suitable data structures and implement Pass 2 of 2 Pass Macro processor.
5. Write a program using LEX specifications to implement a lexical analysis phase of the compiler to generate tokens of subsets of the Java program and create symbol table.
6. Write a program using LEX and YACC to validate compound statements in High Level Language.

MIT-WPU Approved by Academic Council Date 08 JUN 2023

Dr. Dinesh Seth
Dean

7. Write a program using LEX and YACC to create Parser for sample language. (Design Calculator).
8. Implement Recursive Descent parser for sample language.

**Learning Resources:**

**Text Books:**

1. Dhamdhere D., "Systems Programming and Operating Systems", McGraw Hill, ISBN 0 - 07- 463579 – 4.
2. A V Aho, R Sethi, J D Ullman, \Compilers: Principles, Techniques, and Tools", Pearson Edition, ISBN 81-7758-590-8.
3. John Donovan, "System Programming", McGraw Hill, ISBN 978-0--07-460482-3.

**Reference Books:**

1. John. R. Levine, Tony Mason and Doug Brown, "Lex and Yacc", O'Reilly, 1998, ISBN: 56592-000-7.
2. Leland L. Beck, "System Software An Introduction to Systems Programming" 3rd Edition,Person Education, ISBN 81-7808-036-2.
3. Adam Hoover, "System Programming with C and Unix", Pearson,2010

**Supplementary Reading:**

**Web Resources:**

1. https://shraddhasshinde.files.wordpress.com/2017/12/spos-by-dhamdhere.pdf
2. http://web.mit.edu/jjd/www/documents/Instructors%20Manual%20to%20accompany%
3. 0Systems%20Programming%20by%20John%20J.%20Donovan.pdf

**Weblinks:**

1. http://www.uotechnology.edu.iq/ce/Lectures/Dr-Shaima-Sys-Prog/lec1-2-3-4.pdf

**MOOCs:**

1. https://onlinecourses.nptel.ac.in/noc19_cs01/unit?unit=6&lesson=32

**Pedagogy:**

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

MIT-WPU
Approved by
Academic Council
08 JUN 2023
Date...../...../.....

Dr. Dinesh Seth
Dean

**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 learning / Mini Project/Additional implementation/ On paper design | End term practical /oral examination |
|---|---|---|
| 10 Marks | 10 Marks | 10 Marks |

**Term End Examination: 40 Marks**

**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Theory |
| 1 | **Introduction to System Software and Assembler Design**<br>Need and Components of system software: Assembler, Compiler, Interpreter, Macro processor, Linker, Loader, debugger, text editor.<br>**Assembler**: Elements of Assembler language programming, Machine dependent and machine independent assembler features, Design of 2 pass Assembler. | 09 |
| 2 | **Macroprocessor, Loaders and Linkers**<br>**Macro Processor:** Macro Definition macro expansion and nested macros.<br>**Loaders:** Loader schemes: Types of loaders, direct linking loaders.<br>**Linkers:** Relocation and linking concepts, self-relocating programs, Static and dynamic link libraries. | 09 |
| 3 | **Lexical Analysis and Syntax Analysis**<br>**Introduction to compilers:** passes, phases, symbol table.<br>**Lexical Analyzer:** Role of LEX Analyzer, Specification of tokens, Recognition of tokens, input buffering.<br>**Syntax Analysis:** RDP, Predictive parser, SLR, LR (1), LALR parsers, using ambiguous grammar, Error detection and recovery.<br>**LEX and YACC**: Specification and generation using LEX tool, Lexical errors. Automatic construction of parsers using YACC | 09 |

Dr. Dinesh Seth
Dean

MIT-WPU
Approved by
Academic Council
08 JUN 2023
Date...../...../.....

| | | |
|---|---|---|
| 4 | **Semantic Analysis and Intermediate Code Generation**<br>**Semantic Analysis:** Need, Syntax Directed Translation, Syntax Directed Definitions, Translation of assignment Statements, iterative statements, Boolean expressions, conditional statements, Type Checking and Type conversion.<br>**Intermediate Code Formats:** Postfix notation, Parse and syntax tress, Three address code, quadruples and triples. | 09 |
| 5 | **Code Generation and Optimization**<br>Code Generation: Code generation Issues. Basic blocks and flow graphs, A Simple Code Generator.<br>Code Optimization: Machine Independent: Peephole optimizations: Common Sub-expression elimination, removing of loop invariants, Induction variables and Reduction in strengths, use of machine idioms, Dynamic Programming Code Generation.<br>Machine dependent Issues: Assignment and use of registers, Rearrangement of Quadruples for code optimization. | 09 |

**Laboratory:**

| Assignment No | Contents | Workload in Hrs. Lab |
|---|---|---|
| 1 | **Assembler Pass 1**<br>Design suitable data structures and implement Pass 1 of 2 Pass Assembler for pseudo machines in JAVA. | 02 |
| 2 | **Assemble pass 2 (Study Assignment)**<br>Design suitable data structures and implement Pass 2 of 2 Pass Assembler for pseudo machines in JAVA. | 04 |
| 3 | **Macro pass 1**<br>Design suitable data structures and implement Pass 1 of 2 Pass Macro processor. | 04 |
| 4 | **Macro Pass 2**<br>Design suitable data structures and implement Pass 2 of 2 Pass Macro processor. | 04 |
| 5 | **Scanner JAVA (LEX)**<br>Write a program using LEX specifications to implement a lexical analysis phase of the compiler to generate tokens of subsets of the Java program and create symbol table. | 04 |
| 6 | **Validation of Compound statement**<br>Write a program using LEX and YACC to validate compound statements in High Level Language. | 04 |
| 7 | **Parser using YACC**<br>Write a program using LEX and YACC to create Parser for sample language.(Design Calculator). | 04 |
| 8 | **Recursive Descent Parser (Study Assignment)**<br>Implement Recursive Descent parser for sample language. | 04 |

Dr. Dinesh Seth
Dean

MIT-WPU Approved by Academic Council 08 JUN 2023

# COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CET3012B** | | | |
| **Course Category** | **Professional Elective** | | | |
| **Course Title** | **Deep Learning** | | | |
| **Teaching Scheme and Credits** | **Lecture** | **Tutorial** | **Laboratory** | **Credits** |
| **Weekly load hrs** | **3 hr/wk.** | **--** | **2 hr/wk.** | **3+1=4** |

**Pre-requisites**: Data Warehouse and Data Mining

**Course Objectives:**

**1. Knowledge:**

i. To study fundamentals of Artificial Neural Network
ii. To learn the concepts of Deep Learning

**2. Skills:**

i. To design the Convolution Neural Network Model
ii. To develop applications using deep learning technique

**3. Attitude:**

**i.** To analyse and implement various Advanced Deep Learning Models

**Course Outcomes:**

On completion of course, students should be able to

1. Apply the fundamentals of Artificial Neural Network
2. Explore and use Deep Learning technique to solve the problems
3. Develop the model using Convolution Neural Network
4. Implement and solve real world problem using Advanced Deep Learning models

**Course Contents:**

1. Introduction to Neural Network
2. Introduction to Deep Learning
3. Introduction to Convolution Neural Network
4. Advanced Deep Learning
5. Deep Learning Platform and Applications

**Laboratory Exercises:**

1. Data analysis using Advanced Machine Learning.
2. Installation of tensor flow.
3. Basic fundamental operations using tensors.
4. Implement Simple Neural Network using Python.
5. Implement a Convolution Neural Network (CNN) for Image dataset using Python.
6. Implement a prediction model using pre-trained model.
7. Implement a prediction model for time-series data using Deep Learning method.
8. Mini Project

MIT-WPU
Approved by
Academic Council
08 JUN 2023
Date

Dr. Dinesh Seth
Dean

**Learning Resources:**

**Text Books:**

1. Michael A. Nielsen, "Neural Networks and Deep Learning", Determination Press, 2015
2. Good fellow I Bengio Y, Courville A, Deep learning, MIT Press, 2016
3. Nikhil Budua, Fundamentals of Deep Learning, Designing Next Generation Artificial Intelligence Algorithms, First edition, O'Reilly Publications, 2016

**Reference Books:**

1. Introduction to Artificial Neural Systems by Jacek M. Zurada Yegnanarayana B, Artificial Neural Systems , PHP learning
2. Machine learning with neural networks: an introduction for scientists and engineers, Bernhard Mehlig.

**Supplementary Reading:**

**Web Resources:**

1. https://www.javatpoint.com/artificial-neural-network
2. https://swayam.gov.in/nd1_noc19_cs85/preview
3. https://nptel.ac.in/courses/106/106/106106213/

**Weblinks:**

1. https://www.oreilly.com/library/view/neural-networks-and/9781492037354/ch01.html
2. https://www.cse.unr.edu/~bebis/MathMethods/NNs/lecture.pdf
3. https://towardsdatascience.com/artificial-intelligence-framework-a-visual-introduction-to-machine-learning-and-ai-d7e36b304f87
4. https://web.stanford.edu/class/cs231a/lectures/intro_cnn.pdf
5. https://towardsdatascience.com/simple-introduction-to-convolutional-neural-networks-cdf8d3077bac
6. https://www.analyticsvidhya.com/blog/2019/03/deep-learning-frameworks-comparison/

**MOOCs:**

1. https://nptel.ac.in/courses/106106184/
2. https://www.coursera.org/learn/deep-learning-in-computer-vision
3. htps://cs230.stanford.edu/

**Pedagogy:**

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

MIT-WPU
Approved by
Academic Council
08 JUN 2023
Date 08 JUN 2023

Dr. Dinesh Seth
Dean

**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 learning / Mini Project/Additional implementation/ On paper design | End term practical /oral examination |
|---|---|---|
| 10 Marks | 10 Marks | 10 Marks |

**Term End Examination: 40 Marks**

**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Theory |
| 1 | **Introduction to Neural Network**<br>Introduction, The architecture of an artificial neural network, Types of ANN architecture, Advantages and disadvantages of ANN, Perceptron, Sigmoid Neurons, Activation Functions, Loss Function. | 09 |
| 2 | **Introduction to Deep Learning**<br>Introduction to Deep learning, Architecture, Multilayer Perceptron (MLP), Training MLP, Chain Rule, Back propagation, Optimization Methods, Feedforward Neural Network, Examples of Deep Learning. | 09 |
| 3 | **Convolutional Neural Networks:**<br>Convolutional Network Architectures, Filters, Feature Maps, Pooling, Batch Normalization, Stride Padding, Dropouts Complete Convolutional Network for image Data. | 09 |
| 4 | **Advanced Deep Learning:**<br>Deep Learning Architectures: LeNet, AlexNet, VGG, RESNET, RNN, LSTM. | 09 |
| 5 | **Deep Learning Platform & Applications:**<br>Deep Learning Libraries, Introduction to Tensor flow, Tensor flow features, building blocks of Tensor flow, Installation of Tensor flow, Using keras in Tensor flow. Deep Learning Applications | 09 |

MIT-WPU
Approved by
Academic Council
08 JUN 2023
Date...../...../.....

Dr. Dinesh Seth
Dean

**Laboratory:**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Lab |
| 1 | Data analysis using Advanced Machine Learning. | 02 |
| 2 | Installation of tensor flow. | 02 |
| 3 | Basic fundamental operations using tensors. | 02 |
| 4 | Implement Simple Neural Network using Python. | 02 |
| 5 | Implement a Convolution Neural Network (CNN) for Image dataset using Python | 04 |
| 6 | Implement a prediction model using pre-trained model. | 04 |
| 7 | Implement a prediction model for time-series data using Deep Learning method. | 04 |
| 8 | Mini Project | 08 |

MIT-WPU
Approved by
Academic Council
08 JUN 2023
Date...../...../.....

Dr. Dinesh Seth
Dean

# COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CET4009B** | | | |
| **Course Category** | **Professional Elective** | | | |
| **Course Title** | **Augmented Reality and Virtual Reality** | | | |
| **Teaching Scheme and Credits** | **Lecture** | **Tutorial** | **Laboratory** | **Credits** |
| **Weekly load hrs.** | **3 hr/wk** | **--** | **02 hr/wk** | **3+1=04** |

**Pre-requisites:**
Computer Graphics & 3D Modelling

**Course Objectives:**

**1.Knowledge**

i. To provide understanding of concepts of Augmented Reality and Virtual Reality.

**2.Skills**

i. To give exposure to the students about hardware devices for Augmented Reality and Virtual Reality.
ii. To familiarize with Development Tools and Frameworks in Virtual Reality.

**3.Attitude**

**i.** To prepare the students to develop Augmented Reality and Virtual Reality applications.

**Course Outcomes:**

On completion of course, students should be able to:

1. Understand the fundamental concepts of Augmented Reality and Virtual Reality.
2. Know hardware devices and technologies for Augmented Reality and Virtual Reality.
3. Illustrate development tools and frameworks in Virtual Reality.
4. Design and develop Augmented Reality and Virtual Reality applications.

**Course Contents:**

1. Introduction to Augmented Reality
2. Introduction to Virtual Reality
3. Development Tools and Frameworks in Virtual Reality
4. Computer Vision and Techniques for Augmented Reality
5. Future Trends and Applications

**Laboratory Exercises:**

1. Study Assignment: Comparison of various Augmented Reality and Virtual Reality hardware devices
2. Design 3D objects in any Augmented Reality and Virtual Reality software
3. Installation of Unity
4. Develop a scene in Unity
5. Create an immersive environment for Virtual Reality
6. Develop Augmented Reality Application
7. Develop Virtual Reality Application
8. Deploy the Virtual Reality Application in VR Headset

MIT-WPU Approved by Academic Council 08 JUN 2023 Date

Dr. Dinesh Seth
Dean

**Learning Resources:**

**Reference Books:**

1. Grigore C. Burdea, Philippe Coiffet, "Virtual Reality Technology", Wiley Interscience,1 Edition,1994.
2. Adams, "Visualization of Virtual Reality", Tata McGraw Hill, 2000
3. William R Sherman, Alan B Craig, "Understanding Virtual Reality: Interface, Applications and Design", Morgan Kaufman, 2008
4. Tony Parisi – Learning Virtual Reality, O'Reilly Media, Inc., 2015, ISBN- 9781491922835
5. Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR, Steve Aukstakalnis, Released September 2016, Publisher(s): Addison-Wesley Professional, ISBN: 9780134094328

**Supplementary Reading:**

**Web Resources:**

**E-books:**

1. Augmented Reality and Virtual Reality the Power of AR and VR for Business, Editors: M. Claudia tom Dieck, Timothy Jung, Publisher: Springer International Publishing, 2019, eBook ISBN: 978-3-030-06246-0
2. Creating Augmented and Virtual Realities by Erin Pangilinan, Steve Lukas, Vasanth Mohan, Released April 2019, Publisher(s): O'Reilly Media, Inc., ISBN: 9781492044192
3. Virtual Reality By Samuel Greengard, The MIT Press, September 2019, ISBN: 9780262537520

**Weblinks:**

1. https://docs.microsoft.com/en-us/windows/mixed-reality/
2. https://docs.unity3d.com/Manual/index.html

**MOOCs:**

1. https://nptel.ac.in/courses/106/106/106106138/
2. https://www.udemy.com/topic/augmented-reality/
3. https://www.coursera.org/specializations/unity-xr

**Pedagogy:**

1. PowerPoint Presentation
2. White-board / Pen / Smart board
3. Two Teacher method
4. Video Lectures
5. Flipped Classroom Activity

MIT-WPU Approved by Academic Council
Date: 08 JUN 2023

Dr. Dinesh Seth
Dean

**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 learning / Mini Project/Additional implementation/ On paper design | End term practical /oral examination |
|---|---|---|
| 10 Marks | 10 Marks | 10 Marks |

**Term End Examination: 40 Marks**

**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs Theory |
|---|---|---|
| 1 | **Introduction to Augmented Reality**<br>Introduction, History, Relationship between AR with other technologies.<br>**Augmented Reality Concepts:** Visual and Auditory depth cues, dimensionality, Registration and Latency.<br>**Augmented Reality Hardware:** Sensors, Processors and Displays.<br>**Augmented Reality Software:** Software for creating AR applications, Software for content creation for AR application, other software related to AR. | 09 |
| 2 | **Introduction to Virtual Reality**<br>Introduction, Historical and Recent Developments in Virtual Reality, Primary Features and Components of Virtual Reality, Key Elements of Virtual Reality Experience, Representation of the Virtual World.<br>**Multiple Models of Input and Output Interface in Virtual Reality:**<br>Input - Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Scanner etc.Output - Visual / Auditory / Haptic Devices.<br>**Interactive Techniques in Virtual Reality:** Body Track, Hand Gesture, 3D Menus, Object Grasp. | 09 |
| 3 | **Development Tools and Frameworks in Virtual Reality**<br>**3D Computer Graphics:** Perspective Projection, 3D Clipping, Simple 3D modeling, Illumination and Reflection models, Shading algorithms, Frameworks of Software Development Tools in Virtual Reality.<br>**Light and Perspective in VR:** Eye Tracking process, Psychological effects of VR. | 09 |

MIT-WPU Approved by Academic Council
08 JUN 2023
Date...../...../.....

Dr. Dinesh Seth
Dean

| | | |
|---|---|---|
| | Virtual Reality: Planning, Staging and Storyboarding, UI design for AR & VR, Creating 360 degree Videos, VR Content Creation & Interaction. | |
| 4 | **Computer Vision and Techniques for Augmented Reality**<br>**Computer Vision for Augmented Reality:** Marker Tracking, Multiple-Camera Infrared Tracking, Natural Feature Tracking by Detection, Simultaneous Localization and Mapping, Outdoor Tracking<br>**Marker-based approach:** Introduction to marker-based tracking<br>**Marker types:** Template markers, 2D barcode markers, imperceptible markers.<br>**Marker-less approach:** Localization based augmentation, real world examples<br>**Tracking methods:** Visual tracking, feature based tracking, hybrid tracking | 09 |
| 5 | **Future Trends and Applications**<br>**Applications of VR:** Digital Entertainment: VR Technology in Film & TV Production, VR Technology in Physical Exercises and Games, VR in Education, VR in Real Estate.<br>**Applications of AR:** AR in E-commerce application, AR in Education, AR in Fashion Industry, AR in Defence/Military.<br>**Applications of Mixed Reality:** Case Study.<br>**Applications of Extended Reality:** Case Study. Field of Research, Future Trends, Challenges and Technology future. | 09 |

**Laboratory:**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Lab |
| 1 | Study Assignment: Comparison of various Augmented Reality and Virtual Reality hardware devices. | 02 |
| 2 | Design 3D objects in any Augmented Reality and Virtual Reality software. | 04 |
| 3 | Installation of Unity and setting it up for VR application development. | 04 |
| 4 | Develop a scene in Unity that includes game objects such as a cube, sphere and plane. Apply transformations on these 3 game objects, add a video and audio source and apply Rigid body component, Material and Box collider to the game objects. Write a program to control game objects. | 04 |
| 5 | Create an immersive environment for Virtual Reality (living room/ terrain/basketball court) with only static game objects. 3D objects can be created using Blender or use available 3D models. | 04 |
| 6 | Develop Augmented Reality Application. | 04 |
| 7 | Develop Virtual Reality Application. | 04 |
| 8 | Deploy the Virtual Reality Application in VR Headset | 04 |

Dr. Dinesh Seth
Dean

MIT-WPU
Approved by
Academic Council
08 JUN 2023
Date...../...../.....

# COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CET4010B** | | | |
| **Course Category** | **Professional Elective** | | | |
| **Course Title** | **Vulnerability Identification and Penetration Testing** | | | |
| **Teaching Scheme and Credits** | **Lecture** | **Tutorial** | **Laboratory** | **Credits** |
| **Weekly load hrs** | **3 hr/wk** | **--** | **2 hr/wk** | **3+1=04** |

**Pre-requisites:**

- Network Security

**Course Objectives:**

1. **Knowledge:**
   - **i.** Study the importance and benefits of Vulnerability Identification and Penetration Testing
2. **Skills:**
   - ii. Learn ethical guidelines and industry best practices for performing Penetration Testing
3. **Assessments:**
   - i. Demonstrate the knowledge to perform Vulnerability Assessments and Penetration Testing
   - ii. Identify breaches/ Vulnerability found in a network using Penetration Testing

**Course Outcomes:**

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

1. Understand how to exploit a program and different types of software exploitation techniques
2. Understand the exploit development process
3. Search for vulnerabilities in closed-source applications
4. Analyze and apply different VAPT tools and generate report

**Course Contents:**

1. Penetration Testing-Principles and Practices
2. Vulnerabilities
3. Vulnerabilities Identification
4. Penetration Testing
5. VAPT Audit and uses cases

MIT-WPU
Approved by
Academic Council
08 JUN 2023
Date

Dr. Dinesh Seth
Dean

**Learning Resources:**

**Text Books:**

1. The Art of Network Penetration Testing by Royce Devis, copyright Manning Publications-2020.
2. Penetration Testing: A Hands-On Introduction to Hacking 1st Edition by Georgia Weidman, No-starch Press, ISBN-13: 978-1593275648

**Reference Books:**

1. Advanced Infrastructure Penetration Testing by Chiheb Chebbi, Packt Publishing Birmingham – Mumbai, 2018.
2. The basic of Hacking and Penetration testing, second edition on ethical hacking and penetration by Patrick Engebretson
3. Hack I.T. - Security Through Penetration Testing, T. J. Klevinsky, Scott Laliberte and Ajay Gupta, Addison-Wesley, ISBN: 0-201-71956-8
3. Metasploit: The Penetration Tester's Guide, David Kennedy, Jim O'Gorman, Devon Kearns, Mati Aharoni
4. Professional Penetration Testing: Creating and Operating a Formal Hacking Lab, Thomas Wilhelm

**MOOCs:**

1. https://swayam.gov.in/nd1_noc20_ma24/preview

**Pedagogy:**

2. PowerPoint Presentation
3. Two Teacher Method

**Assessment Scheme:**

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

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

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

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

**End Term Examination: 40 Marks**

Dr. Dinesh Seth
Dean

MIT-WPU
Approved by
Academic Council
Date 08 JUN 2023

**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Theory |
| 1 | **Penetration Testing-Principles and Practices**<br>Importance and benefits of Penetration Testing assessments. Penetration Testing-Principles and concepts, PT work flows and examples, blind tests, Function of malware and destructive viruses. Ethical hacking techniques, Ethical guidelines and industry best practices for performing Penetration Testing assessments. | 07 |
| 2 | **Vulnerabilities**<br>Introduction to Metasploit: Metasploit framework, Metasploit Console, Payloads Using Nmap to sweep IP ranges for live hosts, Performance tuning Nmap scans. Discovering hosts using commonly known ports.<br>Understan Computer Vision ding security posture, cybersecurity issues. Gathering Information about target computer systems – Foot printing and Investigation. Scanning computers in the Networks. Network infrastructure vulnerabilities. | 07 |
| 3 | **Vulnerabilities Identification**<br>Enumeration- Listing the systems/users and connecting them. Identifying Vulnerabilities associated with systems. Ethical hacking- penetrate into the security to locate vulnerabilities<br>Vulnerability Issues: Operating System Vulnerabilities; Application Vulnerabilities; Vulnerability assessment for natural disaster, technological hazards and terrorist threats; implications for emergency response, vulnerability of critical infrastructures | 07 |
| 4 | **Penetration Testing**<br>Exploring Ethical Hacking, Malware Threats and their Counter measures. Monitoring and Capturing Data Packets using Sniffing. Restricting the System Access – DoS Attack, Gather Confidential Information – Social Engineering. | 07 |
| 5 | **VAPT Audit and Uses cases**<br>Discovering patching vulnerabilities, Discovering web server vulnerabilities. Synthetic transactions, interface testing and fuzzing, SDLC phases and security mandates. Perform Penetration Testing assessments, detect and respond to network breaches found in a Penetration Testing assessments. Preparation of a Penetration Test report. Auditing the Systems. Analysis and Reporting. Case Studies of recent vulnerabilities and attacks. | 07 |

MIT-WPU
Approved by
Academic Council
08 JUN 2023
Date...../...../.....

Dr. Dinesh Seth
Dean

**Laboratory:**

| Assignment No. | Contents | Workload in Hrs |
|---|---|---|
| | | Lab |
| 1 | Generate Brute-force password-guessing attacks. Use Password cracking tools – Air-crack-ng | 02 |
| 2 | Find sweep IP ranges for live hosts and Performance tuning using Nmap scans | 02 |
| 3 | Obtain network services from an attacker's perspective using Nmap | 02 |
| 4 | Discover Network service to Organize and Sort through Nmap scan output | 02 |
| 5 | Creating protocol-specific target lists for vulnerability discovery | 02 |
| 6 | Obtain threats associated with Web Servers & Applications. i.e. Session Hijacking | 02 |
| 7 | Implementation to gather information from any PC's connected to the LAN using whois, port scanners, network scanning, Angry IP scanners etc. | 02 |
| 8 | Implementation of IT Audit, malware analysis and Vulnerability assessment and generate the report. | 04 |

MIT-WPU
Approved by
Academic Council
08 JUN 2023
Date...../...../.....

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

MIT-WPU

# COURSE STRUCTURE

| | | | | |
|---|---|---|---|---|
| **Course Code** | **CET4011B** | | | |
| **Course Category** | **Professional Elective** | | | |
| **Course Title** | **Computer Vision** | | | |
| **Teaching Scheme and Credits** | **Lecture** | **Tutorial** | **Laboratory** | **Credits** |
| **Weekly load hrs** | **3 hr/wk** | **-** | **2 hr/wk** | **3+1=04** |

**Pre-requisites:**

- Fundamentals of Data Structure
- Design and Analysis of Algorithms

**Course Objectives:**

**1. Knowledge:**

i. To learn fundamentals of image processing and formation techniques for computer vision.
ii. To study mathematical operations and algorithms for specific visual applications.

**2. Skills:**

i. To analyze the strengths and limitations of available tools, and select the appropriate tool for application to be developed.
ii. To develop applications using computer vision techniques and available tools

**3. Attitude:**

**i.** Ability to select appropriate processing algorithms for image and video.
**ii.** Ability to apply the knowledge in trans-disciplinary applications.

**Course Outcomes:**

Apply appropriate mathematics required for image processing applications

1. To implement image enhancement and segmentation techniques
2. To analyze the images with the help of feature extraction
3. To demonstrate various motion estimation algorithms used in video analysis
4. Use current trends and future scope in Computer Vision Applications

**Course Contents:**

1. Fundamentals of Digital Image Processing
2. Image Enhancement and Segmentation Techniques
3. Feature Detection and Extraction
4. Fundamentals of Video Processing
5. Applications of Computer Vision

**Laboratory Exercises:**

1. Install OpenCV library in Python environment and import an image.
2. To perform basic operations on an image.
3. To Enhancement operations on images.
4. Implement Image Segmentation.
5. Implement different Morphological Operations on an image.
6. Implement Object detection using Hough transform.
7. Foreground extraction using video segmentation.
8. Case Studies on Computer Vision Application

MIT-WPU
Approved by
Academic Council
Date 08 June 2023

**Learning Resources:**

**Reference Books:**

1. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Addison- Wesley, 1992
2. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.
3. A. Forsyth, J. Ponce, Computer Vision: A Modern Approach, Pearson Education, 2003.
4. R. Davies, Computer & Machine Vision, Fourth Edition, Academic Press, 2012

**Supplementary Reading:**

**Web Resources:**

**Weblinks:**

1. tate of the art in the course
2. Computer Vision. Ballard and Brown:
3. https://homepages.inf.ed.ac.uk/rbf/BOOKS/BANDB/bandb.htm
4. Invitation to 3D Vision: From Images to Geometric Models: Y. Ma, S. Soatto, J. Kosecka
5. and S. Sastry:
6. https://www.eecis.udel.edu/~cer/arv/readings/old_mkss.pdf
7. Fundamentals of Computer Vision:
8. https://www.cse.unr.edu/~bebis/CS485/Handouts/ShahBook.pdf

**MOOCs:**

1. Online courses for self-learning
2. https://nptel.ac.in/courses/106/106/106106224/
3. https://onlinecourses.nptel.ac.in/noc21_ee23/preview

**Pedagogy:**

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

MIT-WPU
Approved by
Academic Council
08 JUN 2023
Date.....

**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 learning / Mini Project/Additional implementation/ On paper design | End term practical /oral examination |
|---|---|---|
| 10 Marks | 10 Marks | 10 Marks |

**Term End Examination: 40 Marks**

**Syllabus: Theory**

| Module No. | Contents | Workload in Hrs Theory |
|---|---|---|
| 1 | **Image Processing Fundamentals:**<br>**Introduction**: Types of Computer Images, Satellite Images, Medical Images, Image File Formats, Components of Image Processing System, Fundamentals Steps in Image Processing, Dimensions of image, Image Operations.<br>**Image Formation and Low-Level Processing**: Human Vision System, Computer Vision System, Stereo Vision, Geometric Cameras and projection models, noise models, Human color perception. | 09 |
| 2 | **Image Enhancement and Segmentation Techniques:**<br>**Image Enhancement:** Point processing, Gray Level Slicing, Thresholding Transformations, Histogram Processing, Filtering with morphological operators, Intensity transformations, contrast stretching, histogram equalization, Correlation and convolution, smoothing filters, sharpening filters.<br>**Image Segmentation**: Classification of image segmentation techniques, thresholding-based image segmentation, edge-based segmentation, edge detection, edge linking, Hough transform, watershed transform, clustering techniques, region approach.<br>**Texture**<br>Local texture representations using filters, Synthesizing Textures and filling holes, Shape from texture. | 09 |

MIT-WPU Approved by Academic Council 08 JUN 2023 Date

| | | |
|---|---|---|
| 3 | **Feature Detection and Extraction:**<br>**Edge Detection**: Mathematical concepts, Operators based on first order derivative (Roberts, Prewitt and Sobel), Laplacian of Gaussian (LoG).<br>**Corners Detection:** Harris and Orientation Histogram, Scale-Invariant Feature Transform (SIFT), Speeded Up Robust Features (SURF), Histogram of Oriented gradients (HOG).<br>**Feature extraction**: Spatial Features, Amplitude, transform based features, Histogram based statistical features, based on statistical moments (e.g., mean, variance, kurtosis, etc), Shape/geometry-based features and moment-based features (Radii, perimeter, area, compactness, max boundary rectangle, orientation etc.), Texture features (GLCM and texture features, Gabor features), Color features | 09 |
| 4 | **Fundamentals of Video Processing**<br>**Introduction**<br>Analog Video, Digital Video, 3D Video, Video Quality, Video standards<br>**Motion Estimation and Tracking**<br>Motion Models, 2D Motion Estimation: Differential Methods: Lukas–Kanade Method, Horn–Schunk Motion Estimation,<br>**Motion Tracking**<br>Kanade–Lucas–Tomasi Tracking, Mean-Shift Tracking, Particle-Filter Tracking, Active-Contour Tracking,<br>**Video Segmentation**<br>Change Detection: Shot-Boundary Detection, Background Subtraction, Motion Segmentation: Dominant-Motion Segmentation, Multiple-Motion Segmentation, Region-Based Motion Segmentation: Fusion of Color and Motion | 09 |
| 5 | **Applications of Computer Vision:**<br>**Object Recognition:** simple object recognition methods, Shape correspondence and shape matching, contour based representation, Region based representation, Patterns and pattern classification.<br>**Introduction to Satellite Image Processing:** Concepts and Foundations of Remote Sensing, Multispectral, Thermal, and Hyper Spectral Sensing, Earth Resource Satellites Operating in the Optical Spectrum.<br>**Introduction to Medical Image Processing:** Basic steps of medical image Processing, Medical Image Enhancement, Segmentation, Medical Image Analysis (Images of X-ray/ CT Scan/ MRI). | 09 |

MIT-WPU
Approved by
Academic Council
08 JUN 2023
Date...../...../.....

**Laboratory:**

| Module No. | Contents | Workload in Hrs |
|---|---|---|
| | | Lab |
| 1 | Install OpenCV library in Python environment and import an image for following operations<br>a) To convert it from BGR to RGB<br>b) To Convert the image into gray scale<br>gray2ind, ind2gray, ind2rgb, mat2gray,<br>rgb2gray, rgb2ind<br>Read, write, view images | 02 |
| 2 | Write a program to perform basic operations on an image using OpenCV.<br>Basic Operations such as: Cropping an image section/ coping a region to another in an image/Resizing/ Scaling and Rotation,<br>/ up sampling and down sampling an image. | 02 |
| 3 | Write a program for Enhancement operations on images using OpenCV.<br>Enhancement Techniques: Contrast Enhancement/ Brightness Enhancement/Histogram Processing Histogram equalization. | 04 |
| 4 | Implement different Morphological Operations on an image using OpenCV.<br>Morphological Transformations: Dilatation, Opening, closing and erosion. | 04 |
| 5 | Implement Object detection using Hough transform.<br>Hough Line: How to detect a line in an image<br>Hough Circle: How to detect a circle in an image | 04 |
| 6 | Implement Image Segmentation using any one below given method.<br>Thresholding-based image segmentation/ Edge-based segmentation/ Clustering techniques/Region approach | 04 |
| 7 | Implement Face detection on an image. | 04 |
| 8 | Implementation and Report writing on Computer Vision Application (Choose any One)<br>Satellite Image Processing/ Medical Image Processing/ Steganography and Watermarking/ Automatic Attendance monitoring system. | 06 |

MIT-WPU
Approved by
Academic Council
08 JUN 2023
Date...../...../.....

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

MIT-WPU

# COURSE STRUCTURE

| | | |
|---|---|---|
| **Course Code** | **CET4062B** | |
| **Course Title** | **Internship** | |
| **Teaching Scheme and Credits Weekly load hrs** | **Laboratory** | **Credits** |
| | **12hr/wk** | **6** |

**Course Objectives:**

1. Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
2. Get exposed to the current technological developments relevant to the object area of training.
3. Use the experience gained from the 'Industrial Internship' in discussions held in the classrooms.
4. Learn to apply the knowledge in real industrial solutions.
5. Gain experience in writing reports in Technical works/projects or in managerial situation.
6. Expose students to the professional responsibilities and ethics.

**Course Outcomes:**

1. Demonstrate the technical / managerial knowledge by applying the same to solve the real life problem or situation, as the case may be.
2. Identify the appropriate method(s) / tool(s) to deal with the situation.
3. Understand professional responsibilities and ethics.
4. Collect and organize data into meaningful information.
5. Develop professional communication skills and interpersonal skills.

**Internship Outline and Policy:**

1. Students may opt for an internship in any one: Semester VII or Semester VIII

| LCA | | | | | |
|---|---|---|---|---|---|
| **Supervisor 1 and 2** | | **Supervisor 1** | | **Supervisor 2** | **Total** |
| **Mid Term** | **End Term** | **Progress Evaluation Sheet** | **Report** | **Company Supervisor's Evaluation** | |
| 50 Marks | 50 Marks | 25 Marks | 25 Marks | 50 Marks | 200 Marks |

MIT-WPU
Approved by
Academic Council
08 JUN 2023
Date.....