**Pimpri Chinchwad Education Trust's**

# PIMPRI CHINCHWAD COLLEGE OF ENGINEERING

**SECTOR NO. 26, PRADHIKARAN, NIGDI, PUNE 411044**

An Autonomous Institute Approved by AICTE and Affiliated to SPPU, Pune

# DEPARTMENT OF INFORMATION TECHNOLOGY

## Curriculum Structure and Syllabus

## of

## Final Year B.Tech Information Technology

**(Course 2020)**

**Effective from Academic Year 2023-24**

# VISION AND MISSION OF INSTITUTE

## Institute Vision

To be one of the top 100 Engineering Institutes of India in coming five years by offering exemplarily Ethical, Sustainable and Value Added Quality Education through a matching ecosystem for building successful careers.

## Institute Mission

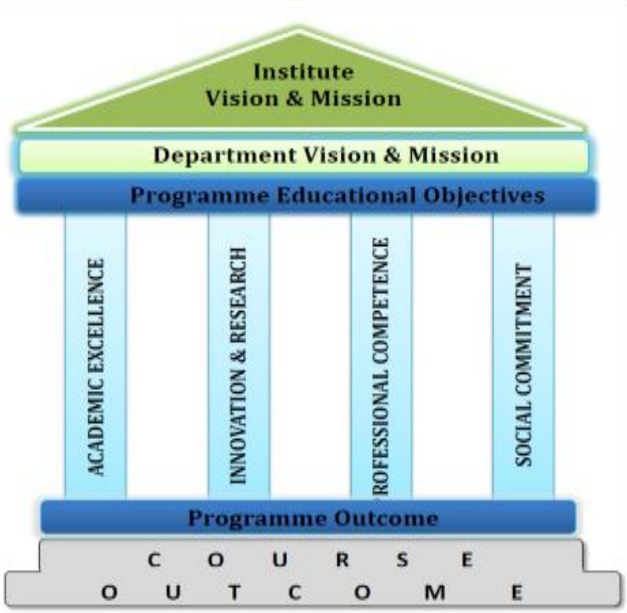
1. Serving the needs of the society at large through establishment of a state-of-art Engineering Institute

2. Imparting right Attitude, Skills, Knowledge for self-sustenance through Quality Education

3. Creating globally competent and Sensible engineers, researchers and entrepreneurs with an ability to think and act independently in demanding situations

## Quality Policy

We at PCCOE are committed to impart Value Added Quality Education to satisfy the applicable requirements, needs and expectations of the Students and Stakeholders. We shall strive for academic excellence, professional competence and social commitment in fine blend with innovation and research. We shall achieve this by establishing and strengthening state-of-the-art Engineering and Management Institute through continual improvement in effective implementation of Quality Management System.



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|---|---|---|
| | **Pimpri Chinchwad Education Trust's**<br>**Pimpri Chinchwad College of Engineering** | |
| **Course Approval Summary** | | |

## A) Board of study - Department of Information Technology

| Sr. No. | Name of the Course | Course Code | Page number | Signature and stamp of BoS |
|---|---|---|---|---|
| 1 | Cryptography & Networks Security | **BIT7401** | 17-18 | |
| 2 | Object Oriented Modelling and Design | **BIT7402** | 19-20 | |
| 3 | Cryptography & Networks Security Lab | **BIT7403** | 21-21 | |
| 4 | Object Oriented Modelling and Design Lab | **BIT7404** | 22-22 | |
| 5 | Cryptography & Networks Security | **BIT8401** | 17-18 | |
| 6 | Object Oriented Modelling and Design | **BIT8402** | 19-20 | |
| 7 | Cryptography & Networks Security Lab | **BIT8403** | 21-21 | |
| 8 | Object Oriented Modeling and Design Lab | **BIT8404** | 22-22 | |
| 9 | Virtualization | **BIT7501** | 23-24 | |
| 10 | Natural Language Processing | **BIT7502** | 25-26 | |
| 11 | Augmented and Virtual Reality | **BIT7503** | 27-28 | |
| 12 | Block chain Platform | **BIT7504** | 29-30 | |
| 13 | Business Intelligence | **BIT7505** | 31-32 | |
| 14 | DevOps | **BIT7506** | 33-34 | |
| 15 | Virtualization | **BIT8501** | 23-24 | |
| 16 | Natural Language Processing | **BIT8502** | 25-26 | |
| 17 | Augmented and Virtual Reality | **BIT8503** | 27-28 | |
| 18 | Block chain Platform | **BIT8504** | 29-30 | |
| 19 | Business Intelligence | **BIT8505** | 31-32 | |
| 20 | DevOps | **BIT8506** | 33-34 | |
| 21 | Project | **BIT7701** | 60-65 | |
| 22 | Project | **BIT8701** | 60-65 | |
| 23 | MOOC | **BIT7602** | 66 | |

**Board of study - Department of E &TC**

| Sr. No. | Name of the Course | Course Code | Page number | Signature and stamp of BoS |
|---|---|---|---|---|
| 1 | Bio-Inspired Systems And Computing | BET7601 | 35-36 | |
| 2 | Sensor and Automation with IoT | BET7602 | 37-38 | |
| 3 | MOOC | BET7603 | 39-39 | |
| 4 | Drone Technology. | BET7604 | 40-41 | |
| 5 | Advanced Driver Assistance System(ADAS) | BET7605 | 42-43 | |
| 6 | Bio-Inspired Systems And Computing | BET8601 | 35-36 | |
| 7 | Sensor and Automation with IoT | BET8602 | 37-38 | |
| 8 | MOOC | BET8603 | 39-39 | |
| 9 | Drone Technology. | BET8604 | 40-41 | |
| 10 | Advanced Driver Assistance System(ADAS) | BET8605 | 42-43 | |

**Board of study - Department of Civil Engineering**

| Sr. No. | Name of the Course | Course Code | Page number | Signature and stamp of BoS |
|---|---|---|---|---|
| 1 | E- waste management | BCI7605A | 44-45 | |
| 2 | Advanced Instrumentation in Infrastructural Engineering | BCI7605B | 46-47 | |
| 3 | 3-D printing technique for construction | BCI7606A | 48-49 | |
| 4 | Structural Health Monitoring and Audit | BCI7606B | 50-51 | |
| 6 | E- waste management | BCI8605A | 44-45 | |
| 5 | Advanced Instrumentation in Infrastructural Engineering | BCI8605B | 46-47 | |
| 6 | MOOC (only for civil department student) | BCI8605C | | |
| 7 | 3-D printing technique for construction | BCI8606A | 48-49 | |
| 8 | Structural Health Monitoring and Audit | BCI8606B | 50-51 | |

**B) Board of study - Department of Mechanical Engineering**

| Sr. No. | Name of the Course | Course Code | Page number | Signature and stamp of BoS |
|---|---|---|---|---|
| 1 | Project Management & Governance | BME7605A | 52-53 | |
| 2 | Industrial Engineering | BME7605B | 54-55 | |

| | | | | |
|---|---|---|---|---|
| 3 | Lean Six Sigma | **BME7606A** | 56-57 | |
| 4 | Professional Ethics | **BME7606B** | 58-59 | |
| 5 | Project Management & Governance | **BME8605A** | 52-53 | |
| 6 | Industrial Engineering | **BME8605B** | 54-55 | |
| 7 | MOOC | **BME8605C** | | |
| 8 | Lean Six Sigma | **BME8606A** | 56-57 | |
| 9 | Professional Ethics | **BME8606B** | 58-59 | |

**Approved by Academic Council:**

Chairman, Academic Council
Pimpri Chinchwad College of Engineering

**Approved by Board of Governors:**

Chairman Board of Governors:
Pimpri Chinchwad College of Engineering

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# ABBREVIATIONS

| Sr. No. | Type of course | Abbreviations |
|---|---|---|
| 1 | Basic Science Course | **BSC** |
| 2 | Engineering Core/Science Course | **ECC** |
| 3 | Humanities, Social Sciences and Management Course | **HSMC** |
| 4 | Professional Core Course | **PCC** |
| 5 | Professional Elective Course | **PEC** |
| 6 | Open Elective Course | **OEC** |
| 7 | Project | **PROJ** |
| 8 | Internship | **INTR** |
| 9 | Audit Course | **AC** |
| 10 | Mandatory Course | **MC** |
| 11 | Life Skills | **LS** |
| 12 | Proficiency Course | **PFC** |
| 13 | Professional Development Training | **PDT** |
| 14 | MOOC | **MO** |
| 15 | Internal Evaluation | **IE** |
| 16 | Mid Term Evaluation | **MTE** |
| 17 | End Term Evaluation | **ETE** |
| 18 | Term Work | **TW** |
| 19 | Oral | **OR** |
| 20 | Practical | **PR** |

## Curriculum Framework for B.Tech IT

| Sr. No. | Type of course | Abbreviations |
|---|---|---|
| 1 | Basic Science Course | **BSC** |
| 2 | Engineering Core/Science Course | **ECC** |
| 3 | Humanities, Social Sciences and Management Course | **HSMC** |
| 4 | Professional Core Course | **PCC** |
| 5 | Professional Elective Course | **PEC** |
| 6 | Open Elective Course | **OEC** |
| 7 | Project | **PROJ** |
| 8 | Internship | **INTR** |
| 9 | Audit Course | **AC** |
| 10 | Mandatory Course | **MC** |
| 11 | Life Skills | **LS** |
| 12 | Proficiency Course | **PFC** |
| 13 | MOOC | **MO** |

| Sr. No. | Type of course | No. of Courses | Total Credits | |
|---|---|---|---|---|
| | | | No | % |
| 1 | Basic Science Course | **8** | **23** | **14.3** |
| 2 | Engineering Core/Science Course | **14** | **22** | **13.7** |
| 3 | Humanities, Social Sciences and Management Course | **6** | **13** | **8.1** |
| 4 | Professional Core Course | **22** | **48** | **29.8** |
| 5 | Professional Elective Course | **10** | **18** | **11.2** |
| 6 | Open Elective Course | **6** | **18** | **11.2** |
| 7 | Project | **21** | **16** | **9.9** |
| 8 | Internship | **1** | **3** | **1.9** |
| 9 | Audit Course | **3** | **0** | **0.0** |
| 10 | Mandatory Course | **2** | **0** | **0.0** |
| 11 | Life Skills | **4** | **0** | **0.0** |
| 12 | Proficiency Course | **3** | **0** | **0.0** |
| 13 | MOOC | **1** | **0** | **0.0** |
| | **Total** | **82** | **161** | **100.0** |

## COURSE DISTRIBUTION: SEMESTER WISE

| Sr. No. | Type of course | No. of Courses/Semester | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| 1 | Basic Science Course | 3 | 3 | 2 | | | | | | **8** |
| 2 | Engineering Core/Science Course | 5 | 6 | 2 | 1 | | | | | **14** |
| 3 | Humanities, Social Sciences and Management Course | 1 | 1 | 1 | 1 | 1 | 1 | | | **6** |
| 4 | Professional Core Course | | | 5 | 6 | 4 | 4 | 4 | | **23** |
| 5 | Professional Elective Course | | | | | 4 | 4 | 2 | | **10** |
| 6 | Open Elective Course | | | | 1 | 1 | 2 | 2 | | **6** |
| 7 | Project | 1 | | | | | | | 1 | **2** |
| 8 | Internship | | | | | | | | 1 | **1** |
| 9 | Audit Course | | | | 1 | 1 | 1 | | | **3** |
| 10 | Mandatory Course | | | | | 1 | 1 | | | **2** |
| 11 | Life Skills | 1 | 1 | 1 | 1 | | | | | **4** |
| 12 | Proficiency Course | | | | 1 | 1 | 1 | | | **3** |
| 13 | MOOC | | | | | | | 1 | | **1** |
| **Total** | | **11** | **11** | **11** | **12** | **13** | **14** | **8** | **3** | **84** |

## CREDIT DISTRIBUTION: SEMESTER WISE

| Sr. No. | Type of course | No. of Credits/Semester | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| 1 | Basic Science Course | 9 | 9 | 5 | | | | | | **23** |
| 2 | Engineering Core/Science Course | 7 | 9 | 3 | 3 | | | | | **22** |
| 3 | Humanities, Social Sciences and Management Course | 2 | 2 | 3 | 2 | 2 | 2 | | | **13** |
| 4 | Professional Core Course | | | 12 | 12 | 8 | 8 | 8 | | **48** |
| 5 | Professional Elective Course | | | | | 6 | 6 | 6 | | **18** |
| 6 | Open Elective Course | | | | 3 | 3 | 6 | 6 | | **18** |
| 7 | Project | 2 | | | | | | | 14 | **16** |
| 8 | Internship | | | | | | | | 3 | **3** |
| 9 | Audit Course | | | | | | | | | **0** |
| 10 | Mandatory Course | | | | | | | | | **0** |
| 11 | Life Skills | | | | | | | | | **0** |
| 12 | Proficiency Course | | | | | | | | | **0** |
| 13 | MOOC | | | | | | | | | **0** |
| **Total** | | **20** | **20** | **23** | **20** | **19** | **22** | **20** | **17** | **161** |

# Curriculum Structure

## Final Year B. Tech

## Information Technology

### (Sem-VII and VIII)

## B. Tech (Information Technology) Curriculum Structure Semester VII/VIII

| Sem – VII | | Teaching Scheme | | | | | Evaluation Scheme | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Category** | **Course Name** | **Lecture** | **Tutorial** | **Practical** | **Work Hour** | **Credit** | **CE** | **MTE** | **ETE** | **TW** | **PR** | **OR** | **Total** |
| **PCC** | Cryptography & Networks Security | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| **PCC** | Object Oriented Modeling and Design | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| **PCC** | Cryptography & Networks Security Lab | | _ | 2 | 2 | 1 | | | | 25 | 25 | - | 50 |
| **PCC** | Object Oriented Modeling and Design Lab | _ | _ | 2 | 2 | 1 | | | | 25 | - | 25 | 50 |
| **PEC** | Elective V | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| **PEC** | Elective VI | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| **OEC/ MO** | Open Elective-V/MOOC | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| **OEC** | Open Elective-VI | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| **Total** | | **18** | **0** | **4** | **22** | **20** | **120** | **180** | **300** | **100** | **25** | **25** | **700** |

## B. Tech (Information Technology) Curriculum Structure Semester VII/VIII

| Sem – VIII | | Teaching Scheme | | | | | Evaluation Scheme | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Category** | **Course Name** | **Lecture** | **Tutorial** | **Practical** | **Work Hour** | **Credit** | **CE** | **MTE** | **ETE** | **TW** | **PR** | **OR** | **Total** |
| **PROJ** | Project | _ | _ | _ | _ | 14 | | | | 200 | - | 150 | 350 |
| **INTR** | Internship | _ | _ | _ | _ | 3 | | | | 100 | - | - | 100 |
| **Total** | | **_** | **_** | **_** | **_** | **17** | | | | **300** | **-** | **150** | **450** |

**Abbr:** Course Abbreviation; **L**- Lecture; **P**- Practical; **H**- Hours; **CR**- Credits; **IE1**– Internal Evaluation-1; **IE2**– Internal Evaluation-2; **ETE** – End Term Examination; **TW** – Term Work; **OR** – Oral Exam

# Curriculum Structure

## Final Year B.Tech.

## Information Technology

## Scheme-A

### (Sem-VII and VIII)

## B. Tech (Information Technology) Curriculum Structure Semester VII

| Sem – VII | | | Teaching Scheme | | | | | Evaluation Scheme | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Course Name | Lecture | Tutorial | Practical | Work Hour | Credit | CE | MTE | ETE | TW | PR | OR | Total |
| BIT7401 | PCC | Cryptography & Networks Security | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| BIT7402 | PCC | Object Oriented Modeling and Design | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| BIT7403 | PCC | Cryptography & Networks Security Lab | | _ | 2 | 2 | 1 | | | | 25 | 25 | - | 50 |
| BIT7404 | PCC | Object Oriented Modeling and Design Lab | _ | _ | 2 | 2 | 1 | | | | 25 | - | 25 | 50 |
| BIT7501 | PEC | Elective V | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| BIT7502 | PEC | Elective VI | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| BIT7601 | OEC/ MO | Open Elective-V/MOOC | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| BIT7602 | OEC | Open Elective-VI | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| **Total** | | | **18** | **0** | **4** | **22** | **20** | **120** | **180** | **300** | **100** | **25** | **25** | **700** |

**Abbr:** Course Abbreviation; **L-** Lecture; **P-** Practical; **H-** Hours; **CR-** Credits; **IE1**– Internal Evaluation-1; **IE2**– Internal Evaluation-2; **ETE** – End Term Examination; **TW** – Term Work; **OR** – Oral Exam

## B. Tech (Information Technology) Curriculum Structure Semester VIII

| Sem – VIII | | | Teaching Scheme | | | | | Evaluation Scheme | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Course Name | Lecture | Tutorial | Practical | Work Hour | Credit | CE | MTE | ETE | TW | PR | OR | Total |
| BIT8701 | PROJ | Project | _ | _ | _ | _ | 14 | | | | 200 | - | 150 | 350 |
| BIT8801 | INTR | Internship | _ | _ | _ | _ | 3 | | | | 100 | - | - | 100 |
| **Total** | | | **_** | **_** | **_** | **_** | **17** | | | | **300** | **-** | **150** | **450** |

**Abbr:** Course Abbreviation; **L-** Lecture; **P-** Practical; **H-** Hours; **CR-** Credits; **IE1**– Internal Evaluation-1; **IE2**– Internal Evaluation-2; **ETE** – End Term Examination; **TW** – Term Work; **OR** – Oral Exam

# Curriculum Structure

## Final Year B.Tech.

## Information Technology

## Scheme-B

### (Sem-VII and VIII)

## B. Tech (Information Technology) Curriculum Structure Semester VII

| Sem – VII | | | Teaching Scheme | | | | | Evaluation Scheme | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Course Name | Lecture | Tutorial | Practical | Work Hour | Credit | CE | MTE | ETE | TW | PR | OR | Total |
| BIT7701 | PROJ | Project | _ | _ | _ | _ | 14 | | | | 200 | - | 150 | 350 |
| BIT8801 | INTR | Internship | _ | _ | _ | _ | 3 | | | | 100 | - | - | 100 |
| **Total** | | | **_** | **_** | **_** | **_** | **17** | | | | **300** | **-** | **150** | **450** |

## B. Tech (Information Technology) Curriculum Structure Semester VIII

| Sem – VIII | | | Teaching Scheme | | | | | Evaluation Scheme | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Course Name | Lecture | Tutorial | Practical | Work Hour | Credit | CE | MTE | ETE | TW | PR | OR | Total |
| BIT8401 | PCC | Cryptography & Networks Security | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| BIT8402 | PCC | Object Oriented Modeling and Design | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| BIT8403 | PCC | Cryptography & Networks Security Lab | | _ | 2 | 2 | 1 | | | | 25 | 25 | - | 50 |
| BIT8404 | PCC | Object Oriented Modeling and Design Lab | _ | _ | 2 | 2 | 1 | | | | 25 | - | 25 | 50 |
| BIT8501 | PEC | Elective V | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| BIT8502 | PEC | Elective VI | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| BIT8601 | OEC/ MO | Open Elective-V/MOOC | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| BIT8602 | OEC | Open Elective-VI | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| **Total** | | | **18** | **0** | **4** | **22** | **20** | **120** | **180** | **300** | **100** | **25** | **25** | **700** |

**Abbr:** Course Abbreviation; **L-** Lecture; **P-** Practical; **H-** Hours; **CR-** Credits; **IE1**– Internal Evaluation-1; **IE2**– Internal Evaluation-2; **ETE** – End Term Examination; **TW** – Term Work; **OR** – Oral Exam

# Curriculum Structure

## Final Year B.Tech.

## Information Technology

## Scheme-C

### (Sem-VII and VIII)

## B. Tech (Information Technology) Curriculum Structure Semester VII & VIII

| Sem – VII | | | Teaching Scheme | | | | | Evaluation Scheme | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Course Name | Lecture | Tutorial | Practical | Work Hour | Credit | CE | MTE | ETE | TW | PR | OR | Total |
| BIT7401/ BIT8401 | PCC | Cryptography & Networks Security | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| BIT7402/ BIT8402 | PCC | Object Oriented Modeling and Design | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| BIT7403/ BIT8403 | PCC | Cryptography & Networks Security Lab | | _ | 2 | 2 | 1 | | | | 25 | 25 | - | 50 |
| BIT7404/ BIT8404 | PCC | Object Oriented Modeling and Design Lab | _ | _ | 2 | 2 | 1 | | | | 25 | - | 25 | 50 |
| BIT7501/ BIT8501 | PEC | Elective V | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| BIT7502/ BIT8502 | PEC | Elective VI | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| BIT7601/ BIT8601 | OEC/ MO | Open Elective-V/MOOC | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| BIT7602/ BIT8602 | OEC | Open Elective-VI | 3 | _ | _ | 3 | 3 | 20 | 30 | 50 | - | - | - | 100 |
| **Total** | | | **18** | **0** | **4** | **22** | **20** | **120** | **180** | **300** | **100** | **25** | **25** | **700** |

## B. Tech (Information Technology) Curriculum Structure Semester VII & VIII

| Sem – VII | | | Teaching Scheme | | | | | Evaluation Scheme | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Course Name | Lecture | Tutorial | Practical | Work Hour | Credit | CE | MTE | ETE | TW | PR | OR | Total |
| BIT7701 | PROJ | Project | _ | _ | _ | _ | 7 | | | | 100 | | 100 | 200 |
| **Total** | | | **_** | **_** | **_** | **_** | **7** | | | | **100** | | **100** | **200** |
| **Sem – VIII** | | | **Teaching Scheme** | | | | | **Evaluation Scheme** | | | | | | |
| BIT8701 | PROJ | Project | _ | _ | _ | _ | 7 | | | | 100 | - | 50 | 150 |
| BIT8801 | INTR | Internship | _ | _ | _ | _ | 3 | | | | 100 | - | - | 100 |
| **Total** | | | **_** | **_** | **_** | **_** | **17** | | | | **200** | **-** | **50** | **250** |

**Abbr:** Course Abbreviation; **L-** Lecture; **P-** Practical; **H-** Hours; **CR-** Credits; **IE1**– Internal Evaluation-1; **IE2**– Internal Evaluation-2; **ETE** – End Term Examination; **TW** – Term Work; **OR** – Oral Exam

***Note: Students can choose any course in any semester with the condition that total credits should be within 20.***

# Semester- VII

## List of Professional Electives –V

| Course Code | Course Name | |
|---|---|---|
| BIT7501 | Virtualization | Choose any one |
| BIT7502 | Natural Language Processing | |
| BIT7503 | Augmented and Virtual Reality | |

## List of Professional Electives -VI

| Course Code | Course Name | |
|---|---|---|
| BIT7504 | Block chain Platform | Choose any one |
| BIT7505 | Business Intelligence | |
| BIT7506 | DevOps | |

## List of Open Elective Courses –V

| Course Code | Course Name | Department | |
|---|---|---|---|
| BET7601 | Bio-Inspired Systems And Computing | E&TC | Choose any one |
| BET7602 | Sensor and Automation with IoT | E&TC | |
| BET7603 | MOOC | E&TC | |

## List of Open Elective Courses –VI

| Course Code | Course Name | Department | |
|---|---|---|---|
| BET7604 | Drone Technology. | E&TC | Choose any one |
| BET7605 | Advanced Driver Assistance System(ADAS) | E&TC | |

## List of Open Elective Courses –V

| Course Code | Course Name | Department | |
|---|---|---|---|
| BCI7605A | E- waste management | Civil | Choose any one |
| BCI7605B | Advanced Instrumentation in Infrastructural Engineering | Civil | |
| BCI7605C | MOOC (only for civil department student) | Civil | |

**List of Open Elective Courses –VI**

| Course Code | Course Name | Department | |
|---|---|---|---|
| BCI7606A | 3-D printing technique for construction | Civil | Choose any one |
| BCI7606B | Structural Health Monitoring and Audit | Civil | |

**List of Open Elective Courses –V**

| Course Code | Course Name | Department | |
|---|---|---|---|
| BME7605A | Project Management & Governance | Mechanical | Choose any one |
| BME7605B | Industrial Engineering | Mechanical | |
| BME7605C | MOOC | Mechanical | |

**List of Open Elective Courses –VI**

| Course Code | Course Name | Department | |
|---|---|---|---|
| BME7606A | Lean Six Sigma | Mechanical | Choose any one |
| BME7606B | Professional Ethics | Mechanical | |

# Semester- VIII

## List of Professional Electives –V

| Course Code | Course Name | |
|---|---|---|
| BIT8501 | Virtualization | Choose any one |
| BIT8502 | Natural Language Processing | |
| BIT8503 | Augmented and Virtual Reality | |

## List of Professional Electives -VI

| Course Code | Course Name | |
|---|---|---|
| BIT8504 | Block chain Platform | Choose any one |
| BIT8505 | Business Intelligence | |
| BIT8506 | DevOps | |

## List of Open Elective Courses –V

| Course Code | Course Name | Department | |
|---|---|---|---|
| BET8601 | Bio- Inspired Systems And Computing | E&TC | Choose any one |
| BET8602 | Sensor and Automation with IoT | E&TC | |
| BET8603 | MOOC | E&TC | |

## List of Open Elective Courses –VI

| Course Code | Course Name | Department | |
|---|---|---|---|
| BET8604 | Drone Technology. | E&TC | Choose any one |
| BET8605 | Advanced Driver Assistance System(ADAS) | E&TC | |

## List of Open Elective Courses –V

| Course Code | Course Name | Department | |
|---|---|---|---|
| BCI8605A | E- waste management | Civil | Choose any one |
| BCI8605B | Advanced Instrumentation in Infrastructural Engineering | Civil | |
| BCI8605C | MOOC (only for civil department student) | Civil | |

**List of Open Elective Courses –VI**

| Course Code | Course Name | Department | |
|---|---|---|---|
| **BCI8606A** | 3-D printing technique for construction | Civil | Choose any one |
| **BCI8606B** | Structural Health Monitoring and Audit | Civil | |

**List of Open Elective Courses –V**

| Course Code | Course Name | Department | |
|---|---|---|---|
| **BME8605A** | Project Management & Governance | Mechanical | Choose any one |
| **BME8605B** | Industrial Engineering | Mechanical | |
| **BME8605C** | MOOC | Mechanical | |

**List of Open Elective Courses –VI**

| Course Code | Course Name | Department | |
|---|---|---|---|
| **BME8606A** | Lean Six Sigma | Mechanical | Choose any one |
| **BME8606B** | Professional Ethics | Mechanical | |

# Course Syllabus

## Semester-VII/VIII

| Program: | **B. Tech. I.T.** | | | | Semester: **VII/ VIII** | | |
|---|---|---|---|---|---|---|---|
| Course : **Cryptography and Network Security** | | | | | Code : **BIT7401** | | |
| **Teaching Scheme** | | | | **Evaluation Scheme** | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **IE** | **MTE** | **ETE** | **Total** |
| 3 | - | - | 3 | 20 | 30 | 50 | 100 |

**Prior Knowledge of**

- Graphs and Trees
- Basic networking concepts

**are essentials.**

**Course Objectives:**

1. To understand basics of Cryptography and Network Security.
2. To be able to secure a message over insecure channel by various means.
3. To learn about how to maintain the Confidentiality, Integrity and Availability of a data.

**Course Outcomes:**

After learning the course, the students will be able to:

1. Detect, prevent and recover from a security attacks.(Analyze security attacks)
2. Apply private key cryptographic techniques in software and system design.
3. Design Security systems using public key cryptography.
4. Apply methods to authenticate the document and check the data integrity.
5. Apply key distribution techniques for securely delivering keys to parties.
6. Implement various networking protocols and protect the network from the threats.

**Detailed Syllabus**

| Unit | Description | Duration (Hrs) |
|---|---|---|
| 1. | **Basics of security and classical ciphers**<br>Computer security concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security, Symmetric Cipher Model, Substitution Techniques, Transposition techniques, Steganography. | 7 |
| 2. | **Block Ciphers, Data and Advanced Encryption Standards**<br>Block Cipher Principles, The Data Encryption Standard (DES), A DES Examples, The Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles, AES: Structure, Round functions, key expansion, example. | 8 |
| 3. | **Number Theory and Public Key Cryptography**<br>Prime numbers, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms,<br>Principles of Public Key Cryptosystem, The RSA Algorithm, Diffie-Hellman Key Exchange, Elliptic Curve Arithmetic, Elliptic curve Cryptography, | 8 |
| 4. | **Data Integrity Algorithms**<br>Cryptographic Hash Function: Application of Cryptographic Hash Function, Two Simple Hash Functions, Requirements and Security, Hash function Based on Cipher Block Chaining, Secure Hash Algorithm(SHA),<br>Message Authentication Requirements, Message Authentication Functions, Message Authentication Codes, Security of MACs, MACs Based on Hash Cipher: HMAC<br>Digital Signatures<br>Digital Signatures, ElGamal Digital Signature Scheme, Schnorr Digital Signature Scheme, Digital Signature Standard, | 8 |
| 5. | **Key Management and Distribution**<br>Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public keys.X.509 Certificates, Public key Infrastructure,<br>User Authentication Protocols, Remote User Authentication Principles, Remote User Authentication Using Symmetric Encryption, Kerberos, Remote User Authentication using Asymmetric Encryption. | 7 |

| | | |
|---|---|---|
| 6. | **Network and Internet Security**<br>Transport-Level Security: Web Security Issues, Secure Sockets Layer(SSL),Transport Layer Security(TLS),HTTPS, Secure Shell(SSH)<br>IP Security: IP Security Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange, Cryptographic Suites | 7 |
| | **Total** | **45** |

**Text Books:**


1. William Stallings, Computer Security : Principles and Practices, Pearson 6th Ed, ISBN: 978-0-13- 335469-0
2. Bernard Menezes, Network Security and Cryptography, Cengage Learning, ISBN-978-81-315-1349-1
3. Dr. V.K. Pachghare, Cryptography and Information security, PHI, Second edition, ISBN- 978-81-203- 5082-3


**Reference Books:**


1. Bruice Schneier , Applied Cryptography- Protocols, Algorithms and Source code in C, Algorithms, Wiely India Pvt Ltd, 2nd Edition, ISBN 978-81-265-1368-0
2. Nina Godbole , Information Systems Security , Wiley India Pvt. Ltd, ISBN -978-81-265-1692-6
3. Atul kahate, Cryptography & network security , TATA- McGraw Hill India,4th Edition, ISBN-13: 978-0-07-064823-4.
4. Berouz Forouzan, Cryptography and Network Security, TMH, 2 edition, ISBN -978-00-707-0208-0.

| Program: | **B. Tech. I.T.** | | | Semester: **VII** | | | |
|---|---|---|---|---|---|---|---|
| Course : **Object Oriented Modeling And Design** | | | | Code : **BIT7402/ BIT8402** | | | |
| **Teaching Scheme** | | | | **Evaluation Scheme** | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **IE** | **MTE** | **ETE** | **Total** |
| 3 | - | - | 3 | 20 | 30 | 50 | 100 |

**Prior Knowledge of**

- Software Requirement Specification (SRS)
- Basics of Object Oriented Methodology

**are essentials.**

**Course Objectives:**

1. Understand the fundamental aspects of different object oriented methodologies and unified approach along with Unified Modeling Language (UML).
2. Explore and analyze use case modeling, domain/ class modeling.
3. Learn how to do Interaction and behavior modeling.
4. Orient students with the software design principles and patterns.

**Course Outcomes:**

After learning the course, the students will be able to:

1. Describe object-oriented analysis and design methods with a clear emphasis on UML.
2. Analyze a system from the requirements and model in terms of static and dynamic behavior using relevant UML diagrams.
3. Build different interaction and behavior models using object oriented design.
4. Apply architecture design principles to draw different architectural diagrams for a given system.
5. Describe architectural design principles and guidelines in the various type of application development.
6. Make use of an appropriate design patterns to improve the overall design.

**Detailed Syllabus**

| Unit | Description | Duration (Hrs) |
|---|---|---|
| 1. | **Introduction To Modeling**<br>Traditional System Development Methodology and Object Oriented Analysis and Design, Object Oriented Methodology ,Introduction to Unified Modeling Language (UML), UML history, UML Structure, UML Building Blocks UML new features, Rational unified process emphasizing inception, Elaboration, Construction, Transition phases, Architectural approaches, Use case centric, Architecture driven, Iterative approach, UML meta model, Extensibility mechanisms like stereotypes, Tagged values, Constraints and Profiles, OCL, Overview of all diagrams in UML. | 6 |
| 2. | **Use Case and Class Models**<br>Object Oriented Analysis Process, Use Case Modeling: Actor Identification, Actor Classification, Actor Generalization, Use Cases Identification, Communication, Uses/Include and Extend Associations, Writing a Formal Use Cases, Use Case realizations.<br>Introduction to object diagrams, Class diagrams - Domain / Class Modeling: Approaches For Identifying Classes (Noun-Phase Approach, Common Class Pattern Approach, Class Responsibilities Collaboration Approach, Naming Classes, Class Associations and Identification of Associations, abstract classes, Generalization/Specialization Relationship, Aggregation and Composition Relationships, Attributes and Methods Identification. | 8 |
| 3. | **Interaction and Behavior Modeling**<br>Activity Diagram : Activity and Actions, Initial and Final Activity, Activity Edge, Decision and Merge Points, Fork and Join, Input and Output Pins, Activity Group, Activity Partitions, Constraints on Action, Swim Lanes. Sequence Diagram: Context, Objects and Roles, Links, Object Life Line, Message or stimulus, Activation/Focus of Control, Modeling Interactions.<br>Sequence Diagram: Context, Objects and Roles, Links, Object Life Line, Message or stimulus, Activation/Focus of Control, Modeling Interactions.<br>State Chart Diagram: State Machine, Transitions, Initial and Final State, Composite States, Submachine States, State Generalization<br>Collaboration Diagram: Objects and Links, Messages and stimuli, Active Objects, Communication Diagram, Iteration Expression, Parallel Execution, Guard Expression, Timing Diagram. | 10 |

| | | |
|---|---|---|
| 4. | **Architectural Design I**<br>Support for modeling, Architecture in UML, Package diagrams, Component diagrams, Deployment diagrams, Applications of UML in embedded systems, Web applications, Commercial applications, UML 2.0 for each diagram the Need, Purpose, Concepts, Notation, Forward Engineering, Reverse Engineering and Application. | 7 |
| 5. | **Architectural Design II**<br>Overview of software Architecture, Designing Client / Server Software Architectures, Designing Service Oriented Software Architectures, Designing Component Based Software Architectures, Designing Concurrent and Real-Time Software Architectures, Designing Product Line Architectures, Related Case Studies. | 6 |
| 6. | **Design Patterns**<br>General Responsibility Assignment Software Patterns (GRASP): Introduction, Creator, Information Expert, Low coupling, Controller, High Cohesion, Polymorphism, Pure fabrication, Indirection, Protected Variations.<br>Gang of Four (GoF): Introduction, Categories of Patterns - Creational, Structural and Behavioral Patterns. | 8 |
| | **Total** | **45** |

**Text Books:**


1. Grady Booch, James Rumbaugh, Ivar Jacobson "Unified Modeling Language User Guide", 2nd Edition (Addison-Wesley Object Technology Series) (Hardcover), ISBN 0-201-57168-4.
2. Michael Bilaha, James R Rambaugh: Object Oriented Modelling and Design, PHI, 2nd edition, ISBN-10: 8131711064.


**Reference Books:**


1. Eric Gamma et al, Design Patterns: Elements of Reusable Object-Oriented Software, Pearson, 7th Edition, ISBN: 9789332555402, 9332555400.
2. Dan Pilone, Neil Pitman "UML 2.0 in a Nutshell", (In a Nutshell (O'Reilly)) Publications
3. Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", Third Edition
4. Ali Bahrami, Object Oriented System Development: Using Unified Modeling Language, McGraw-Hill, International Editions, ISBN:0-07-116090-6.
5. Jim Arlow, Ila Neustadt "UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design", 2nd Edition (Addison-Wesley Object Technology Series).


**Online references**:

NPTEL Course on "Object Oriented System Development Using UML, Java And Patterns" available online at https://onlinecourses.nptel.ac.in/noc23_cs46.

| Program: | B. Tech. I.T. | | | Semester: **VII** | | | |
|---|---|---|---|---|---|---|---|
| Course : **Cryptography and Network Security Lab** | | | | Code : **BIT7403/ BIT8403** | | | |
| **Teaching Scheme** | | | | **Evaluation Scheme** | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **TW** | **PR** | **OR** | **Total** |
| - | 2 | - | 1 | 25 | 25 | - | 50 |

**Prior knowledge of**

- C Programming
- Fundamentals of Data Structures

**are essentials.**

**Course Objectives:**

1. To learn the concepts related to applied cryptography, symmetric cryptography, asymmetric cryptography, and digital signatures.
2. To demonstrate the various cryptographic and hashing algorithms.

**Course Outcomes:**

After learning the course, the students will be able to:

1. Develop a security system to ensure the accuracy, completeness, consistency, and validity of data.
2. Develop a system to achieve authentication and confidentiality of information transmitting through insecure channel.
3. Develop an information security system free of vulnerabilities and impervious to attack.

**Suggested List of Assignments**

| | |
|---|---|
| 1. | Implement any one classical encryption technique in any programming language. |
| 2. | Design an experiment to estimate the amount of time to i) Generate key pair (RSA) ii) Encrypt n bit message (RSA) iii) Decrypt n bit message (RSA) As function of key size, experiment with different n-bit messages. Summarize your conclusions. |
| 3. | Design and Implement your own encryption/ decryption algorithm using any programming language |
| 4. | Demonstrate how Diffie-Hellman key exchange works with Man-In-The-Middle attack. |
| 5. | A message is to be transmitted using network resources from one machine to another calculate and demonstrate the use of a Hash value equivalent to SHA-1. Develop program in C++/Python/Java using Eclipse. |
| 6. | Let X and Y be two users. Develop a system where X wants to send a confidential message to Y.<br>The man in middle Say Z trying to read the message should not be able to read it even though he gets access to the text. ( hint: Encryption RSA)<br>The system should also achieve non-repudiation (i.e. user X should not be able to deny that he has not sent the text) and Integrity. (hint: Digital signature)<br>Hashing message has not been altered during transit. (hint: MD5/SHA) |
| 7. | Design a website and provide the security features to protect it from password cracking attack. Apply any password protection technique. (Students are expected to use various password protection techniques). |
| 8. | Two users are exchanging the images on unsecured network. Design a security system to protect the image from any security attack while transmitting it on network. |

**Text Books:**


1. V. K. Pachghare, "Cryptography and Information Security", 2nd edition, PHI Learning, ISBN: 978-81-203-5082-3.
2. Charlie Kaufman, Radia Perlman, and Mike Speciner, Network Security: Private• Communication in a Public World, Prentice Hall, ISBN 0-13-046019-2


**Reference Books:**


1. William Stallings, "Cryptography and Network Security, Principles and Practices", Pearson Education, Fifth Edition, ISBN: 0-13-60970-9
2. Nina Godbole , Information Systems Security , Wiley India Pvt. Ltd, ISBN -978-81-265-1692-6
3. Berouz Forouzan, "Cryptography and Network Security", 2nd edition, TMH, ISBN :9780070702080

| Program: | **B. Tech. I.T.** | | | Semester: **VII** | | | |
|---|---|---|---|---|---|---|---|
| Course : **Object Oriented Modeling and Design Lab** | | | | Code : **BIT7404/ BIT8404** | | | |
| **Teaching Scheme** | | | | **Evaluation Scheme** | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **TW** | **PR** | **OR** | **Total** |
| - | 2 | - | 1 | 25 | - | 25 | 50 |

**Prior knowledge of**

- Basics of Object Oriented Programming

**is essential.**

**Course Objectives:**

1. To apply Unified Modeling Language (UML 2.0), in terms of "how to use" it for the purpose of specifying and developing software.
2. To explore and analyze use case and class modeling.
3. To learn Interaction and Behavior Modeling.
4. To apply software design principles and patterns.

**Course Outcomes:**

After learning the course, the students will be able to:

1. Build a system from the requirements and model in terms of static and dynamic behavior using relevant UML diagrams.
2. Identify Major Use Cases, actors, classes and collaboration from requirements.
3. Apply an appropriate design patterns to improve the overall design.

**Suggested List of Assignments**

| | |
|---|---|
| 1. | Identify Project of enough complexity, which has at least 4-5 major functionalities. Write detail problem statement for your system. |
| 2. | Capture Functional Requirements with Use Cases for the project / problem statement. Identify actors. Write Use Case specification for all major Use Cases. Draw detail Use Case Diagram using UML2.0 notations. |
| 3. | Identify Activity states and Action states. Draw Activity diagram with Swim lanes using UML2.0 Notations for major Use Cases. |
| 4. | **Build Analysis Model-Class Model**<br>Draw Analysis class Model using UML2.0 Notations. |
| 5. | **Build Design Model from Analysis Model**<br>Identify Design classes/ Evolve Analysis Model. Use advanced relationships. Draw Design class Model using Object Constraint Language(OCL) and UML2.0 Notations. |
| 6. | **Build Interaction Model – Sequence Model**<br>Identify at least 3 major scenarios (sequence flow) for your system. Draw Sequence Diagram for every scenario by using advanced notations using UML2.0. |
| 7. | **Build Behavioral Model – State Model**<br>Identify States and events for your system. Identify state transitions and Guard conditions.<br>Draw State chart diagram with advanced UML 2 notations. |
| 8. | Apply any two GRASP and GOF patterns to refine the Design Model for a given problem description and implement them with a suitable object oriented language |
| | Note: Draw the diagrams using any open source tool like Visual Paradigm, StarUML.<br>Implement any 5 UML diagrams using suitable object-oriented language. |

**Text Books:**


1. Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and the Unified Process, 2nd Edition, ISBN: 9780130925695.
2. UML 2 and the Unified Process, 2nd Edition, JIM Arlow, Ila Neustadt, Pearson, ISBN:978-0-321-32127-5
3. Design Patterns: Elements of Reusable Object Oriented Software, Eric Gamma, Pearson, 2nd Edition ISBN: 0201633612


**Reference Books:**


1. Dan Pilone, Neil Pitman "UML 2.0 in a Nutshell", (In a Nutshell (O'Reilly)) Paperback).
2. UML2 Bible by Tom Pender, Wiley India Pvt. Limited 2011, ISBN: 978-0-764-52604-6
3. Design Patterns in Java 2nd Edition by Steven John Metsker, Pearson, 2nd Edition, ISBN-13: 978-8131713082 ISBN-10: 9788131713082
4. NPTEL Course on "Object Oriented System Development Using UML, Java and Patterns" available online at https://onlinecourses.nptel.ac.in/noc23_cs46.

| Program: | **B. Tech. I.T.** | | | Semester: **VII** | | | |
|---|---|---|---|---|---|---|---|
| Course : Virtualization | | | | Code : **BIT7501/ BIT8501** | | | |
| **Teaching Scheme** | | | | **Evaluation Scheme** | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **IE** | **MTE** | **ETE** | **Total** |
| 3 | - | - | 3 | 20 | 30 | 50 | 100 |

**Prior Knowledge of**

- Basics of Computer Networks
- Cloud Computing

**are essentials.**

**Course Objectives:**

1. Find the basics of virtualization and its importance.
2. Interpret the common standards with available Virtualization formats.
3. Acquire knowledge of Virtualization and its basic principles and understand role of Cloud Computing using SDN.
4. Classify network virtualization.
5. Demonstrate network function virtualization.
6. Apply various Virtualization Techniques.

**Course Outcomes:**

After learning the course, the students will be able to:

1. Classify and choose the concepts of Virtualization and its interpretation.
2. Recognize most common standards available for developers.
3. Demonstrate IT Infrastructure and relate the data center in Software Define Network (SDN).
4. Interpret and relate frameworks available in the Virtual Stack.
5. Identify and Demonstrate Network virtualization formats.
6. Compare and Examine different virtualization techniques as per the environment requirements.

**Detailed Syllabus**

| Unit | Description | Duration (Hrs) |
|---|---|---|
| 1. | **Introduction and Concepts**<br>System Architectures – Virtual Machine Basics – Process Virtual Machines – System Virtual Machines – Taxonomy of Virtual Machines – Emulation: Basic Interpretation – Threaded Interpretation – Pre-Coded and Direct Interpretation – Binary Translation – Full and Para Virtualization – Types of Hypervisor – Types of Virtualization. | 6 |
| 2. | **Common Standards**<br>The Open Cloud Consortium, Open Virtualization Format, Standards for Application Developers: Browsers (Ajax), Data (XML, JSON), Solution Stacks (LAMP and LAPP),Syndication (Atom, Atom Publishing Protocol, and RSS), Standards for Security. | 8 |
| 3. | **SDN in Data Centers**<br>Data Center- Definition, Data Center Demands, Tunneling Technologies for the Data Center, Path technologies in data centers, Ethernet fabrics in Data centers, SDN Use Cases in the Data Center, Multitenant and Virtualized Multitenant Data Center – SDN Solutions for the Data Center Network. | 6 |
| 4. | **Network Virtualization( I )**<br>Definition, Concepts, Benefits of Network Virtualization, Components of a Virtual Network, Applications, Existing Network Virtualization Framework (VMWare and others), Network as a Service (NaaS).Design of Scalable Enterprise Networks e.g. Virtualizing the Campus. | 8 |
| 5. | **Network Virtualization (II)**<br>WAN Design – WAN Architecture – WAN virtualization – Virtual Enterprise Transport Virtualization – VLANs and Scalability – Theory Network Device Virtualization Layer 2 – VLANs Layer 3 VRF Instances Layer 2 – VFIs Virtual Firewall Contexts Network Device Virtualization – Data path Virtualization Layer 2: 802.1q – Trunking Generic Routing Encapsulation – IPSec L2TPv3 Label Switched Paths – Control-Plane Virtualization – Routing Protocols – VRF- Aware Routing – Multi-Topology Routing. | 9 |

| | | |
|---|---|---|
| 6. | **Applying Virtualization**<br>Comparison of Virtualization Technologies: Guest OS, Host OS, Hypervisor, Emulation, Kernel Level – Shared Kernel – Enterprise Solutions: Vmware Server, ESXi, Citrix Xen Server, Microsoft Virtual PC, Microsoft Hyper-V, Virtual Box – Server Virtualization: Configuring Server with Server Virtualization, Adjusting and Tuning Virtual Servers, VM Backup and Migration – Desktop Virtualization: Terminal Services, Hosted Desktop, Web Based Solutions, Localized Virtualized Desktop – Network and Storage Virtualization: VPN, VLAN, SAN and VSAN, NAS. | 8 |
| | **Total** | **45** |

**Text Books:**


1. Chris Wolf, Erick M. Halter, "Virtualization: From the Desktop to the Enterprise", APress, 2005.
2. Paul Goransson and Chuck Black, "Software Defined Networks: A Comprehensive Approach", Morgan Kaufmann, 2014, ISBN: 9780124166752, 9780124166844.
3. Thomas Erl, Zaigham Mahmood and Ricardo Puttini, Cloud Computing: Concepts, Technology & Architecture, Pearson, ISBN: 978 9332535923, 9332535922, 1st Edition.


**Reference Books:**


1. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
2. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center", Auerbach Publications, 2006.

| Program: | **B. Tech. I.T.** | | | Semester: **VII** | | | |
|---|---|---|---|---|---|---|---|
| Course : **Natural Language Processing** | | | | Code : **BIT7502/ BIT8502** | | | |
| **Teaching Scheme** | | | | **Evaluation Scheme** | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **IE** | **MTE** | **ETE** | **Total** |
| 3 | - | - | 3 | 20 | 30 | 50 | 100 |

**Prior Knowledge of**

- Machine Learning basics
- Python Programming Language
- Probability

**are essentials.**

**Course Objectives:**

1. Understand the fundamental concepts of natural language processing.
2. Make use of leading trends and systems in natural language processing
3. Describe concepts of morphology, syntax, semantics and pragmatics of the language
4. Implement deep learning algorithms in Python and learn how to train deep networks for NLP applications.
5. To learn and understand the role of Machine learning and Deep Learning in natural language processing.

**Course Outcomes:**

After learning the course, the students will be able to:

1. Demonstrate the fundamental procedures and structures used in syntax, semantics, and other areas of natural language processing. (L2-Understand)
2. Analyze the models used for word/sentence representations for various NLP applications (L4-Analyze)
3. Describe machine learning and deep learning algorithms for Natural Language Processing applications. (L2-Understand)
4. Apply tools for performing text analytics in a variety of contexts (L3-Apply)
5. Use of the emerging natural language processing technologies for real-time applications.(L3-Apply)
6. Illustrate natural language processing systems for different applications. (L2-Understand)

**Detailed Syllabus**

| Unit | Description | Duration (Hrs) |
|---|---|---|
| 1. | **Introduction**<br>Terminologies: Natural Language Processing (NLP) and Natural Language Understanding (NLU), Text Preprocessing: Tokenization, Segmentation, Stemming, Lemmatization, Stop Words part-of-speech tagging, chunking, Syntax parsing: Top-Down and bottom-Up Parser, Dependency parsing, named entity recognition.<br>**Self-Learning Topic:**<br>NLP basics: Stemming and Lemmatization and its implementation in python | 7 |
| 2. | **Text representations and Embedding**<br>One-hot encoding, Bag-of-Words (BoW) Dictionary: Term Frequency – Inverse Document Frequency (TF IDF), N-grams (Unigrams, Bigrams, Trigrams), smoothing technique, Introduction to nlp toolkits such as nltk, Gensim, Spacy etc,<br>**Self-Learning Topic:**Named Entity Recognition with Spacy in Python | 7 |
| 3. | **Introduction to Deep Learning**<br>Neural Networks Basics Feed forward Neural Network, Recurrent Neural Networks, LSTM, Encoder and Decoder architecture, An Introduction to Transformers and Sequence-to-Sequence Learning. Neural Networks for NLP – Vector Representation of words – Contextual Understanding of text – Co-occurrence of matrix – N-grams – Dense Word Vector, Conversational Chabot<br>**Self-Learning Topic:**Text Classification using neural network with Tensorflow | 10 |
| 4. | **Feature Extraction and Embedding**<br>Word Embedding, Word2Vec–CBOW and Skip- gram Models – One-word learning architecture-Forward pass for Word2Vec – Reduction of complexity – sub-sampling and negative sampling. Continuous Skip-Gram Model, BERT- State of the NLP technique.<br>**Self-Learning Topic:** Implementing word embedding layer using keras NLP | 7 |

| | | |
|---|---|---|
| 5. | **NLP Challenges/Tasks**<br>Word sense Disambiguation NER. Named Entity Recognition, Sentiment analysis, Text categorization: Basic supervised text categorization algorithms, including Naive Bayes, k Nearest Neighbour (kNN) and Logistic Regression, Topic Modelling<br>**Self-Learning Topic:** LDA Topic Modelling Explained with implementation using Gensim in python | 7 |
| 6. | **Applications of NLP**<br>Question Answering & Information Translation, Chabot and dialog systems, Machine Translation, and Machine Evaluation tools such as Bleu, WER (Word Error Rate), Automatic Speech Recognition and text to speech.<br>**Self-Learning Topic:** Create Conversational Chabot using NLP | 7 |
| | **Total** | **45** |

**Text Books:**

1. C.D. Manning et al, "Foundations of Statistical Natural Language Processing," MitPress. MIT Press, 1999. ISBN: 9780262133609.
2. James Allen, "Natural Language Processing with Python", O'Reilly Media.
3. Ian Goodfellow, YoshuaBengio, and Aaron Courville, Deep Learning, http://www.deeplearningbook.org. MIT Press.

**Reference Books:**

1. Daniel Jurafsky and James H. Martin "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition," 1st. Upper Saddle River, NJ, USA: Prentice Hall PTR, 2000. isbn: 0130950696.
2. Jacob Perkins, "Python 3 text processing with NLTK 3 cookbook," Packet Publishing Ltd.

**Online Courses:**

1. https://archive.nptel.ac.in/courses/106/106/106106211/
2. https://onlinecourses.nptel.ac.in/noc19_cs56/preview
3. https://www.coursera.org/learn/sequence-models-in-nlp?specialization=natural-language-processing
4. https://web.stanford.edu/class/cs224n/
5. https://www.udemy.com/course/natural-language-processing
6. https://www.mygreatlearning.com/academy/learn-for-free/courses/introduction-to-natural-language-processing

| Program: | **B. Tech. I.T.** | | | | | Semester: **VII** | |
|---|---|---|---|---|---|---|---|
| Course : **Augmented and Virtual Reality** | | | | | | Code : **BIT7503/ BIT8503** | |
| **Teaching Scheme** | | | | **Evaluation Scheme** | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **IE** | **MTE** | **ETE** | **Total** |
| 3 | - | - | 3 | 20 | 30 | 50 | 100 |

**Prior Knowledge of**

- Discrete Mathematics
- Basic networking concepts

**are essentials.**

**Course Objectives:**

1. To provide a foundation to the fast growing field of Augmented, Virtual and Mixed Reality.
2. To make the students aware of the various AR, VR devices.
3. To learn applications of ARVR.

**Course Outcomes:**

After learning the course, the students will be able to:

1. Describe fundamentals Computer Vision, Computer Graphics and Human Computer Interaction Techniques related to VR/AR
2. Apply Geometric Modeling Techniques to develop VR systems.
3. Describe the working of Virtual Environment.
4. Describe the working of AR systems.
5. Apply the computer vision concepts to AR.
6. Apply ARVR techniques to digital entertainment.

**Detailed Syllabus**

| Unit | Description | Duration (Hrs) |
|---|---|---|
| 1. | **Introduction to Virtual Reality (VR)**<br>Virtual Reality and Virtual Environment, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark | 7 |
| 2. | **Computer Graphics and Geometric Modeling**<br>The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, Color theory, Conversion From 2D to 3D, 3D space curves, 3D boundary representation, Simple 3D modeling, 3D clipping, Illumination models, Reflection models, Shading algorithms, Geometrical Transformations: Introduction, Frames of reference, Modeling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection | 7 |
| 3. | **Virtual Environment**<br>Input /Output Devices: Input (Tracker, Sensor, Digital Gloves, Movement Capture, Videobased Input, 3D Menus & 3D Scanner, etc.), Output (Visual/Auditory/Haptic Devices) Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems, Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in between, free from deformation, particle system Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft | 8 |
| 4. | **Augmented Reality**<br>AR Concepts, technology and features of augmented reality, difference between AR and VR, Challenges with AR, Augmented reality methods, Visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems. | 8 |

| | | |
|---|---|---|
| 5. | **Computer Vision 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 Augmented Reality Software - Introduction, Major Software Components for Augmented Reality Systems, Software used to Create Content for the Augmented Reality Application | 8 |
| 6. | **Application of ARVR in Digital Entertainment**<br>ARVR Technology in Film & TV Production, ARVR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by ARVR. | 7 |
| | **Total** | **45** |

**Text Books:**


1. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016
2. Allan Fowler-AR Game Development‖, 1st Edition, A press Publications, 2018, ISBN 978- 1484236178


**Reference Books:**


1. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", 2005.
2. Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, "3D User Interfaces, Theory and Practice", Addison Wesley, USA, 2005
3. Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016, ISBN: 9781491962381
4. Sanni Siltanen- Theory and applications of marker-based augmented reality. Julkaisija – Utgivare Publisher. 2012. ISBN 978-951-38-7449-0

| Program: | **B. Tech. I.T.** | | | | Semester: **VII** | | |
|---|---|---|---|---|---|---|---|
| Course : **Block chain Platform** | | | | | Code : **BIT7504/ BIT8504** | | |
| **Teaching Scheme** | | | | **Evaluation Scheme** | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **IE** | **MTE** | **ETE** | **Total** |
| 3 | - | - | 3 | 20 | 30 | 50 | 100 |

**Prior Knowledge of**
Introduction to Cryptography, Hash functions, Public key cryptography, Digital Signature **is essential.**

**Course Objectives:**

1. Understand the block chain platform and its terminologies.
2. Understand smart contracts, wallets, and consensus protocols.
3. Design and develop decentralized applications using Ethereum, and Hyper ledger.
4. Creating block chain networks using Hyper ledger Fabric deployment.
5. Understand the considerations for creating block chain applications.
6. Analyze various Block chain Platforms.

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

1. Explain the Blockchain platform and its types.
2. Create Public Blockchain using Ethereum.
3. Develop Smart Contracts using REMIX IDE.
4. Apply the concept of private blockchain using Hyperledger.
5. Analyze different types of blockchain platforms.
6. Deploy Enterprise Applications on Blockchain.

**Detailed Syllabus**

| Unit | Description | Duration (Hrs) |
|---|---|---|
| 1. | **Introduction to Block chain Platforms**<br>Why Blockchain Platform: Platform types, Public, Private, technology requirements for implementation. Introduction to Ethereum, Hyperledger and Smart Contracts. Case study of blockchain Application.<br>**Self-learning Topics: Study different applications of block chain.** | 6 |
| 2. | **Public Block chain**<br>Introduction, Characteristics of Public Blockchain, Advantages. Examples of Public Blockchain-Bitcoin: Terminologies and Transaction, Ethereum: Smart contract, Comparison of Bitcoin and Ethereum, Other public Blockchain platforms.<br>**Self-learning Topics: Study any one case study on public block chain.** | 6 |
| 3. | **Ethereum Blockchain**<br>Introduction, Ethereum and Its Components: Mining, Gas, Ethereum, Ether, Ethereum Virtual Machine, Transaction, Accounts.<br>Architecture of ethereum, Smart Contract: Remix IDE, Developing smart contract for ethereum blockchain, e-voting applications using smart contract, Dapp Architecture.<br>Types of test-networks used in ethereum, Transferring Ethers Using MetaMask, Mist Wallet, Ethereum Frameworks, Case study of Ganache for ethereum blockchain. Deploying e-voting applications on Ganache framework.<br>Ethereum 2., Concept of Beacon chain, POS (Proof of Stake), Shading of Chain.<br>**Self-learning Topics: Study case study on any ethereum blockchain.** | 10 |
| 4. | **Private Block chain**<br>Introduction, Key Characteristics, Need of Private Block chain. Consensus Algorithm for private Blockchain (Ex. RAFT and PAXOS), Smart Contract in Private Block chain, Case Study of E-commerce Website, Design Limitations.<br>**Self-learning Topics: Case study on private block chain.** | 8 |

| | | |
|---|---|---|
| 5. | **Hyperledger Blockchain**<br>Introduction to Hyperledger, tools and frameworks, Hyperledger Fabric, Comparison between Hyperledger Fabric & Other Technologies, Distributed Ledgers.<br>Hyperledger Fabric Architecture, Components of Hyperledger Fabric: MSP, Chain Codes etc., Transaction Flow, Advantages of Hyperledger Fabric Blockchain, working of Hyperledger Fabric, Creating Hyperlegder network, Case Study of Supply chain management using Hyperledger<br>**Self-learning Topics: Case study on Hyperledger blockchain** | 10 |
| 6. | **Other Blockchain platforms**<br>Corda, Ripple, Quorum and other emerging blockchain platforms, Case Study on any of the blockchain platforms. Developing Blockchain application on Cloud(AWS/Azure)<br>**Self-learning Topics: Compare different blockchain platforms.** | 5 |
| | **Total** | **45** |

**Text Books:**

1. Blockchain Technology, Chandramouli Subramanian, Asha A George, Abhillash K. A and MeenaKarthikeyen, Universities press.
2. Mastering Ethereum, Building Smart Contract and Dapps, Andreas M. Antonopoulos Dr. Gavin Wood, O'reilly.

**Reference Books:**

1. Blockchain for Beginners, Yathish R and Tejaswini N, SPD
2. Blockchain Basics, A non Technical Introduction in 25 Steps, Daniel Drescher, Apress.

| Program: | **B. Tech. I.T.** | | | Semester: **VII** | | | |
|---|---|---|---|---|---|---|---|
| Course : **Business Intelligence** | | | | Code : **BIT7505/ BIT8505** | | | |
| **Teaching Scheme** | | | | **Evaluation Scheme** | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **IE** | **MTE** | **ETE** | **Total** |
| 3 | - | - | 3 | 20 | 30 | 50 | 100 |

**Prior Knowledge of**

- Database Management System.
- Fundamentals of Data Science

**are essentials.**

**Course Objectives:**

1. Understand the concepts of Business Intelligence.
2. Inculcate the concepts of Data Warehousing and Data Mining.
3. Understand the basics of design and management of BI systems.
4. Apply Business Intelligence tools to build BI Project.

**Course Outcomes:**

After learning the course, the students will be able to:

1. Interpret the fundamentals of Business Intelligence.
2. Summarize the concept of Data Warehouse and Data Mining.
3. Apply the concepts of Data Analytics on real world applications
4. Analyze and manage BI systems.
5. Apply the concept of BI in real world applications.
6. Identify various phases to build BI Project.

**Detailed Syllabus**

| Unit | Description | Duration (Hrs) |
|---|---|---|
| 1. | **Introduction To Business Intelligence**<br>Meaning of Business Intelligence, History of Business Intelligence: Data Warehouse, ETL Process, Data Mining Engines, Reporting Tools, Data Mart, Purpose of BI systems, BI Cycle, BI Architecture, BI Structure: Decision Support System, Access Enables, Data Management, BI Applications | 7 |
| 2. | **Data Warehousing And Data Mining**<br>Introduction of Data Warehousing, Characteristics, Benefits, Limitation of Data Warehousing, Main Components of Data Warehouse, Relation between BI and DW - OLAP (Online analytical processing) definitions - Difference between OLAP and OLTP - Dimensional analysis - What are cubes? Drill-down and roll-up - slice and dice or rotation - OLAP models - ROLAP versus MOLAP - defining schemas: Stars, snowflakes and fact constellations , Data Mining: Process, Knowledge Discovery, Goals and Tasks. | 8 |
| 3. | **Data Pre-processing and outliers**<br>Data Analytics life cycle, Discovery, Data preparation, Preprocessing requirements, data cleaning, data integration, data reduction, data transformation, Data discretization, and concept hierarchy generation, Model Planning, Model building, Communicating Results and Findings, Real-world Applications, types of outliers, outlier challenges, Outlier detection Methods, Proximity-Based Outlier analysis, Clustering Based Outlier analysis | 7 |
| 4. | **Designing and managing BI systems**<br>Determining infrastructure requirements, planning for scalability and availability, managing and maintenance of BI systems, managing BI operations or business continuity | 7 |
| 5. | **Data Mining for Business Intelligence Applications**<br>Data mining for business Applications like Balanced Scorecard, Fraud Detection, Clickstream Mining, Market Segmentation, retail industry, telecommunications industry, banking & finance and CRM etc.,<br>Data Analytics Life Cycle: Introduction to Big data Business Analytics - State of the practice in analytics role of data scientists<br>Key roles for successful analytic project: Main phases of life cycle, Developing core deliverables for stakeholders. | 8 |

| | | |
|---|---|---|
| 6. | **How to Build BI Project**<br>Planning the BI project, Project Resources; Project Tasks, Risk Management and Mitigation, Cost-justifying BI solutions and measuring success, Collecting User Requirements, Requirements-Gathering Techniques; Prioritizing & Validating BI Requirements, Changing Requirements; BI Design and Development, Best Practices for BI Design; Post-Implementation Evaluations, Maintaining Your BI Environment. | 8 |
| | **Total** | **45** |

**Text Books:**

1. R. Sharda, D. Delen, and E. Turban, Business Intelligence and Analytics. Systems for Decision Support, 10th Edition. Pearson/Prentice Hall, 2015. ISBN-13: 978-0-13-305090-5, ISBN-10: 0-13-305090-4
2. Paulraj Ponniah, "Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals", John Willey.

**Reference Books:**

1. Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining: Concepts and Techniques", 3rd Edition Elsevier
2. Grossmann W, Rinderle-Ma, "Fundamental of Business Intelligence", 2015,Springer
3. M. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education.
4. G. Shmueli, N.R. Patel, P.C. Bruce, "Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner", Wiley India.
5. Business Intelligence (IBM ICE Publication).

**Online Courses:**

1. Coursera Course on "BI Foundations with SQL, ETL and Data Warehousing Specialization "offered by IBM at https://www.coursera.org/specializations/bi-foundations-sql-etl-data-warehouse
2. Coursera Course on "Business Intelligence Concepts, Tools and Applications "offered by University of Colorado at https://www.coursera.org/learn/business-intelligence-tools
3. Coursera Course on "Foundations of Business Intelligence" offered by Google at https://www.coursera.org/learn/foundations-of-business-intelligence

| Program: | **B. Tech. I.T.** | | | Semester: **VII** | | | |
|---|---|---|---|---|---|---|---|
| Course : **DevOps** | | | | Code : **BIT7506/ BIT8506** | | | |
| **Teaching Scheme** | | | | **Evaluation Scheme** | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **IE** | **MTE** | **ETE** | **Total** |
| 3 | - | - | 3 | 20 | 30 | 50 | 100 |

**Prior Knowledge of**

- Software Engineering and Project Management
- Cloud Computing

**are essentials.**

**Course Objectives:**

1. Understand the need of DevOps and DevOps life cycle as a software engineering practice.
2. To learn and understand the concept of Continuous Integration Continuous Delivery (CICD)
3. To learn the concept of Containerization
4. To learn and explore the Orchestration
5. Understand the concept of configuration Management

**Course Outcomes:**

After learning the course, the students will be able to:

1. Explain the fundamentals of DevOps and Version Control System.
2. Use of Continuous Integration and Continuous Delivery/Deployment (CI/CD) tool.
3. Comprehend the Concept of Microservices and Containerization.
4. Interpret the concept of Orchestration using kubernetes.
5. Describe the concept of Infrastructure Automation
6. Discuss the concept Configuration Management using Ansible

**Detailed Syllabus**

| Unit | Description | Duration (Hrs) |
|---|---|---|
| 1. | **Introduction To DevOps and Version control system**<br>Understanding SDLC, Software Development Methodologies: Waterfall, Agile, Scrum. DevOps: Introduction, Benefits, Role of Engineer, practices, Reason for adopting, pipeline phases. Dev and op tools.<br>Version Control System: Introduction, Benefits<br>Git: GitHub, Git Features , 3-Tree Architecture, Various commands of Git. | 7 |
| 2. | **Continuous Integration and Continuous Delivery**<br>Continuous Integration, Continuous Delivery and Continuous Deployment. Differentiate Continuous Delivery and Continuous Deployment,<br>CI/CD: Pipeline Stages , pipeline building, implementation benefits<br>**CI/CD Tool:**<br>Jenkins; Features, Architecture, Master- Slave Architecture, Installation and Configuration , Scheduling build Jobs, types of Jobs, Plugins.<br>**Introduction to Build Tool- Maven** | 8 |
| 3. | **Microservices and Containerization**<br>Overview, Microservices: characteristics and its architecture, Comparison, Pros and Cons, Comparison Monolithic vs Microservices<br>Virtualization and Containerization, Working of Containerization, Comparison virtualization vs containerization,<br>**Containerization Tool: Docker**; Introduction, Use, architecture, Objects<br>Study of Docker Command to run and create docker images. | 9 |

| | | |
|---|---|---|
| 4. | **Container Orchestration**<br>Container Orchestration, Use of Container Orchestration,<br>Container Orchestration tool<br>**Kubernetes:** Features and Architecture, Components , uses<br>Key Objects of Kubernetes: Control Plane, Pod, Node, Service, Replica Set, Namespaces , kubelet, kubectl, Docker Swarm vs Kubernetes<br>Study about YAML Files , Creating a Deployment in Kubernetes using YAML<br>**Helm chart: Overview** | 8 |
| 5. | **Infrastructure Automation**<br>Introduction, Importance, its working and Benefits,<br>Infrastructure as Code, Terraform: Introduction, Advantages, Difference between Terraform vs Cloud Formation. Life cycle, its Core concepts, Multi – cloud Provisioning, Terraform Workflow | 8 |
| 6. | **Configuration Management**<br>Configuration Management: Overview, Benefits, uses<br>Configuration Management Tool:<br>Ansible: Workflow, Server Configuration , Terms used ,<br>Architecture, Playbooks and its Structure, Ad-hoc Commands, Modules, Roles<br>Continuous Monitoring: Overview | 5 |
| | **Total** | **45** |

**Text Book**

1. PierluigiRiti, "Pro DevOps with Google Cloud Platform", Apress, ISBN: 978-1-4842-3896-7.
2. Jez Humble and David Farley, "Continuous Delivery", Pearson Education, Inc, ISBN: 978–0–321–60191–9

**Reference Book**:

1. Viktor Farcic, "The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline with Containerized Microservices"
2. Sanjeev Sharma and Bernie Coyne, "DevOps for Dummies", John Wiley & Sons, Inc., 2nd IBM Limited Edition, ISBN: 978-1-119-04705-6

Online Courses:

https://www.udemy.com/course/ci-cd-devops/
https://www.edureka.co/devops-certification-training
https://www.coursera.org/learn/intro-to-devops

| Program: B. Tech. (E&TC) | | | | Semester: VII/VIII | | | |
|---|---|---|---|---|---|---|---|
| Course: Bio inspired systems and Computing | | | | Code: BET7601/ BET8601 | | | |
| Teaching Scheme | | | | Evaluation Scheme | | | |
| Lecture | Tutorial | Hours | Credit | IE | MTE | ETE | Total |
| 3 | - | 3 | 3 | 20 | 30 | 50 | 100 |

**Prior knowledge of**

Data Science and Statistics is essential

**Course Objectives:**

1. To explain bio-inspired theorem and algorithms
2. To demonstrate role of random walk and simulated annealing
3. To discuss genetic algorithm and differential evolution with their applications
4. To elaborate use of swarm optimization and ant colony for feature selection

**Course Outcomes:**

After completion of this course students will be able to,

1. Understand bio-inspired algorithms used in computing.
2. Implement optimization using genetic algorithms.
3. Explore role of swam optimization in computing algorithms
4. Apply bio inspired algorithms in image processing applications.
5. Describe bio-inspired routing protocols for VANETs
6. Understand bio-mimetically inspired robot prototype

**Detailed Syllabus:**

| Unit | Description | Hours |
|---|---|---|
| 1 | **INTRODUCTION:** Bio-inspired Computing, The influence of brain science on Brain-inspired computing, Development focus of bio-inspired algorithms, Paradigm of evolution of algorithms with increase of complexity of problems. Current Issues in Bio-Inspired Computing | 06 |
| 2 | **GENETIC ALOGORITHMS AND DIFFERENTIAL EVOLUTION:** Introduction to genetic algorithms, Components of genetic algorithms, Properties of genetic algorithms, Linear genetic programming, Biological vs. artificial evolution . Applications: Prediction of cancer survival | 07 |
| 3 | **SWARM OPTIMIZATION AND FIREFLY ALGORITHM** Swarm intelligence - PSO algorithm, Properties of PSO, binary PSO , Types of Swarm-Intelligence-Based Algorithms<br>The Firefly algorithm - algorithm analysis - implementation - variants- Ant colony optimization toward feature selection. | 08 |
| 4 | **APPLICATION IN IMAGE PROCESSING:** Bio-Inspired Computation and its Applications in Image Processing: An Overview, Improved Weighted Threshold based Histogram Equalization Algorithm for Digital Image, Contrast Enhancement Using Bat Algorithm, Mobile Object Tracking Using Cuckoo Search | 08 |
| 5 | **BIO-INSPIRED ROUTING PROTOCOLS FOR VANETs:** Motivations for using bio-inspired approaches in VANET routing, Fundamental concepts and operations of bio-inspired VANET routing, Basic bio-inspired algorithms used in VANET routing literature, Swarm intelligence for VANET routing | 08 |
| 6 | **BIO-MIMETICALLY INSPIRED ROBOT PROTOTYPE:** Definition: Bionics, Biomimetics, Bio-inspired, and Biotechnology, State of the Art in Robotics and Robotic Actuation, Biomimetically Inspired Robot Prototype, The Robot's Performance, Field of Application | 08 |
| | **Total** | 45 |

**Text Books:**

1. Yang ,Cui,XIao, Gandomi,Karamanoglu ,"Swarm Intelligence and Bio-Inspired Computing", Elsevier, First Edition, 2013
2. Xin-She Yang, Jaao Paulo papa, "Bio-Inspired Computing and Applications in Image Processing", Elsevier First edition 2016
3. Abdelhamid Mellouk, Salim Bitam, “Bio-Inspired Routing Protocols for Vehicular Ad Hoc Networks”,Wiley , First edition 2014.
4. Ralf Simon King , “BiLBIQ_ A Biologically Inspired Robot with Walking and Rolling Locomotion” Volume 2, [Biosystems & Biorobotics] , Springer Berlin Heidelberg, 2012

**Reference Books:**

1. Mattias Wahde, “Biologically Inspired Optimization Methods: An Introduction”, WIT Press, First edition 2008
2. Eiben, A.E.,Smith, James E, "Introduction to Evolutionary Computing", Springer 2015.
3. Helio J.C. Barbosa, "Ant Colony Optimization - Techniques and Applications", Intech 2013
4. Acharjya, D. P._ Santhi, V - Bio-Inspired Computing for Image and Video Processing-CRC Press, 2018.
5. Xin-She Yang, "Nature Inspired Optimization Algorithm, Elsevier First Edition 2014

**Papers:**

1. Arpan Kumar Kar,Bio inspired computing – A review of algorithms and scope of applications, Expert Systems with Applications,Volume 59,2016,Pages 20-32,ISSN 0957-4174, https://doi.org/10.1016/j.eswa.2016.04.018.

| Program: | B. Tech.(E&TC) | Semester: | VII/VIII |
|---|---|---|---|
| Course: | Sensor and Automation with IoT | Code: | BET7602/ BET8602 |

| Teaching Scheme | | | | Evaluation Scheme | | | |
|---|---|---|---|---|---|---|---|
| Lecture | Tutorial | Hours | Credit | IE | MTE | ETE | Total |
| 3 | - | 3 | 3 | 20 | 30 | 50 | 100 |

**Prior Knowledge of:**

1. Basic Electronics Engineering
2. Programming with Arduino is essential

**Course Objectives:**

1. Explain fundamental methods and characteristics of measurement systems.
2. Introduction to various types of transducers with working principles
3. Make students aware of need of computer aided process automation in industrial applications.
4. Demonstrate PLC ladder programming for design of basic logic gates for various applications
5. Make students familiar with various applications of IoT.

**Course Outcomes:**

After completion of this course students will be able to,

1. Illustrate the working principle of various types of transducers and their characteristics.
2. Choose proper sensor comparing different standards, guidelines and requirements for measurements of displacement, velocity, acceleration and level.
3. Select proper sensor comparing different standards, guidelines and requirements for measurements of Temperature and Force
4. Describe the need and concept of process control and automation systems
5. Design of basic logic gates using ladder programming.
6. Explain applications of IoT for real life application in automobile and healthcare

**Detailed Syllabus:**

| Unit | Description | Duration (Hours) |
|---|---|---|
| 1. | **Introduction to Sensors and Transducers**<br>Introduction to Sensors, Description and Working principle, Types of sensors, Specifications of Sensors. Introduction to transducers, Advantages and Disadvantages of Electrical Transducers, Classification of Transducers**,** Static and Dynamic characteristics, Difference between sensors and transducers | 7 |
| 2. | **Sensors for Displacement, Vibration, Acceleration and Level**<br>Classification of Displacement Sensors: Potentiometer, Strain-gauged element, Capacitive element,<br>Differential transformers, Eddy current proximity sensors, Inductive and Capacitive Proximity switch, Optical encoders.<br>Pneumatic sensors (Bellows, Diaphragm), Hall effect sensors, Accelerometer, Gyroscope and Magnetometer (ADXL335/345), Electro-Optical Sensors, Position Encoders. | 8 |
| 3. | **Force and Temperature Sensors**<br>Basic methods and types of force measurement: elastic force, strain gauge, piezoelectric, inductive, Capacitive load cells. Methods of temperature measurement: Optical Fiber, Resistance Temperature Detectors, Thermistor, Thermocouples | 7 |
| 4. | **Computer Aided Process Control and Automation Systems**<br>Introduction of computer aided process control hardware, Industrial communication systems, Introduction of Computer based data acquisition system **(DAQ)**, fundamentals of automation, Automation principles and strategies, reasons for Automating, basic elements of an automated system: Power, Program and control system. | 8 |

| | | |
|---|---|---|
| **5.** | **Introduction of Programmable Logic Controllers**<br>Fundamentals of PLC, PLC selection criteria and applications of PLC<br>Introduction to PLC programming, Ladderdiagram, Sequential flow chart, Industrial bus systems<br>**Case Study**: Basic Logic Gates implementation using Ladder programming, Temperature Measurement with interfacing to DAQ | **8** |
| **6.** | **Introduction to Internet of Things:** Overview of Internet of Things- the Edge, Cloud and the Application Development, Anatomy of the Thing, Basic Concept of IoT, Sensor Interface in IoT systems, Design Model for IOT<br>Case Study 1: IoT based Automobile Sector (Engine Management System) (Mention of Fuel Level, Ignition, Exhaust Sensors)<br>Case Study 2: IoT based Healthcare Systems (Block Diagram and Simulation) | **7** |
| | **Total** | **45** |

**Text Books:**


1. A.K. Sawhney: "A Course in Electrical and Electronic Measurements and Instrumentation", 18th Edition, Dhanpat Rai Publications, 2001
2. D. Patranbis, "Sensor and Transducers", 2nd Edition, PHI publication, 2005.
3. Krishna Kant, "Computer - Based Industrial Control", 2nd Edition, Prentice Hall, New Delhi, 2011
4. Frank D. Petruzella, "Programmable Logic Controllers", 5th Edition, McGraw- Hill, New York, 2016.
5. Joe Biron& Jonathan Follett, Oreilly, "Foundational Elements of an IOT Solution - The Edge, Cloud and Application Development", First Edition, March 2016


**Reference Books:**


1. Jacob Milman, Christos Halkias, Chetan D. Parikh, "Millman's Integrated Electronics", McGraw Hill Education India Pvt. Ltd., Second edition, 2010
2. Curtis D. Johnson, "Process Control Instrumentation Technology", 8th Edition, Pearson New International, 2013.
3. Lukas M.P, "Distributed Control Systems", Van Nostrand Reinhold Co., New York, 1986.
4. N. Viswanandham, Y. Narahari, "Performance Modeling of Automated Manufacturing Systems", 1st Edition, 2009
5. Lucas Darnell, "The Internet of Things (A Look at Real World Use Cases and Concerns)". Kindle Edition, 2016

| Program: | B.Tech (E&TC) | | | Semester : VII/VIII | | | |
|---|---|---|---|---|---|---|---|
| Course : | MOOCs | | | Code :BET7603/ BET8603 | | | |
| Teaching Scheme | | | | Evaluation Scheme | | | |
| Lecture | Tutorial | Hours | Credit | IE | MTE | Certification exam | Total |
| -- | -- | 03 | 03 | 70 | -- | 30 | 100 |

**Guidelines: For Students:**

1. Individual student can register for MOOC course of their interest in VII/VIII Sem as an option to Open Elective Course offered by institute.
2. MOOC course should be exclusive to courses undertaken by students. (Repetition of Course undertaken in any semester is not allowed.)
3. Student should submit the registration details with documentary proof to MOOC Coordinator .
4. Course selected should be Minimum of 40 -45 or Twelve-Fourteen Week contact hours.
5. Weekly assignment needs to be regularly completed as per requirement of course, which will be considered for internal assessment of course.
6. Students should submit progress report of assignment to MOOC Coordinator during the reviews.
7. At the end of the Course a detailed report on MOOC in hardcopy is mandatory.

**Evaluation Guidelines and Rubrics*:**

***As per B.Tech. R&R***

Continuous Internal Evaluation twice a semester (50 Marks):

a. Timely completion of assignment (15 marks)

***b.*** Progress of assignment ( 10 Marks) ***Best /average of the given assignments***

1. MOOCs report Submission (20 Marks) : The student should summarize learning outcomes in report of 15-20 pages.

   Rubrics:

   a. Plagiarism of report/ paper must be below acceptable level of standard ( 5 Marks)
   b. Report must be drafted appropriately (LATEX tool but not compulsory) ( 5 Marks)
   c. Content of the report/ paper (10 Marks)
2. Final Examination Certificate (30 Marks)
   a. Appeared for Exam : 05 Marks
   b. Performance of Exam: 25 Marks

| Program:B. Tech. (E&TC) | | | | Semester: VII/VIII | | | |
|---|---|---|---|---|---|---|---|
| Course: Drone Technology. | | | | Code: BET7604/ BET8604 | | | |
| Teaching Scheme | | | | Evaluation Scheme | | | |
| Lecture | Tutorial | Hours | Credit | IE | MTE | ETE | Total |
| 3 | - | 3 | 3 | 20 | 30 | 50 | 100 |

**Prior knowledge of**

Basic understanding of physics, sensors and actuators, Control systems and python programming is essential

**Course Objectives:**

1. To introduce students about the accessories of drone and its functionality.
2. To describe the students about mathematical model of quad copter drone.
3. To make the students, design and development of drone model using Simulink.
4. To discuss the implementation models of different drone based case studies.

**Course Outcomes:**

After completion of this course students will be able to,

1. Understand the basic concepts of drone technology
2. Justify specifications and requirements of customized drone design.
3. determine different accessories of Drones as per applications.
4. Comprehend drone control system development using Simulink
5. Design Simulink model simulating the complete dynamics of quadcopter drone.
6. Evaluate the design model of existing drone base systems.

**Detailed Syllabus:**

| Unit | Description | Duration(Hours) |
|---|---|---|
| 1 | **Introduction to drones:** Unmanned Aerial Systems (UAS), Basics of drones, different body materials used for drone, different types of drones, Laws of Motion, Bernoulli's Principle, four forces of Flight, three axes of Flight. | 06 |
| 2 | **Drone accessories I:** Sensors & Motors, its types and specifications, design constraints, Test and measurement methods for drone sensors and actuators, Introduction of different types of batteries used in drone. Understand different specifications and their significance of batteries. | 07 |
| 3 | **Drone accessories II:** Propellers, Concept of propulsion, Forces working on a Flight, Principle axes and rotation of aerial systems, Role of GPS navigation and telemetry model, interfacing of GPS module to navigation drone. | 07 |
| 4 | **Drone control system development using Simulink:** Control system architecture, Quadcopter with actuator & propellers functionality block, Sensing & estimation functionality block, controller functionality block. | 08 |
| 5 | **Modelling, Simulation & Flight control design:** Dynamic quad coptersystem Model, flight control design, 3D visualization, testing & Tuning the model, Flight operations, Applicable software for data collection, processing, and analysis | 09 |
| 6 | **Applications of Drone Technology:** Drones in delivering mail, parcels and other cargo, Drones in agriculture, Drones in inspection of transmission lines and power distribution, Drones in disaster management (Flood, Fire etc), Case Study: Eagle Eye drone. | 08 |
| | **Total** | 45 |

**Text Books:**

1. John Baichtal ,"Building your own drones, a beginner's guide to drones, UAVS, and ROVs" Pearson Education, 1st Edition,2015
2. Muhammad Usman , "Quadcopter modeling and control with Matlab/Simulink implementation" LAB University of Applied Sciences, 1st Edition, 2020
3. K.S.Fu, R.C.Gonzalez, C.G.Lee , "Robotics control, sensing, vision and intelligence" MGH, 1st Edition, 1987

**Reference Books:**

1. R.K.Mittal , I.J.Nagrath, "Robotics and control" Tata McGraw-Hill, 1st Edition,2005
2. Ben Rupert , "Drones (The ultimate guide)", Create Space Independent Publishing Platform, 1st Edition,2017
3. Agam Kumar Tyagi, "Matlab and Simulink for engineers", Oxford University Press, 1st Edition,2012

| Program:B. Tech. (E&TC) | | | | Semester: VII/VIII | | | |
|---|---|---|---|---|---|---|---|
| Course: Advanced Driver Assistance System(ADAS) | | | | Code: BET7605/ BET8605 | | | |
| Teaching Scheme | | | | Evaluation Scheme | | | |
| Lecture | Tutorial | Hours | Credit | IE | MTE | ETE | Total |
| 3 | - | 3 | 3 | 20 | 30 | 50 | 100 |

**Prior knowledge of** eVehicle and Automotive Electronics **is essential**

**Course Objectives:**

1. To introduce Autonomous and Intelligent Vehicle Technology
2. To elaborate ADAS system architecture and features.
3. To explore role of AI in ADAS using various application in autonomous vehicle.

**Course Outcomes:**

After completion of this course students will be able to,

1. Understand the importance of ADAS in Autonomous and intelligent vehicle
2. Model Sensor technology required in prototype design used in ADAS
3. Apply AI concepts in automated analysis using vision based algorithms
4. Design automated electronics systems for driver assistance.
5. Develop models for safety system in autonomous vehicles.
6. Evaluate the test for maintenance, calibration and diagnostics of ADAS systems

**Detailed Syllabus:**

| Unit | Description | Duration(Hours) |
|---|---|---|
| 1 | Introduction to ADAS, General Block Diagram, Role of ADAS in Autonomous vehicle, Integration of ADAS Technology into Vehicle Electronics, Non-Passenger Car Advanced Driver Assistance Systems and Autonomous Operation, Intelligent Vehicles | 06 |
| 2 | Prototype, Test, Evaluate and Validate ADAS : Generic dynamic and distributed architecture, Environment and climatic conditions , Modeling of perception sensors: Optical Sensor, RADAR, LIDAR, GNSS. | 07 |
| 3 | AI for ADAS: The construction of the intelligent vehicle's basic building blocks employing AI methods, Vision sensors, Vision algorithms, Automated Guided Autonomous Car Using Deep Learning and Computer Vision, Deep Learning for Obstacle Avoidance in Autonomous Driving | 08 |
| 4 | Electronics Systems in ADAS, Adaptive Cruise Control (ACC), Rear Cross Traffic Alert (RCTA), Vehicle Exit Alert, Front Cross Traffic Alert, Forward Collision Warning | 08 |
| 5 | Safety Systems in ADAS , Blind Spot Detection, Parking Assistance System, Intelligent Head Light Control, Occupant Protection System, Pedestrian Protection System, Evasive Steering Support. | 08 |
| 6 | Calibration of ADAS and Automated Driving Features: Calibration—An Overview Based on Ideality Equation , Common Types of Calibration in an Automated Driving System: End of Line (EoL) Calibration, Service Calibration, Online Calibration, Functional Calibration, Calibration of ADAS and Automated Driving Features , Calibration Environment for Automated Driving Vehicles, Calibration over Diagnostics Interface | 08 |
| | **Total** | **45** |

**Text Books:**


1. Abdelaziz Bensrhair (editor), Thierry Bapin (editor) - From AI to Autonomous and Connected Vehicles_ Advanced Driver-Assistance Systems (ADAS)-Wiley-ISTE (2021)
2. Plato Pathrose - ADAS and Automated Driving_ A Practical Approach to Verification and Validation-SAE International (2022)


**Reference Books:**


1. Harald Waschl, Ilya Kolmanovsky, Frank Willems - Control Strategies for Advanced Driver Assistance Systems and Autonomous Driving Functions-Springer, Vol. 476, 2019.
2. Lentin Joseph (editor), Amit Kumar Mondal (editor) - Autonomous Driving and Advanced Driver-Assistance Systems (ADAS)_ Applications, Development, Legal Issues, and Testing (Chapman & Hall_CRC
3. Yan Li, Hualiang Shi - Advanced Driver Assistance Systems and Autonomous Vehicles_ From Fundamentals to Applications-Springer (2022)
4. https://www.udemy.com/course/advanced-driver-assistance-systems/

| Program: | B. Tech. (Civil Engineering) | | | Semester:VIII Scheme B | | | |
|---|---|---|---|---|---|---|---|
| Course : **E- waste management (OEC-5)** | | | | Code : **BCI7605A** | | | |
| **Teaching Scheme** | | | | **Evaluation Scheme** | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **IE** | **MTE** | **ETE** | **Total** |
| 3 | - | - | 3 | 20 | 30 | 50 | 100 |

**Prior Knowledge of**

- Fundamentals of Environmental Engineering.
- Fundamentals of Sustainable Engineering.

**are essentials.**

**Course Objectives:**

4. To impart knowledge of e-waste in Indian and Global scenarios and role of engineering in e-waste management.
5. To build the concept of the role and responsibility of different stakeholders in the e-waste business.
6. To make aware of e-waste legislation (Acts and guidelines)
7. To get acquainted with recycling and recovering technologies.
8. To create awareness on e-waste global trade.
9. To impart knowledge of the circular economy and e-waste for a sustainable future.

**Course Outcomes:**

After learning the course, the students will be able to:

7. Identify the issues and challenges of e-waste management for a sustainable environment.
8. Explain the role and responsibilities of stakeholders and directory bodies for e-waste control measures.
9. Explain legislation (Acts and guidelines) and apply sustainable approaches.
10. Identify the e-waste handling process, recycling, and recovery techniques for a sustainable future.
11. Explain e-waste global trade and economy.
12. Apply a circular economy road map for an e-waste sustainable future.

**Detailed Syllabus**

| Unit | Description | Duration (Hrs) |
|---|---|---|
| 7. | **Introduction to Electronic and Electrical Waste (e-Waste)**<br>What is E-Waste, Indian and global scenario of e-Waste, Growth of the Electrical and Electronics industry in India and global, Composition and characteristics of e-waste, e-waste pollutants, Possible hazardous substances present in e-waste, Environmental and Health implications-waste disposal issues and challenges for domestic and commercial, Awareness and approach towards E-waste, Role and responsibility of engineering in e-waste management Case Study. | 07 |
| 8. | **Electronic and Electrical Waste (e-Waste) control measures**<br>Need for stringent health safeguards and environmental protection laws in India, Regulatory compliance including roles and responsibilities of different stakeholders, Proposed reduction in the use of hazardous substances(RoHS), Extended Producer's Responsibility (EPR) targets Import of e-waste permissions, Producer-Public-Government cooperation, Administrative Controls & Engineering controls, monitoring of compliance of Rules, Effective regulatory mechanism strengthened by manpower and technical expertise, Reduction of waste at source. Case Study. | 07 |
| 9. | **E-waste Legislation**<br>The regulatory regime for e-waste in India, Hazardous and other Wastes (Management & Transboundary Movement) Rules, 2016, e-waste (Management) Amendment Rules, 2018, 2022 .A comprehensive analysis of e-waste legislation worldwide. International Conventions, Regulations and Laws, handling e-waste in developed and developing countries: initiatives, practices, and consequences with a case study. G20 summit 2023. | 07 |
| 10. | **Electronic and Electrical Waste (e-Waste) Management**<br>Basic principles of e-waste management, Technologies for segregation and recovery of resources from electronic waste, resource recovery potential of e-waste, steps in recycling and recovery of materials-mechanical processing, technologies for recovery of materials, occupational and environmental health perspectives of recycling e-waste in India. Reuse of E-waste. Carbon footprint and credits for recycling, Case study on recycling and recovering technology. | 08 |

| | | |
|---|---|---|
| 11. | **E-waste hazards on Global trade**<br>Essential factors in the global e-waste trade economy, e-waste trading as a quintessential part of electronic recycling, free trade agreements as a means of waste trading. Import of hazardous e-waste in India; India's stand on liberalizing import rules, E-waste economy in the organized and unorganized sector. Estimation and recycling of e-waste in metro cities of India with case study. | 08 |
| 12. | **Circular economy and e-waste**<br>Sustainable management of e-waste and circular economy, Achieving UN Sustainable Development Goals (SDGs) and E-Waste, Urban mining towards sustainable future and circular economy, Entrepreneurship and expertise in e-waste, global challenges and opportunities in structured e-waste management. Circular electronics roadmap, Circular economy startup in India with a case study. | 08 |
| | **Total** | **45** |

**Text Books:**

4. Hester R.E., and Harrison R.M, Electronic Waste Management. Science, Latest edition
5. Electronic Waste Management: Edition 2, by G H Eduljee, R M Harrison, Royal Society of Chemistry 2022, ISBN 978-1-78801-744-2
6. Johri R., E-waste: implications, regulations, and management in India and current global best practices, TERI Press, New Delhi

**Reference Books:**

1. Fowler B, Electronic Waste – 1 st Edition (Toxicology and Public Health Issues), 2017 Elsevier

**E-Resources:**

1. https://cpcb.nic.in/e-waste/
2. https://courses.iid.org.in/course/e-waste-recycling-business
3. https://www.suritex.co.in/
4. http://greenscape-eco.com/
5. https://onlinecourses.nptel.ac.in/noc20_ce12/preview
6. https://nielit.gov.in/gangtok/content/paid-course-e-waste-management

| Program: | **B. Tech. (Civil Engineering)** | | | Semester:**VIII Scheme B** | | | |
|---|---|---|---|---|---|---|---|
| Course : **Advanced Instrumentation in Infrastructural Engineering (OEC-5)** | | | | Code : **BCI7605B** | | | |
| **Teaching Scheme** | | | | **Evaluation Scheme** | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **IE** | **MTE** | **ETE** | **Total** |
| 3 | - | - | 3 | 20 | 30 | 50 | 100 |

**Prior Knowledge of**

- Knowledge of fundamentals of Infrastructure engineering
- Knowledge of fundamentals of geotechnical and transportation engineering

**are essentials.**

**Course Objectives:**

1. To impart knowledge of advanced instruments used in Road Infrastructure
2. To Identify the advancement in various modes of transportation
3. To make aware of the scope of various instruments in monitoring fields.
4. To get acquainted with sensors and transducers.

**Course Outcomes:**

After learning the course, the students will be able to:

1. Elaborate the role of various agencies involved in building road infrastructure and allied areas
2. Explain different attributes related to urban transportation
3. Analyze the various tools and measures to delineate with the traffic conflicts in an urban city
4. Determine the properties of soils using various advanced instruments.
5. Apply the knowledge of instruments in various monitoring fields.
6. Discover the additional attributes in advanced sensors and their role in Civil Engineering.

**Detailed Syllabus**

| Unit | Description | Duration (Hrs) |
|---|---|---|
| 1. | **Pavement Infrastructure**<br>Introduction to pavement infrastructure, Types of pavement (Flexible, Rigid and Composite), IRC (Indian Roads Congress)and MoRTH (Ministry of Road Transport and Highways) guidelines, Role of National Highway Authority of India in pavement construction, Advanced Instrumentation in Pavement construction, Modern Modes of Transportation (Road, Rail, Air and Water transportation) | 07 |
| 2. | **Urban Public Transportation**<br>Urban growth and public transport needs – Transit mode classifications -Transit characteristics-Demand estimation- Frequency & Fleet size determination, Advanced Survey Instruments<br>Requirements of Pedestrians; Pedestrian facilities on Urban Roads; Cycle Tracks – Guidelines and Design standards; Bus bays – Types and Guide lines; Design of On-street and Off street Parking facilities – Guidelines for lay out Design.<br>Types of Road Markings,Traffic Impact Attenuators, Safety Barriers, Traffic signals: types and principles of phasing | 09 |
| 3. | **Traffic Monitoring and Control**<br>Traffic Studies: Basic characteristics of Traffic, Volume, Speed and Density, Traffic Volume studies,Speed and Delay studies, Accident Studies and road safety auditing, Traffic calming measures and modern traffic control devices | 06 |
| 4. | **Soil properties using advanced instruments**<br>Pore pressure measurement, Earth pressure cell, Settlement gauges. Inclinometers, Stress measurements, Seismic measurements. Advanced instrumentation in Earthquake resistant structures | 07 |
| 5. | **Scope of Geotechnical Instruments In Various Monitoring Fields**<br>Dam Monitoring Solutions-Water level, Water pressure and seepage, Lateral ground movement, Deformation, Displacement, Stress, Strain, Load Temperature, Tilt, Surface Settlement. Tunnel Monitoring Solutions- Lateral ground movement, Deformation, Displacement, Stress, Strain, Load ,Temperature Tilt, Surface Settlement. Structural Monitoring Solutions- Tilt Monitoring, Crack Monitoring, Settlement Monitoring, Lateral Ground Movement, Temperature Monitoring, Pore Pressure Monitoring. | 08 |

| | | |
|---|---|---|
| 6. | **Sensors & Transducer:**<br>Introduction to digital encoding transducer- digital displacement transducers- shaft encoder- optical encoder, Introduction to Smart Sensors, Overview in Applications of sensors in Infrastructural Engineering. | 08 |
| | **Total** | **45** |

**Text Books:**


1. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers
2. Highway Engineering, C.E.G.Justo and S.K.Khanna, Nem Chand and Brothers.
3. 3.ChakrobortyP.,DasN.,Principlesof Transportation Engineering(2nd edition),PHI,NewDelhi,2017
4. Handbook of Geotechnical Investigation and Design Tables, Routledge, 2007.
5. DVS Murthy, Transducers and Instrumentation, PHI 2nd Edition 2013
6. D Patranabis, Sensors and Transducers, PHI 2nd Edition 2013.


**Reference Books:**


1. Transportation Engineering - An Introduction - C.Jotin Khisty, Prentice Hall Publication
2. Highway Capacity Manual, Transportation Research Board, National Research Council, Washington, D.C., 2010
3. Geotechnical Investigation Methods: A Field Guide for Geotechnical Engineers. EHUNT, Taylor & Francis, .2006.
4. Koerner, R.M. "Designing with Geosynthetics", Prentice Hall, New Jersey, USA, 5th edition, 2005.
5. IRC and MoRTH standards

| Program: | B. Tech. (Civil Engineering) | | | Semester:**VIII Scheme B** | | | |
|---|---|---|---|---|---|---|---|
| Course :**3-D printing technique for construction (OEC-6)** | | | | Code : **BCI7606A** | | | |
| **Teaching Scheme** | | | | **Evaluation Scheme** | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **IE** | **MTE** | **ETE** | **Total** |
| 3 | - | - | 3 | 20 | 30 | 50 | 100 |

**Prior Knowledge of**

- Computer Aided Design & Drafting.
- Engineering Materials, Strength of Material
- Properties of Concrete

**are essentials.**

**Course Objectives:**

1. To gain knowledge and skills related to 3D printing technologies.
2. To understand the various software tools, process, material and techniques for construction technology.
3. To apply these techniques into civil Engineering applications like Building, Bridge, wall element, roof ceiling and decorative building elements.

**Course Outcomes:**

After learning the course, the students will be able to:

1. Develop CAD models for 3D printing.
2. Process software files
3. Optimize concrete mix
4. Analyze behavior for strength and challenges in printing
5. Design Mechanism and nozzle
6. Identify defects in post process of printing

**Detailed Syllabus**

| Unit | Description | Duration (Hrs) |
|---|---|---|
| 1. | **3D Printing (Additive Manufacturing)**<br>Introduction, Process, Classifications, Advantages, Additive v/s Conventional Manufacturing processes, Applications.<br>**CAD for 3D Manufacturing**<br>CAD Data formats, Data translation, Data loss, STL format. | 07 |
| 2. | **3D Techniques**<br>Stereo- Lithography, Laminated Object Manufacturing (LOM), Fused deposition modeling (FDM), Selective laser sintering (SLS), Selective laser melting (SLM), Binder Jet technology. Processing of software file, Process parameter, Process Selection for various applications | 07 |
| 3. | **Material Properties**<br>Properties of concrete ingredient like cement, sand, fly ash, silica fume, fibers, Concrete Mix proportioning and optimization considering admixtures like super plasticizer, retarders, water reducing agents, quick setting agent etc, viscosity modifying agents, geo-polymers, fibers, alternative material used for printing, | 07 |
| 4. | **Material Testing & Behavior**<br>Testing on material like compressive strength, bonding strength, workability, setting time, build ability, flow ability, etc, Structural behavior and its Integrity. Challenges like problems of aggregate jamming in the nozzle, compacting obstacles, and the spacing limitations due to rebar and formwork installation. | 08 |
| 5. | **Equipment Mechanism**<br>Process Equipment- Design and process parameters, Nozzle design and optimization like shape, diameter, piston type or screw type. Process Design-synchronization of components | 08 |
| 6. | **Post Processing:**<br>Requirement and Techniques, Support Removal, Finishing treatment, polishing<br>**Product Quality:** Inspection and testing, Defects and their causes | 08 |
| | **Total** | **45** |

**Text Books:**

1. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing by Lan Gibson, David W. Rosen and Brent Stucker, Springer, 2010.
2. 3D Printing and Rapid Prototyping- Principles and Applicationsby CK Chua, Kah Fai Leong,World Scientific, 2017.
3. 3D Printing and Design by Hanser Publisher, Khanna Editorial, Khanna Publishing House, Delhi, 2011.
4. Concrete Technology: Theory and Practice byM. S. Shetty & A K Jain, S. Chand Publication, 2019.

**Reference Books:**

1. J.D. Majumdar and I. Manna, "Laser-Assisted Fabrication of Materials", Springer Series in Material Science, 2013.
2. Andreas Gebhardt, "Understanding Additive Manufacturing: Rapid Prototyping, Rapid Tooling, Rapid Manufacturing".

**E Resources:**

1. 3D Printing and Additive Manufacturing Specialization
   https://www.coursera.org/specializations/3d-printing-additive-manufacturing
2. 3D Printing Software',Jeffrey Smith, Education Manager, Coursera Course by University of Illinois at Urbana-Champaign, USA.
   https://www.coursera.org/specializations/3d-printing-additive-manufacturing
3. 3D Printing Applications',Vishal Sachdev Clinical Assistant Professor , Director, Illinois MakerLab, Coursera Course ,University of Illinois at Urbana-Champaign, USA.
   https://www.coursera.org/learn/3d-printing-applications

| Program: | **B. Tech. (Civil Engineering)** | | | Semester:**VIII Scheme B** | | | |
|---|---|---|---|---|---|---|---|
| Course :**Structural Health Monitoring & Audit (OEC-6)** | | | | Code : **BCI7606B** | | | |
| **Teaching Scheme** | | | | **Evaluation Scheme** | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **IE** | **MTE** | **ETE** | **Total** |
| 3 | - | - | 3 | 20 | 30 | 50 | 100 |

**Prior Knowledge of**

- Knowledge of Concrete Technology is essential.
- Knowledge of Rehabilitation and Retrofitting of Structures.

**are essentials.**

**Course Objectives:**

1. To impart knowledge of diagnosis the distress in the structure, its causes and factors.
2. To assess the health of structure using static field methods and dynamic field methods.
3. To introduce the repairs and rehabilitation measures of the structure.

**Course Outcomes:**

After learning the course, the students will be able to:

1. Understand the deterioration and distress in structures.
2. Evaluate causes and prevention methods for structural health monitoring.
3. Understand Simulation and Loading Methods in static field.
4. Analyze Data Acquisition Systems in dynamic field testing methods.
5. Understand piezo– electric materials and other smart materials in structural health monitoring.
6. Apply the knowledge of NDT techniques on real field.

**Detailed Syllabus**

| **Unit** | **Description** | **Duration (Hrs)** |
|---|---|---|
| 1. | **Introduction to Structural Health:** Structural Health: Factors affecting Health of Structures, Causes of Distress, Regular Maintenance. | 07 |
| 2. | **Structural Health Monitoring & Audit:** Structural Health Monitoring: Concepts, Various Measures, Structural Safety in Alteration. Structural Audit: Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures. | 08 |
| 3. | **Static Field Testing:** Types of Static Tests, Simulation and Loading Methods, sensor systems and hardware requirements, Static Response Measurement. | 08 |
| 4. | **Dynamic Field Testing:** Types of Dynamic Field Test, Stress History Data, Dynamic Response Methods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring. | 08 |
| 5. | **Introduction to Repairs and Rehabilitations of Structures:** Case Studies (Site Visits), piezo–electric materials and other smart materials, electro–mechanical impedance (EMI) technique, adaptations of EMI technique. | 07 |
| 6. | **NDT (Non Destructive Testing)Techniques:** Application of NDT Techniques on real-life problems. | 07 |
| | **Total** | **45** |

**Text Books:**


1. Daniel Balageas, Claus_PeterFritzen, Alfredo Güemes, “Structural Health Monitoring”, John Wiley and Sons, 2006.
2. Douglas E Adams, “Health Monitoring of Structural Materials and Components_Methods with Applications”, John Wiley and Sons, 2000


**Reference Books:**


1. 1. J. P. Ou, H. Li and Z. D. Duan, “Structural Health Monitoring and Intelligent Infrastructure”, Vol1, Taylor and Francis Group, London, UK, 2006.
2. 2. Victor Giurglutiu, “Structural Health Monitoring with Wafer Active Sensors”, Academic Press Inc, 2007.

**E Resources:**

https://archive.nptel.ac.in/courses/114/106/114106046/

| Program: | **B. Tech. (Mechanical)** | | | | | Semester: **VII** | |
|---|---|---|---|---|---|---|---|
| Course : **Project Management & Governance (Open Elective-V)** | | | | | | Code : **BME7605A** | |
| **Teaching Scheme** | | | | **Evaluation Scheme** | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **IE** | **MTE** | **ETE** | **Total** |
| 3 | - | - | 3 | 20 | 30 | 50 | 100 |

**Prior Knowledge of**

- Statistics

**is essential.**

**Course Objectives:**

After learning this course, the students will be able to:

7. Course is designed to introduce students to the principles and practices of project management as they relate to mechanical engineering projects.
8. Students will learn the skills and knowledge required to successfully plan, execute, and complete projects in the field of mechanical engineering.

**Course Outcomes:**

Students will be able to:

7. Understand the concept of project management
8. Apply the knowledge of project planning to develop project schedules and resources
9. Apply appropriate project management practices, tools, and methodologies.
10. Define, analyze, refine, and document project requirements, assumptions, and constraints
11. Analyze and refine project time and cost estimates to define project baseline, schedule and budget.
12. Understand how to manage project resources, budgets, and timelines.

**Detailed Syllabus**

| Unit | Description | Duration (Hrs) |
|---|---|---|
| 13. | **Introduction to Project Management**<br>Objectives of Project Management- Importance of Project Management- Types of Projects Project Management Life Cycle- Project Selection – Feasibility study: Types of feasibility Steps in feasibility study, Introduction to project management softwares. | **8** |
| 14. | **Project planning and Implementation**<br>Project Scope- Estimation of Project cost – Cost of Capital – Project Representation and Preliminary Manipulations - Basic Scheduling Concepts - Resource Levelling – Resource Allocation, case studies on PP&I, NPV, IRR, and ROI | **8** |
| 15. | **Project Monitoring and Control**<br>Setting a base line- Project management Information System – Indices to monitor progress. Importance of Contracts in projects- Teamwork in Project Management - Attributes of a good project team – Formation of effective teams – stages of team formation | **8** |
| 16. | **Project Risk Management**<br>Introduction to project risk management, Key risk management concepts and terminology, Importance of risk management in projects, Risk identification techniques, Qualitative risk assessment, Quantitative risk assessment, Risk response planning, Risk management strategies, Risk monitoring and control, case study on Risk management in engineering projects | **8** |

| | | |
|---|---|---|
| 17. | **Project Resource Management**<br>Introduction to project resource management, resource management concepts and terminology, identifying project resources, Resource allocation techniques, Resource optimization techniques, Resource leveling, Resource smoothing, Resource scheduling techniques, Project timeline management, Cost estimation techniques, Cost control and monitoring | **7** |
| 18. | **Project Communication**<br>Introduction to Project Communication, Key communication concepts and terminology, Importance of communication in projects, Developing communication plans, Communication channels and methods, Communication Strategies, Communication during project execution, Communication with Stakeholders, Crisis communication strategies | **6** |
| | **Total** | **45** |

**Text Books:**


4. Project Management, Harold Kerzner, Wiley Publishing, 2013, 11th Edition, ISBN 9781118022276


**Reference Books:**


3. Berkun, Scott (2005), The Art of Project Management, O'Reilly Media: Cambridge, MA.
4. Berkun, Scott (2008), Making Things Happen: Mastering Project Management, O'Reilly Media: Cambridge, MA.
5. Karen (2001), Getting Started in Project Management, Wiley: New York.

| Program: | **B. Tech. (Mechanical)** | | | Semester: **VII** | | | |
|---|---|---|---|---|---|---|---|
| Course : **Industrial Engineering (Open Elective -V)** | | | | Code : **BME7605B** | | | |
| **Teaching Scheme** | | | | **Evaluation Scheme** | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **IE** | **MTE** | **ETE** | **Total** |
| 3 | - | - | 3 | 20 | 30 | 50 | 100 |

**Prior Knowledge of**

- Basics of Engineering

**is essential.**

**Course Objectives:**

1. To make students aware of management, its principles, organizations and structure, and Types of production systems.
2. To make students aware of productivity, measures of productivity and its improvement techniques.
3. To make students aware of Human factors at the workplace and Human resource management.
4. To make students aware of financial management in an organization.

**Course Outcomes:**

The students will be able to:

1. Apply principles of management
2. Use various productivity measures and suggest suitable productivity improvement techniques.
3. Calculate economic order quantity and cost associated with inventory decisions.
4. Suggest a suitable plant location and layout.
5. Understand facets of Human resource management.
6. Calculate the break-even point and payback period.

**Detailed Syllabus**

| Unit | Description | Duration (Hrs) |
|---|---|---|
| 1. | **Introduction**<br>Management definition, importance, functions, Taylors scientific management theory, Principles of Management, Organization types and structures. | **7** |
| 2. | **Productivity**<br>Definition, measures and indexes, Productivity improvement techniques, Method Study and Work measurement | **7** |
| 3. | **Inventory**<br>Types of Inventory, Need, Cost associated with inventory, Economic order quantity, Models of Inventory Control, Selective control of Inventories | **7** |
| 4. | **Plant Location and Layout**<br>Plant Location: Need and factors influencing plant location,<br>Plant Layout: Objectives, principles, types of plant layouts, Introduction to Assembly Line Balancing and Layout parameters to evaluate.<br>Introduction to computer-aided ergonomic analysis of workstation. Assessment of postures and identification of risks to body regions. | **8** |
| 5. | **Human factors**<br>Human Error, Accidents, and Safety, Human relation in industry, Introduction to computer-aided ergonomic workstation analysis. Assessment of postures and identification of risks to body regions. Performance appraisal, Human Factors in Systems Design, Human resource management. | **8** |

| | | |
|---|---|---|
| 6. | **Costing**<br>Introduction to Marginal Costing: Elements of Cost, Break-Even Analysis.<br>Techniques for Evaluation of capital investments. The pay-back period for investments. | **8** |
| | **Total** | **45** |

**Text Books:**


1. M. Telsang, Industrial Engineering and Production Management, S. Chand Publication, 2018
2. O. P. Khanna, Industrial engineering and management, DhanpatRai publication, 2018
3. M Mahajan, Industrial Engineering and Production Management, DhanpatRai and Co., 2015


**Reference books:**


1. Introduction to Work Study by ILO, ISBN 978-81-204-1718-2, Oxford &IBHPublishing Company, New Delhi, Second Indian Adaptation, 2008.
2. H. B. Maynard, K Jell, Maynard_s Industrial Engineering Hand Book, McGraw Hill Education, 2001
3. R. Al-Aomar, A. Williams, O. M. Uigen _Process Simulation using WITNESS', Wiley, 2015
4. Brien Shakel, Applied Ergonomics, Hand Book, Butterworth Scientific, 1988
5. R. C. Bridger, Introduction to Human factor and Ergonomics, McGraw Hill, 2017
6. M. Sanders and E. McCormick, Human Factor Engineering and Design, McGraw Hill, 1992
7. K. Elbert and H. Kroemer, Ergonomics: How to Design for Ease and Efficiency, Prentice Hall, 2018

| Program: | **B. Tech. (Mechanical)** | | | | Semester: **VII** | | |
|---|---|---|---|---|---|---|---|
| Course : **Lean Six Sigma (Open Elective -VI)** | | | | | Code : **BME7606A** | | |
| **Teaching Scheme** | | | | **Evaluation Scheme** | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **IE** | **MTE** | **ETE** | **Total** |
| 3 | - | - | 3 | 20 | 30 | 50 | 100 |

**Prior Knowledge of**

- Statistics

**is essential.**

**Course Objectives:**

1. Students can apply strategic approaches to eliminate defects within the manufacturing processes.
2. Students will be able to apply the tools and techniques of Lean and six sigma to increase productivity.
3. Students will learn the DMAIC (Define, Measure, Analyze, Improve, Control) methodology, including hands-on exercises and case studies.

**Course Outcomes:**

After learning this course, the students will be able to:

1. Understand the principles and benefits of Lean Six Sigma.
2. Apply statistical tools for defining the quality attributes and measuring the performance of attributes.
3. Apply various tools to identify sources of variation affecting the quality of the process.
4. Apply advanced quantitative techniques to improve processes in manufacturing industries.
5. Understand the Six Sigma Implementation and Challenges in the manufacturing industry.
6. Apply continuous improvement methods to improve the efficiency and effectiveness of the process.

**Detailed Syllabus**

| Unit | Description | Duration (Hrs) |
|---|---|---|
| 1. | **Introduction to Lean and Six Sigma:** Introduction to Lean and quality, Cost of Quality (COQ), the background of quality improvement process, quality characteristics, Introduction to Six Sigma, Principles, and methodologies of lean and six sigma, history and evolution of lean and six sigma, roles and responsibilities of six sigma, benefits of using Six sigma in industries, Introduction to DMAIC approach. | **7** |
| 2. | **Tools used for defining and Measurement of Quality:** IPO diagram, Ishikawa diagram, SIPOC diagram, Flow diagram, CTQ tree, Project charter, Histograms, Run Chart, Scatter diagram, Cause and Effect diagram, Pareto chart, Control chart, Flow process chart, Process capability measurement. | **8** |
| 3. | **Tools used for Analysis, Improvement, and Control of quality:** Process mapping, Regression analysis, SWOT analysis, TRIZ, PESTLE, 5 why's, interrelationship diagram, overall equipment effectiveness, Affinity diagram, Normal group technique, SMED, 5S, mistake proofing, Value stream Mapping, forced field analysis, Gantt chart, Activity network diagram, Radar chart, PDCA cycle, Milestone tracker diagram, Earned value management. | **8** |
| 4. | **Advanced Quantitative Techniques for Six Sigma** Design for six sigma (DFSS), Failure mode effect analysis (FMEA), Change acceleration process (CAP), Risk priority number (RPN). | **8** |
| 5. | **Six Sigma Implementation and Challenges:** Lean andSix sigma Implementation cycle, Selection of tools and techniques, Six sigma for startups, Supplier Input Process Output Customer (SIPOC), Quality Function Deployment or House of Quality (QFD), customer quality index (CQI), | **8** |

| | | |
|---|---|---|
| 6. | **Continuous Improvement Methods:**<br>Introduction to continuous improvement methods, the approach of Poka-Yoke, Kanban, 5's, Lean manufacturing methods: 3M's, 4M's, Kaizen, 5's, case studies on continuous improvement methods. | **6** |
| | **Total** | **45** |

**Reference Books:**


1. Michael L.George, David Rownalds, Bill Kastle, What is Lean Six Sigma, McGraw – Hill 2003
2. Thomas Pyzdek, The Six Sigma Handbook, McGraw-Hill,2000
3. Fred Soleimannejed , Six Sigma, Basic Steps and Implementation, AuthorHouse, 2004
4. Forrest W. Breyfogle, III, James M. Cupello, Becki Meadows, Managing Six Sigma:A Practical Guide to Understanding, Assessing, and Implementing the Strategy That Yields Bottom-Line Success, John Wiley & Sons, 2000


**E-sources:**

1. https://www.sixsigmacouncil.org/six-sigma-training-material/
2. https://onlinecourses.nptel.ac.in/noc20_mg19/preview

| Program: | **B. Tech. (Mechanical)** | | | | | Semester: **VII** | |
|---|---|---|---|---|---|---|---|
| Course : **Professional Ethics (Open Elective -VI)** | | | | | | Code : **BME7606B** | |
| **Teaching Scheme** | | | | **Evaluation Scheme** | | | |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **IE** | **MTE** | **ETE** | **Total** |
| 3 | - | - | 3 | 20 | 30 | 50 | 100 |

**Prior Knowledge of**
None

**Course Objectives:**

1. To provide students with an understanding of the ethical issues and responsibilities involved in engineering.
2. To create awareness on ethical principles that govern the engineering profession, the potential consequences of unethical behavior, and strategies for making ethical decisions in complex engineering situations.

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

1. Understand the fundamental ethical principles that govern engineering
2. Recognize ethical dilemmas and learn to analyze them,
3. Develop critical thinking and decision-making skills for ethical engineering practices
4. Learn how to identify and address ethical issues in engineering research and development
5. Identify and analyse complex issues and problems in social impact and develop appropriate and well-justified solutions for the given context.
6. Develop an understanding of the social and global impacts of engineering decisions.

**Detailed Syllabus**

| Unit | Description | Duration (Hrs) |
|---|---|---|
| 1. | **Introduction to Engineering Ethics :** Overview of the importance of ethics in engineering, The role of engineers in society, Ethical principles and theories, Case Studies in Practical application of ethical principles and | **8** |
| 2. | **Ethical Decision Making :** Frameworks for ethical decision making, Analysis and discussion of case studies and group discussions/role plays on ethical dilemmas, Identifying stakeholders and ethical responsibilities. | **7** |
| 3. | **Professional Codes of Ethics :** Codes of ethics in engineering professions, Understanding the code of ethics and its application in practice, Comparison of different codes of ethics: Selection Criteria, Matrix for the best suited code. | **8** |
| 4. | **Engineering and Social Responsibility :** Social, cultural, and safety, health andenvironmental impacts of engineering, Ethical considerations in engineering design and implementation, Addressing issues of sustainability, circular economyand social justice in engineering. | **8** |
| 5. | **Engineering Research and Development :** Ethical considerations in research design, Intellectual property and ownership, Ethical issues in emerging technologies. | **7** |
| 6. | **Engineering and Globalization :** The global impact of engineering decisions, Ethical considerations in international engineering projects, Cultural differences and engineering ethics with due consideration to Diversity, Equity and Inclusion | **7** |

| | | |
|---|---|---|
| | **Total** | **45** |

**Text Books:**

1. Harris, C. E., Pritchard, M. S., &Rabins, M. J. (2019). Engineering ethics: Concepts and cases. 6th Edition, Cengage Learning, Inc..

**Reference Books:**

1. Mike W. Martin and Roland Schinzinger, (2019). Ethics in Engineering, 3rdEdition,Tata McGraw Hill, New Delhi,
2. Caroline Whitbeck, Ethics in Engineering practice and Research. (2011) 2nd Edition, Cambridge.

| Program: | B. Tech. (IT) | | | Semester: | VII/VIII | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Course: | Project Work | | | Code: | BIT7701/BIT8701 | | | | | |
| Teaching Scheme | | | | Evaluation Scheme | | | | | | |
| Lecture | Practical | Tutorial | Credit | CE | MTE | ETE | TW | OR | PR | Total |
| - | 28 | - | 14 | - | - | - | 200 | 150 | - | 350 |

**Course Objectives:**

1. To understand the Project Development Process.
2. To plan various activities of the project and channelize the project work.
3. To work in a team and demonstrate the knowledge, skills and attitudes as a professional engineer.
4. To apply Software Development Life Cycle meticulously.
5. To design and implement real life applications using available platforms.
6. To test the system rigorously before deployment.
7. To validate and evaluate the work undertaken.
8. To consolidate the work and prepare a report.

**Course Outcomes:**

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

1. Identify the realistic problem of societal, industry or research relevance.
2. Compare the literature to find the most appropriate and feasible solution for the selected problem statement.
3. Apply Software Development Life Cycle for the given software project.
4. Design and develop real life applications considering actual requirements.
5. Evaluate the model results and their interpretation
6. Evaluate Create a report and present the original results.

**Project Work:**

The intention of Project work is to conceive an idea and to implement it systematically by using knowledge derived during the course of education mainly to innovate or facilitate. A group of Under Graduate students of Final Year will undertake project work.

**Flexibility in Project Work:**

Students have given following flexibility to carry out their final year project work.

Scheme A: Students can complete the project work in seventh semester, for 14 credits. The evaluation scheme will be as follows.

| | PR | Credit | TW | OR | **Total** |
|---|---|---|---|---|---|
| Semester VII | 28 | 14 | 200 | 150 | **350** |

Scheme B: Students can complete the project work in eighth semester, for 14 credits. The evaluation scheme will be as follows.

| | PR | Credit | TW | OR | **Total** |
|---|---|---|---|---|---|
| Semester VIII | 28 | 14 | 200 | 150 | **350** |

Scheme C: Students can complete the project work in two semesters. Project work can be divided as 7 credits in each semester. The evaluation scheme will be as follows.

| | PR | Credit | TW | OR | **Total** |
|---|---|---|---|---|---|
| Semester VII | 14 | 7 | 100 | 50 | **150** |
| Semester VIII | 14 | 7 | 100 | 100 | **200** |
| | 28 | 14 | 200 | 150 | **350** |

**General Guidelines for Project Work:**

1. Project is one of the significant contributory teamwork that has to be completed for the required number of credits.
2. **Project teams:**Three to four students can form a team within the same or different discipline and their area of interest is to be registered with the project Coordinator.
3. Same project scheme should be followed by all team members
4. **Types of projects**:
   Projects can be carried out inside or outside the institute/Sponsored project, in any relevant industry/organization or research institution/organization with the prior permission of the department.
   Category of the project can be as follows:
   - Domain Specific
   - Interdisciplinary
   - Art and Indian Knowledge System
5. Selection of Project: It is necessary to explore the domain of interest / research/ thrust area/ societal needs to finalize the problem statement.
6. Guide Allotment:
   a. Considering registered team's area of interest/domain and expertise of guide, the Project coordinator in consultation with a panel of experts allots Project guides.
   b. Guide should be allotted from the same program.
   c. In case of interdisciplinary project, along with the guide from same program, one more guide will be allotted from the another program.
   d. In case of a sponsored project (with a reputed industry or any research organization) the external guide should be from the sponsored company/Industry along with the internal guide from the program.
7. Teams in consultation with guide will prepare project Synopsis.
8. Project Review:
   a. The Project coordinator with the Head of the department shall constitute a review committee for project groups.
   b. A review committee will approve the project problem statement and synopsis. Discussion / presentation may be arranged covering topics listed in the synopsis.
   c. The Project Review committee will evaluate the timely progress of the projects.
   d. Project team is expected to appear fortworeviewsper semester.
9. Project Report:

a. Project Report should be prepared using Word/Latex as per the template provided by the department.
b. Project reports shall be submitted in softcopy and hardcopy form.
c. In case of a sponsored project, students must submit a Completion certificate with signature of an external guide from the sponsored company.
d. In case of an Interdisciplinary project, students must submit a Completion certificate with the signature of Guide from other department.

11. GitHub repository should be maintained for the project.
12. **Expected Project Deliverables/Outcomes:**
    a. As a project work outcome each group should complete the following activities.
        - Paper publication in quality journal/conference (Like SCOPUS/ WOS/SCIE)
        - IPR (Patent / Copyright)
        - Participation at state/national/international contests
    b. Software Setup/Product
    c. Black Book and Project Diary
    d. All relevant documents

**Project activity calendar (Scheme A and Scheme B)**

| Sr. No. | Project Activity | Timeline |
|---|---|---|
| 1 | Review 1:Project topic, Motivation, Objectives, Requirement Analysis, Detail Literature Review and Project Design. Demonstration of Developed algorithms, Implementation of modules (50%) | Sixth week of semester |
| 2 | Review 2: Demonstration of complete project (100%) with testing and validation. | Eleventh week of the semester |
| 5 | Submission of **Project Report** and all related **documents** (research paper documents, Completion certificate in case of sponsored project, plagiarism report, Project related competitions proofs etc.) | Fourteenth Week of Semester |

**Project activity calendar (Scheme C)**

| Sr. No. | Project Activity | Time Line |
|---|---|---|
| 1 | Review 1: Project topic, Motivation, Objectives, Requirement Analysis, Detail Literature Review | Sixth week of semester VII |
| 2 | Review 2: Project Design. Demonstration of Developed algorithms, Implementation of modules (50%) | Eleventh week of the semester VII |
| 3 | Review 3:Demonstration of complete project (100%) | Sixth week of semester VIII |
| 4 | Review 4: Testing, Validation and summarization of final results. | Eleventh week of the semester VIII |
| 5 | Submission of Project Report and all related documents | Fourteenth Week of Semester VIII |

**End Term Assessment Sheet (Scheme A and Scheme B)**

| Sr. No. | Performance Indicators (PI)- TW | Maximum Marks |
|---|---|---|
| 1 | Novelty, Innovation and Relevance of the topic | 20 |
| 2 | Literature Survey | 20 |
| 3 | Project planning | 10 |
| 4 | Requirement Analysis, Modeling and Designing | 40 |
| 5 | Implementation | 20 |
| 6 | Testing | 10 |
| 7 | Team work | 10 |
| 8 | Demonstration and Presentation | 20 |
| 9 | Documents and Reports | 30 |
| 10 | Paper publication, IPR, Participation in competitions | 20 |
| | **Total** | **200** |

**Oral Exam Assessment Sheet (Scheme A and Scheme B)**

| Sr. No. | Performance Indicators (PI) - OR | Maximum Marks |
|---|---|---|
| 1 | Modelling and Design | 20 |
| 2 | Implementation | 20 |
| 3 | Testing and Validation | 10 |
| 4 | Team work /Understanding/ individual Contribution in the Project | 20 |
| 5 | Demonstration, Comparison with existing and Presentation | 30 |
| 6 | Documents and Reports | 30 |
| 7 | Question and Answer | 20 |
| | **Total** | **150** |

**End Term Assessment Sheet (Scheme C) : Semester VII**

| Sr. No. | Performance Indicators (PI)- Semester VII | Maximum Marks |
|---|---|---|
| 1 | Novelty, Innovation and Relevance of the topic | 20 |
| 2 | Literature Survey | 20 |

| | | |
|---|---|---|
| 3 | Project planning | 10 |
| 4 | Requirement Analysis, Modeling and Designing | 40 |
| 5 | Implementation (50%) | 10 |
| | **Total** | **100** |

**Oral Exam Assessment Sheet (Scheme C): Semester VII**

| Sr. No. | Performance Indicators (PI) - OR | Maximum Marks |
|---|---|---|
| 1 | Modeling and Design | 10 |
| 2 | Implementation | 10 |
| 3 | Testing and Validation | 05 |
| 4 | Team work /Understanding/ individual Contribution in the Project | 05 |
| 5 | Demonstration, Comparison with existing and Presentation | 10 |
| 7 | Question and Answer | 10 |
| | **Total** | **50** |

**End Term Assessment Sheet (Scheme C) : Semester VIII**

| Sr. No. | Performance Indicators (PI)- Semester VII | Maximum Mars |
|---|---|---|
| 1 | Implementation (100%0 | 10 |
| 2 | Testing | 10 |
| 3 | Team work | 10 |
| 4 | Demonstration and Presentation | 20 |
| 5 | Documents and Reports | 30 |
| 6 | Paper publication, IPR, Participation in competitions | 20 |
| | **Total** | **100** |

**Oral Exam Assessment Sheet (Scheme C) Semesters VIII**

| Sr. No. | Performance Indicators (PI) - OR | Maximum Marks |
|---|---|---|
| 1 | Modelling and Design | 10 |
| 2 | Implementation | 10 |
| 3 | Testing and Validation | 10 |
| 4 | Team work /Understanding/ individual Contribution in the Project | 10 |
| 5 | Demonstration, Comparison with existing and Presentation | 20 |

| | | |
|---|---|---|
| 6 | Documents and Reports | 20 |
| 7 | Question and Answer | 20 |
| | **Total** | **100** |

*Rubrics: Art and Indian Knowledge System : *Will be based on the activity conducted.

| Program: | **B. Tech. I.T.** | | | Semester: **VII** |
|---|---|---|---|---|
| Course : **Massive Open Online Course (MOOC)** | | | | Code : **BIT7602** |
| **Teaching Scheme** | | | | **Evaluation Scheme** |
| **Lecture** | **Practical** | **Tutorial** | **Credit** | **Total** |
| - | - | - | 3 | 100 |

**Course Objectives:**

1. To provide diversified knowledge and skills in a single platform
2. To provide opportunity to students to explore new areas of interest
3. To foster student engagement in self learning

**Course Outcomes:**

After learning the course, the students will be able to:

1. To design solutions to the real life problems.
2. To develop the projects in technical domain.
3. To analyze the new state- of- art for life-long learning.

**Guidelines for Students:**

Individual student can register for MOOC course of their interest in VII Semester as an option to Open Elective V Course offered by institute.

**A) Selection of Course:**

- Students can select any MOOC Course from Online Certification provider with guidance from MOOC Mentor (Project guide).
- The selected course should not be from courses offered in the program curriculum earlier.
- The selected MOOC course should be approved by Department.
- Certification and Grade report is mandatory for the course to be selected.

**B) Duration of Course:** A selected course should be of Minimum 12 Weeks.

**C) Assessment of Course :**

- At the end of Course submission the MOOCs report of 10-15 Pages in hardcopy is mandatory along with certificate of completion.
- Assessment will be done **t**hrough Certification exam report**.**
- Assessment will be done by MOOC Mentor.

**Evaluation Guidelines and Rubrics:**

MOOC Mentor will observe the progress of the student.

- Student will be evaluated progressively for total 100 Marks. (i.e. 70 Marks Progressive and 30 Marks Completion of Certificate)
- The 70 marks will be based on-
  - Timely Submission Assignments (50)
  - Scores of Assignments (10)
  - Presentation of the topic Selected (10).
- The 30 marks will be based on Certification Completion

# Vision and Mission of Department

**VISION**

To develop Information Technology professionals through Quality Education with dedicated faculty.

**MISSION**

Foster the development of Information Technology professionals with focus on Excellent Academics, Research Aptitude, Overall Personality Development and Social Awareness.