

**NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR**  
**(An Autonomous Institute)**



**Affiliated to**

**DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, UTTAR PRADESH LUCKNOW**



**Evaluation Scheme & Syllabus**

**For**

**Master of Integrated Technology  
Computer Science and Engineering**

**Fifth Year**

**(Effective from the Session: 2026-27)**

**NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR**  
(AN AUTONOMOUS INSTITUTE)

**M.Tech Int. (Computer Science & Engineering)**

**Evaluation Scheme**  
**SEMESTER- IX**

| Sl. No. | Subject Codes | Subject                                                    | Types of Subjects | Periods  |          |           | Evaluation Schemes |           |            |            | End Semester |            | Total      | Credit    |
|---------|---------------|------------------------------------------------------------|-------------------|----------|----------|-----------|--------------------|-----------|------------|------------|--------------|------------|------------|-----------|
|         |               |                                                            |                   | L        | T        | P         | CT                 | TA        | TOTAL      | PS         | TE           | PE         |            |           |
| 1       | AMCSE0901     | Software Project Management                                | Mandatory         | 3        | 0        | 0         | 30                 | 20        | 50         |            | 100          |            | 150        | 3         |
| 2       |               | Open Elective -IV                                          | Open Elective     | 2        | 0        | 0         | 30                 | 20        | 50         |            | 50           |            | 100        | 2         |
| 3       | AMCSE0959     | Dissertation-I                                             | Mandatory         | 0        | 0        | 18        |                    |           |            | 100        |              | 300        | 400        | 9         |
| 4       |               | *Massive Open Online Courses<br>(For B.Tech. Hons. Degree) | *MOOCs            |          |          |           |                    |           |            |            |              |            |            |           |
|         |               | <b>TOTAL</b>                                               |                   | <b>5</b> | <b>0</b> | <b>18</b> | <b>60</b>          | <b>40</b> | <b>100</b> | <b>100</b> | <b>150</b>   | <b>300</b> | <b>650</b> | <b>14</b> |

**\* List of MOOCs Based Recommended Courses for Fifth year (Semester-IX) M. Tech Int. Students**

| Sr. No. | Subject Code | Course Name                                 | University / Industry Partner Name     | No of Hours | Credits |
|---------|--------------|---------------------------------------------|----------------------------------------|-------------|---------|
| 1       | AMC0325      | Kanban In Practice                          | Infosys Wingspan (Infosys Springboard) | 24h         | 1.5     |
| 2       | AMC0354      | The Art of Exploring and Analyzing the Data | NASSCOM                                | 30h         | 2       |

## List of Open Elective IV

| Sr. No. | Subject Code | Name of Open Elective Subjects | Subject offered to Program | Types of Subjects | Semester |
|---------|--------------|--------------------------------|----------------------------|-------------------|----------|
| 1       | AOE0961      | Total Quality Management       | M. Tech Int                | Open Elective     | 9        |
| 2       | AOE0966      | Sustainable Technologies       | M. Tech Int                | Open Elective     | 9        |
| 3       | AOE0970      | Finance for Engineers          | M. Tech Int                | Open Elective     | 9        |

### Abbreviation Used:

L: Lecture, T: Tutorial, P: Practical, CT: Class Test, TA: Teacher Assessment, PS: Practical Sessional, TE: Theory End Semester Exam., PE: Practical End Semester Exam, CE: Core Elective, OE: Open Elective, DE: Departmental Elective, CA: Compulsory Audit, MOOCs: Massive Open Online Courses.

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(AN AUTONOMOUS INSTITUTE)

**M.Tech Int. (Computer Science & Engineering)**

**Evaluation Scheme**

**SEMESTER- X**

| Sr. No. | Subject Codes | Subject                                                    | Types of Subjects | Periods  |          |           | Evaluation Schemes |    |       |            | End Semester |            | Total      | Credit    |
|---------|---------------|------------------------------------------------------------|-------------------|----------|----------|-----------|--------------------|----|-------|------------|--------------|------------|------------|-----------|
|         |               |                                                            |                   | L        | T        | P         | CT                 | TA | Total | PS         | TE           | PE         |            |           |
| 1       | AMICSE01059   | Dissertation-II                                            | Mandatory         | 0        | 0        | 36        |                    |    |       | 200        |              | 400        | 600        | 18        |
| 2       |               | *Massive Open Online Courses<br>(For B.Tech. Hons. Degree) | *MOOCs            |          |          |           |                    |    |       |            |              |            |            |           |
|         |               | <b>TOTAL</b>                                               |                   | <b>0</b> | <b>0</b> | <b>36</b> |                    |    |       | <b>200</b> |              | <b>400</b> | <b>600</b> | <b>18</b> |

**\* List of MOOCs Based Recommended Courses for Fifth year (Semester-X) M. Tech Int. Students**

| Sr. No. | Subject Code | Course Name                       | University / Industry Partner Name | No of Hours | Credits |
|---------|--------------|-----------------------------------|------------------------------------|-------------|---------|
| 1       | AMC0355      | Salesforce Administrator Explorer | NASSCOM                            | 38h 25m     | 3       |
| 2       | AMC0356      | Acquiring Data                    | NASSCOM                            | 10h         | 0.5     |

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A student will be eligible to get Under Graduate degree with Honours only, if he/she completes the additional MOOCs courses such as Coursera certifications, or any other online courses recommended by the Institute (Equivalent to 20 credits). During Complete B.Tech. Program Guidelines for credit calculations are as follows.

1. For 6 to 12 Hours =0.5 Credit
2. For 13 to 18 =1 Credit
3. For 19 to 24 =1.5 Credit
4. For 25 to 30 =2 Credit
5. For 31 to 35 =2.5 Credit
6. For 36 to 41 =3 Credit
7. For 42 to 47 =3.5 Credit
8. For 48 and above =4 Credit

For registration to MOOCs Courses, the students shall follow Coursera registration details as per the assigned login and password by the Institute these courses may be cleared during the B. Tech degree program (as per the list provided). After successful completion of these MOOCs courses, the students shall provide their successful completion status/certificates to the Controller of Examination (COE) of the Institute through their coordinators/Mentors only.

The students shall be awarded Honours Degree as per following criterion.

- i. If he / she secures 7.50 as above CGPA.
- ii. Passed each subject of that degree program in the single attempt without any grace.
- iii. Successful completion of MOOCs based 20 credits

|                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                         |     |     |     |     |     |                                                            |     |     |      |      |      |                              |          |      |   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----|-----|-----|-----|-----|------------------------------------------------------------|-----|-----|------|------|------|------------------------------|----------|------|---|
| Course Code: AMCSE0901                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                         |     |     |     |     |     | Course Name: Software Project Management                   |     |     |      |      |      | L                            | T        | P    | C |
| Course Offered in: M.Tech Int. (CSE)                                                                                                                                                                                                                                                                                                                                                                          |                                                                                         |     |     |     |     |     |                                                            |     |     |      |      |      | 3                            | 0        | 0    | 3 |
| Prerequisite: Basic knowledge of Software Engineering, Software Development Life Cycle (SDLC), software development projects and programming fundamentals is desirable.                                                                                                                                                                                                                                       |                                                                                         |     |     |     |     |     |                                                            |     |     |      |      |      |                              |          |      |   |
| Course Objectives:                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                         |     |     |     |     |     |                                                            |     |     |      |      |      |                              |          |      |   |
| This course provides an in-depth understanding of the principles, practices, and techniques involved in managing software development projects. Students will learn how to plan, organize, and control software projects, including topics such as project initiation, scope management, scheduling, resource allocation, risk management, and quality assurance.                                             |                                                                                         |     |     |     |     |     |                                                            |     |     |      |      |      |                              |          |      |   |
| Course Outcome: After completion of the course, the student will be able to                                                                                                                                                                                                                                                                                                                                   |                                                                                         |     |     |     |     |     |                                                            |     |     |      |      |      | Bloom's Knowledge Level (KL) |          |      |   |
| CO1                                                                                                                                                                                                                                                                                                                                                                                                           | Understand the key concepts and principles of software project management.              |     |     |     |     |     |                                                            |     |     |      |      |      | K2                           |          |      |   |
| CO2                                                                                                                                                                                                                                                                                                                                                                                                           | Apply project management frameworks and methodologies to software development projects. |     |     |     |     |     |                                                            |     |     |      |      |      | K3                           |          |      |   |
| CO3                                                                                                                                                                                                                                                                                                                                                                                                           | Analyze & identify the important risks facing in a new project.                         |     |     |     |     |     |                                                            |     |     |      |      |      | K4                           |          |      |   |
| CO4                                                                                                                                                                                                                                                                                                                                                                                                           | Apply project management tools and techniques.                                          |     |     |     |     |     |                                                            |     |     |      |      |      | K3                           |          |      |   |
| CO5                                                                                                                                                                                                                                                                                                                                                                                                           | Apply project management tools and techniques.                                          |     |     |     |     |     |                                                            |     |     |      |      |      | K3                           |          |      |   |
| CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)                                                                                                                                                                                                                                                                                                                                                              |                                                                                         |     |     |     |     |     |                                                            |     |     |      |      |      |                              |          |      |   |
| CO-PO Mapping                                                                                                                                                                                                                                                                                                                                                                                                 | PO1                                                                                     | PO2 | PO3 | PO4 | PO5 | PO6 | PO7                                                        | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1                         | PSO2     | PSO3 |   |
| CO1                                                                                                                                                                                                                                                                                                                                                                                                           | 2                                                                                       | 1   | 1   | –   | 1   | –   | –                                                          | –   | –   | 1    | 2    | 1    | 1                            | –        | 1    |   |
| CO2                                                                                                                                                                                                                                                                                                                                                                                                           | 2                                                                                       | 2   | 2   | 1   | 2   | –   | –                                                          | 1   | 1   | 2    | 3    | 2    | 2                            | –        | 2    |   |
| CO3                                                                                                                                                                                                                                                                                                                                                                                                           | 1                                                                                       | 3   | 2   | 3   | 1   | 1   | –                                                          | 1   | 1   | 2    | 2    | 2    | 2                            | –        | 1    |   |
| CO4                                                                                                                                                                                                                                                                                                                                                                                                           | 2                                                                                       | 2   | 2   | 1   | 3   | –   | –                                                          | 1   | 1   | 2    | 3    | 2    | 2                            | –        | 2    |   |
| CO5                                                                                                                                                                                                                                                                                                                                                                                                           | 2                                                                                       | 2   | 3   | 2   | 3   | –   | –                                                          | 1   | 2   | 3    | 3    | 3    | 2                            | –        | 2    |   |
| Course Contents / Syllabus                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                         |     |     |     |     |     |                                                            |     |     |      |      |      |                              |          |      |   |
| Unit 1                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                         |     |     |     |     |     | Introduction                                               |     |     |      |      |      | 8 hours                      |          |      |   |
| Overview of software project management, Project life cycle models, Introduction to project management software tools, Identifying project stakeholders and gathering requirements, Defining project scope and objectives, Role and responsibilities of a software project manager                                                                                                                            |                                                                                         |     |     |     |     |     |                                                            |     |     |      |      |      |                              |          |      |   |
| Unit 2                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                         |     |     |     |     |     | Project Planning & Resource Management                     |     |     |      |      |      | 8 hours                      |          |      |   |
| Work breakdown structure (WBS) and task estimation techniques, Developing a project schedule using Gantt charts or project management software, Introduction to resource management, Resource identification and allocation strategies, Managing dependencies and constraints                                                                                                                                 |                                                                                         |     |     |     |     |     |                                                            |     |     |      |      |      |                              |          |      |   |
| Unit 3                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                         |     |     |     |     |     | Project Risk Management                                    |     |     |      |      |      | 8 hours                      |          |      |   |
| Introduction to Project Risk Management, Identifying and assessing project risks, Risk Handling and Control,Types of Risk, Risk Conditions and Decision-Making Content, Developing risk mitigation strategies, The Concept of Risk Management, Risk, Contracts and Procurement                                                                                                                                |                                                                                         |     |     |     |     |     |                                                            |     |     |      |      |      |                              |          |      |   |
| Unit 4                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                         |     |     |     |     |     | Project Management Organizational Structures and Standards |     |     |      |      |      | 8 hours                      |          |      |   |
| The Concept of the Organizational Breakdown Structure, Organizational Theory and Structures, Examples of Organizational Structures, Project Management Standards, The Concept of Project Time Planning and Control ,Resource Scheduling & Project Replanning, Trade-off Analysis, Probability Analysis, Budgeting and control,Introduction to Agile Project Management Scrum Management, Six Sigma Principles |                                                                                         |     |     |     |     |     |                                                            |     |     |      |      |      |                              |          |      |   |
| Unit 5                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                         |     |     |     |     |     | Software Quality & Case Study                              |     |     |      |      |      | 8 hours                      |          |      |   |
| Project Termination, The place of software quality in project planning, The importance of software quality, Defining software quality ISO 9126, Practical software quality measures, Case Studies                                                                                                                                                                                                             |                                                                                         |     |     |     |     |     |                                                            |     |     |      |      |      |                              |          |      |   |
| Total Lecture Hours                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                         |     |     |     |     |     |                                                            |     |     |      |      |      |                              | 40 hours |      |   |

| Textbook:                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                    |                                  |
|------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
|                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                    | Author                           |
| 1.                                                                                                                                 | Research Methodology Methods and Techniques”, New Age International publishers,5th Edition, 2023.                                                                                                                                                                                                                                                                                                                  | C. R. Kothari, Gaurav Garg       |
| 2.                                                                                                                                 | Research Methodology: A Step-by-Step Guide for Beginners, SAGE Publication, 4th Edition, 2023.                                                                                                                                                                                                                                                                                                                     | Ranjit Kumar                     |
| 3.                                                                                                                                 | Research Methodology, Vikas Publication,2 <sup>nd</sup> Edition,2018.                                                                                                                                                                                                                                                                                                                                              | Deepak Chawla, Neena Sondhi      |
| Reference Books:                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                    |                                  |
|                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                    | Author                           |
| 1.                                                                                                                                 | Business Research Methods, TMGH, 12th edition, 2018                                                                                                                                                                                                                                                                                                                                                                | Donald Cooper & Pamela Schindler |
| 2.                                                                                                                                 | Research design: Qualitative, quantitative, and mixed methods approach sage publications,5 <sup>th</sup> Edition, 2018                                                                                                                                                                                                                                                                                             | Creswell, John W                 |
| Self-Study Content Links:                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                    | Duration (in Hrs)                |
| MOOCs                                                                                                                              | <a href="https://nptel.ac.in/courses/106105218">https://nptel.ac.in/courses/106105218</a><br><a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0135015614502092808194/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0135015614502092808194/overview</a>                                                                                                           | 20 hrs<br>1 hr                   |
| Video Lectures                                                                                                                     | <a href="https://www.youtube.com/watch?v=vmSLu_Onai0&amp;list=PLhPUku4sdS3mF374Z0fdKzYD4oWOviQ_t">https://www.youtube.com/watch?v=vmSLu_Onai0&amp;list=PLhPUku4sdS3mF374Z0fdKzYD4oWOviQ_t</a><br><a href="https://www.youtube.com/watch?v=6iS1QV39y4Y&amp;list=PLFge8Doy5d0gfioBgDRhFFezL4YixlEVd">https://www.youtube.com/watch?v=6iS1QV39y4Y&amp;list=PLFge8Doy5d0gfioBgDRhFFezL4YixlEVd</a>                     | 2 hrs<br>2 hrs                   |
| Web References                                                                                                                     | <a href="https://mrcet.com/downloads/digital_notes/CSE/IV%20Year/SOFTWARE%20PROJECT%20MANAGEMENT.pdf">https://mrcet.com/downloads/digital_notes/CSE/IV%20Year/SOFTWARE%20PROJECT%20MANAGEMENT.pdf</a><br><a href="https://ebooks.lpude.in/management/mba/term_4/DCAP304_DCAP515_SOFTWARE_PROJECT_MANAGEMENT.pdf">https://ebooks.lpude.in/management/mba/term_4/DCAP304_DCAP515_SOFTWARE_PROJECT_MANAGEMENT.pdf</a> | 5 Hrs                            |
| Note: Self-study material may include assignments, seminars, micro projects, industrial visits, any other student activities, etc. |                                                                                                                                                                                                                                                                                                                                                                                                                    |                                  |

| M. Tech Int. (CSE) FIFTH YEAR                                                                                                                                                                                                                                                                                                                                                           |                                                                                    |                                             |  |                    |   |                 |         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|---------------------------------------------|--|--------------------|---|-----------------|---------|
| Course Code                                                                                                                                                                                                                                                                                                                                                                             |                                                                                    | AOE0961                                     |  | L                  | T | P               | Credit  |
| Course Title                                                                                                                                                                                                                                                                                                                                                                            |                                                                                    | Total Quality Management                    |  | 3                  | 0 | 0               | 3       |
| Course Objective: The objective of this course is to:                                                                                                                                                                                                                                                                                                                                   |                                                                                    |                                             |  | Duration: 40 Hours |   |                 |         |
| 1                                                                                                                                                                                                                                                                                                                                                                                       | Get familiarized with the basic concept and framework of Total Quality management. |                                             |  |                    |   |                 |         |
| 2                                                                                                                                                                                                                                                                                                                                                                                       | Understand the Implication of Quality on Business.                                 |                                             |  |                    |   |                 |         |
| 3                                                                                                                                                                                                                                                                                                                                                                                       | Understand the tools and techniques used in TQM.                                   |                                             |  |                    |   |                 |         |
| 4                                                                                                                                                                                                                                                                                                                                                                                       | Outline the evolution of the TQM philosophy.                                       |                                             |  |                    |   |                 |         |
| 5                                                                                                                                                                                                                                                                                                                                                                                       | Understand the Continuous Process Improvement in TQM.                              |                                             |  |                    |   |                 |         |
| Pre-requisites: NIL                                                                                                                                                                                                                                                                                                                                                                     |                                                                                    |                                             |  |                    |   |                 |         |
| Course Contents / Syllabus                                                                                                                                                                                                                                                                                                                                                              |                                                                                    |                                             |  |                    |   |                 |         |
| UNIT-I                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                    | Introduction to Quality Management          |  |                    |   |                 | 8 Hours |
| Introduction – Need for quality –Definitions of quality — Basic concepts of TQM – TQM Framework –Barriers to TQM – Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention.                                                                                                                                                               |                                                                                    |                                             |  |                    |   |                 |         |
| UNIT-II                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                    | TQM Thinkers and Thoughts                   |  |                    |   |                 | 8 Hours |
| Quality Councils – Employee involvement –Team and Teamwork- Recognition and Reward- PDCA cycle, 5S- Kaizen- TQM Gurus                                                                                                                                                                                                                                                                   |                                                                                    |                                             |  |                    |   |                 |         |
| UNIT-III                                                                                                                                                                                                                                                                                                                                                                                |                                                                                    | Tools and Techniques for Quality Management |  |                    |   |                 | 8 Hours |
| The seven traditional tools of quality – New management tools – Six sigma: Concepts, Methodology, DMAIC, applications to manufacturing, service sector including IT –Bench marking process                                                                                                                                                                                              |                                                                                    |                                             |  |                    |   |                 |         |
| UNIT-IV                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                    | Statistical process and Quality control     |  |                    |   |                 | 8 Hours |
| Introduction to Statistical process control -Quality function deployment (QFD) – Taguchi quality loss function – Total Productive Maintenance (TPM)                                                                                                                                                                                                                                     |                                                                                    |                                             |  |                    |   |                 |         |
| UNIT-V                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                    | Quality Systems and Certification           |  |                    |   |                 | 8 Hours |
| Quality Systems- ISO 9000, ISO 9000:2000, ISO 14000, other quality systems. Quality Auditing                                                                                                                                                                                                                                                                                            |                                                                                    |                                             |  |                    |   |                 |         |
| Course outcome: At the end of course, the student will be able to:                                                                                                                                                                                                                                                                                                                      |                                                                                    |                                             |  |                    |   |                 |         |
| CO 1                                                                                                                                                                                                                                                                                                                                                                                    | Understand the concepts of Quality, TQM, and benefits of TQM.                      |                                             |  |                    |   | Understand (K2) |         |
| CO 2                                                                                                                                                                                                                                                                                                                                                                                    | Understand the thoughts of various gurus of quality management.                    |                                             |  |                    |   | Understand (K2) |         |
| CO 3                                                                                                                                                                                                                                                                                                                                                                                    | Understand the tools and techniques utilized for Quality improvement               |                                             |  |                    |   | Understand (K2) |         |
| CO 4                                                                                                                                                                                                                                                                                                                                                                                    | Apply quality control concepts to solve industrial problems.                       |                                             |  |                    |   | Apply (K3)      |         |
| CO 5                                                                                                                                                                                                                                                                                                                                                                                    | Understand various Quality Systems and Auditing on implementation of TQM           |                                             |  |                    |   | Understand (K2) |         |
| Text books                                                                                                                                                                                                                                                                                                                                                                              |                                                                                    |                                             |  |                    |   |                 |         |
| 1. Besterfield, D.H., Besterfield, C., Besterfield, G.H., Besterfield, M., Hemant, U. and Rashmi, U., Total QualityManagement, ed.v, 2018, Pearson.<br>2. James R. Evans and William M. Lindsay, “The Management and Control of Quality”, 8th Edition, South-Western (Thomson Learning), 2011                                                                                           |                                                                                    |                                             |  |                    |   |                 |         |
| Reference Books                                                                                                                                                                                                                                                                                                                                                                         |                                                                                    |                                             |  |                    |   |                 |         |
| 1. Evans J. R, and Lidsay W. M. – ‘The Management and Control of Quality’ – Southwestern (Thomson Learning) – 2002<br>2. Feigenbaum A. V. – ‘Total Quality Management – Vol I &II ’ – McGraw Hill ,1991<br>3. Ramasamy, S., Total Quality Management, , McGraw Hill Education,2017<br>4. Suganthi.L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd.,2006. |                                                                                    |                                             |  |                    |   |                 |         |



**M. Tech Int. (CSE) FIFTH YEAR**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                         |   |   |   |         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|---|---|---|---------|
| Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | AOE0966                                 | L | T | P | Credit  |
| Course Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Sustainable Technologies                | 3 | 0 | 0 | 3       |
| <b>Course objective:</b><br><br>This course explores the main principles that guide modern science and technology towards sustainable solutions. It covers topics as resource management technologies, waste and wastewater treatment renewable energy technologies, high performance buildings and transportation systems, application of informatics and feedback to sustainable systems, and more the real-life examples and taps into current practices of technology analysis. |                                         |   |   |   |         |
| <b>Pre-requisites:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                         |   |   |   |         |
| <b>Course Contents / Syllabus</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                         |   |   |   |         |
| UNIT-I                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Basics of sustainability                |   |   |   | 8 hours |
| Principle of sustainable systems; sustainability definitions, growth and no growth dilemma, principles of sustainable design, principle of sustainable engineering, fundamental of system analysis, growth decay and tipping points.<br><br>Technology developments and lifecycle assessments; Technology as a part of anthropogenic environment. Technology readiness levels (TRL), Emerging, converging, disruptive technologies, Life Cycle Assessment                           |                                         |   |   |   |         |
| UNIT-II                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Metrics for Technology Evaluation       |   |   |   | 8 hours |
| Metrics for Technology Evaluation; Purpose of metrics and how they are selected ,Environmental Metrics, Economic Metrics , Social Metrics, Sustainability Index, Metric Balance, Green Chemistry; Principles of Green Chemistry, Mitigating Environmental Risk, Frameworks for, assessment of alternatives, Case of Garment Cleaning Solvents, Green chemistry examples, Multifunctional Materials and Their Impact on Sustainability                                               |                                         |   |   |   |         |
| UNIT-III                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Waste management purpose and strategies |   |   |   | 8 hours |
| Waste management purpose and strategies, recycling: open-loop versus closed-loop thinking, Recycling efficiency, Management of food waste and composting technologies, E-waste stream management, Solar PV Recycling, Reuse and redistribution programs, Circular Economy                                                                                                                                                                                                           |                                         |   |   |   |         |
| UNIT-IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Applied Renewable Energy Technologies   |   |   |   | 8 hours |
| Renewable Energy Basics, Building Integrated Solar Energy Technologies, Solar Thermal Electric Power Generation, Utility Scale Geothermal Energy Systems, Wind Energy Applications and Technologies, Bio-mass Fuelled Combined Heat and Power Systems, Environmental Impact of Renewable Energy.                                                                                                                                                                                    |                                         |   |   |   |         |

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| <b>UNIT-V</b>                                                                                                                                                                                                                                                                                                                  | <b>Base Load Energy Sustainability</b>                                                                                                                                                        | <b>8 hours</b> |
| Base Load Energy Sustainability, Smart Grid and Demand Response Technologies, Examples of Demand Response Innovations, Can Renewables Meet Global Energy Demand?<br>Sustainable Transportation Technologies; Alternative Fuel Vehicle Technologies Zero Emission Vehicles, Sustainable Community and Mass Transit Technologies |                                                                                                                                                                                               |                |
| <b>Course outcome: After completion of course students will be able to</b>                                                                                                                                                                                                                                                     |                                                                                                                                                                                               |                |
| CO 1                                                                                                                                                                                                                                                                                                                           | Understand the principles of sustainable systems and demonstrate how the economic and technical performance of sustainable technologies can be measured and compared.                         | K <sub>2</sub> |
| CO 2                                                                                                                                                                                                                                                                                                                           | Identify the technical and economic obstacles to the widespread use of sustainable technologies.                                                                                              | K <sub>3</sub> |
| CO 3                                                                                                                                                                                                                                                                                                                           | Assess sustainable technologies to show the greatest long-term promise in terms of social, environmental, and economic metrics.                                                               | K <sub>3</sub> |
| CO 4                                                                                                                                                                                                                                                                                                                           | Identify types of sustainable energy technologies that are closest to commercialization.                                                                                                      | K <sub>2</sub> |
|                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                               |                |
| <b>Text books :</b>                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                               |                |
| 1. Sustainable Technologies for the Building Construction Industry" by Alevtina Smirnova<br>2. Sustainable Technologies: Environmental Issues and Solutions" by T. A. Kuder and B. C. Pijanowski<br>3. Industrial Ecology and Sustainable Engineering" by T. E. Graedel and B. R. Allenby                                      |                                                                                                                                                                                               |                |
| <b>Reference Books:</b>                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                               |                |
| 1. Sustainable Technology Development by Paul Weaver , Leo Jansen , Geert van Grootveld , Egbert van Spiegel , Philip Vergragt Routledge; 1st edition.<br>2. Sustainable Energy Technologies by Eduardo Rincon Mejia, Alejandro de las Heras, CRC press                                                                        |                                                                                                                                                                                               |                |
| <b>ink:</b> NPTEL/ YouTube/ Faculty Video Link:                                                                                                                                                                                                                                                                                |                                                                                                                                                                                               |                |
| <b>Unit 1</b>                                                                                                                                                                                                                                                                                                                  | <a href="https://onlinecourses.nptel.ac.in/noc21_me83">https://onlinecourses.nptel.ac.in/noc21_me83</a>                                                                                       |                |
| <b>Unit 2</b>                                                                                                                                                                                                                                                                                                                  | <a href="https://www.youtube.com/watch?v=YygGzfkhtJc">https://www.youtube.com/watch?v=YygGzfkhtJc</a>                                                                                         |                |
| <b>Unit 3</b>                                                                                                                                                                                                                                                                                                                  | <a href="https://www.youtube.com/watch?v=cjIacnNRLHE&amp;list=PLwdnzlV3ogoXAap_BHeApkcF7M8nt13hv">https://www.youtube.com/watch?v=cjIacnNRLHE&amp;list=PLwdnzlV3ogoXAap_BHeApkcF7M8nt13hv</a> |                |
| <b>Unit 4</b>                                                                                                                                                                                                                                                                                                                  | <a href="https://www.youtube.com/watch?v=mh51mAUexK4&amp;list=PLwdnzlV3ogoXUifhvYB65lLJCZ74o_fAk">https://www.youtube.com/watch?v=mh51mAUexK4&amp;list=PLwdnzlV3ogoXUifhvYB65lLJCZ74o_fAk</a> |                |
| <b>Unit 5</b>                                                                                                                                                                                                                                                                                                                  | <a href="https://www.youtube.com/watch?v=t1sNQHqt75M">https://www.youtube.com/watch?v=t1sNQHqt75M</a>                                                                                         |                |

| M. Tech Int. FIFTH YEAR                                                                                                                                                                                                                                                                                                                 |                                                                                                                           |                               |  |                                                 |          |   |        |
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| Course Code                                                                                                                                                                                                                                                                                                                             | AOE0970                                                                                                                   |                               |  | L                                               | T        | P | Credit |
| Course Title                                                                                                                                                                                                                                                                                                                            | Finance for Engineers                                                                                                     |                               |  | 3                                               | 0        | 0 | 3      |
| Course objective:                                                                                                                                                                                                                                                                                                                       |                                                                                                                           |                               |  | Duration: 40 Hours                              |          |   |        |
| 1                                                                                                                                                                                                                                                                                                                                       | Familiarize students with basic financial accounting concepts & process                                                   |                               |  |                                                 |          |   |        |
| 2                                                                                                                                                                                                                                                                                                                                       | Develop analytical skills for financial analysis                                                                          |                               |  |                                                 |          |   |        |
| 3                                                                                                                                                                                                                                                                                                                                       | Develop capacity to appraise projects and their financing along with solving various issues related to inventory and cash |                               |  |                                                 |          |   |        |
| 4                                                                                                                                                                                                                                                                                                                                       | Understand and construct personal saving and investment portfolios                                                        |                               |  |                                                 |          |   |        |
| Prerequisites: Computational and logical skills                                                                                                                                                                                                                                                                                         |                                                                                                                           |                               |  |                                                 |          |   |        |
| Course Contents / Syllabus                                                                                                                                                                                                                                                                                                              |                                                                                                                           |                               |  |                                                 |          |   |        |
| UNIT-I                                                                                                                                                                                                                                                                                                                                  |                                                                                                                           | Basics of Accounting          |  |                                                 | Hours- 9 |   |        |
| Basics of Accounting: Principles of Accounting , Concept of debit & credit, Books of accounts, Journal, Ledgers, Basic Accounting terminologies, Overview to Depreciation (straight line and diminishing method)                                                                                                                        |                                                                                                                           |                               |  |                                                 |          |   |        |
| UNIT-II                                                                                                                                                                                                                                                                                                                                 |                                                                                                                           | Financial Statements Analysis |  |                                                 | Hours-9  |   |        |
| Financial Statements: Income statement & Position statement: Preparation and analysis Key financial ratios, their interpretation, comparison of ratio with competition to identify improvement areas                                                                                                                                    |                                                                                                                           |                               |  |                                                 |          |   |        |
| UNIT-III                                                                                                                                                                                                                                                                                                                                |                                                                                                                           | Project Finance               |  |                                                 | Hours-8  |   |        |
| Appraisal of projects: Techniques, Finance for Startups- Govt Schemes / PSU & PSE Bank Finance, Bank Scrutiny for approvals etc., Project Budgeting, Capex, Opex and Importance of tracking cost of projects in execution,                                                                                                              |                                                                                                                           |                               |  |                                                 |          |   |        |
| UNIT-IV                                                                                                                                                                                                                                                                                                                                 |                                                                                                                           | Working Capital Management    |  |                                                 | Hours-8  |   |        |
| Concepts of Working Capital and its types, Approaches to working capital, Inventory management: Nature, Objective, Techniques of inventory management, Cash Management: Objectives, preparation of Cash Flow Statement and its analysis.                                                                                                |                                                                                                                           |                               |  |                                                 |          |   |        |
| UNIT-V                                                                                                                                                                                                                                                                                                                                  |                                                                                                                           | Financial Products & Services |  |                                                 | Hours-6  |   |        |
| Introduction to Personal Financial Portfolio Management, Key Options of Savings &Investment – Debt, Equity, etc. Brief Introduction to Mutual Funds and Stock Market                                                                                                                                                                    |                                                                                                                           |                               |  |                                                 |          |   |        |
| Course outcome: At the end of course, the student will be able to                                                                                                                                                                                                                                                                       |                                                                                                                           |                               |  |                                                 |          |   |        |
| CO 1                                                                                                                                                                                                                                                                                                                                    | Understand and record financial transactions.                                                                             |                               |  | Knowledge (K2), Remembering (K1), Applying (K4) |          |   |        |
| CO 2                                                                                                                                                                                                                                                                                                                                    | Analyze and take decision based on income, expenditure, assets & liabilities                                              |                               |  | Knowledge (K2), Applying (K4)                   |          |   |        |
| CO 3                                                                                                                                                                                                                                                                                                                                    | Decide avenues for financing projects and                                                                                 |                               |  | Knowledge (K2)                                  |          |   |        |
| CO 4                                                                                                                                                                                                                                                                                                                                    | Understand critical issues in cash and inventory management                                                               |                               |  | Knowledge (K2), Analyzing (K5)                  |          |   |        |
| CO 5                                                                                                                                                                                                                                                                                                                                    | Design and appraise their savings & Investment portfolio                                                                  |                               |  | Knowledge (K2), Analyzing (K5)                  |          |   |        |
| Text books                                                                                                                                                                                                                                                                                                                              |                                                                                                                           |                               |  |                                                 |          |   |        |
| 1. Pandey I M, Financial Management (Vikas Publishing, 11 <sup>th</sup> Ed, 2020)<br>2. Maheshwari S N, Financial Accounting (Vikas Publishing, 6 <sup>th</sup> Ed. 2019)                                                                                                                                                               |                                                                                                                           |                               |  |                                                 |          |   |        |
| Reference Books                                                                                                                                                                                                                                                                                                                         |                                                                                                                           |                               |  |                                                 |          |   |        |
| 1. Van Horne JC, Wachowicz Jr, J M Fundamentals of Financial Management (FT Prentice Hall13 <sup>th</sup> Ed)<br>2. Khan and Jain - Financial Management (Tata McGraw Hill, 7th Ed.)<br>3. N.L. Ahuja-Financial Accounting and Analysis-Taxmann Publication-2016<br>4. R.P.Rustagi-Working Capital Management- Taxmann Publication-2021 |                                                                                                                           |                               |  |                                                 |          |   |        |