D.No 576
06/02/2025

# *DEPARTMENT OF CIVILENGINEERING*

# *MINUTES OF BOARD OF STUDIES MEETING, DECEMBER 2024 ALONG WITH ITS ANNEXURES*

# Minutes of Board of Studies Meeting held on 09th December, 2024

The meeting of Board of Studies of the Civil Engineering department was held on 09th December, 2024 at 2:30 PM onwards in online mode. Following were present:

1. Prof. Pradeep Bhargava (Expert nominated by Vice Chancellor, MITS-DU)
   Professor, Civil Engg., IIT Roorkee
2. Dr. Sanjay Tiwari (Chairperson BoS & Head of the department, Civil Engg, MITS)
3. Dr. S. K. Jain (Professor, Civil Engg, MITS, Member, BOS)
4. Dr. M. K. Trivedi (Professor, Civil Engg, MITS, Member, BOS)
5. Prof. A. K. Dwivedi (Associate Professor, Civil Engg, MITS, Member, BOS)
6. Prof. A. K. Saxena (Associate Professor, Civil Engg, MITS, Member, BOS)
7. Prof. G. Bhadoriya (Assistant Professor, Civil Engg, MITS, Member, BOS)
8. Prof. Aditya K. Agarwal (Assistant Professor, Civil Engg, MITS, Member, BOS)

Prof. K. N. Jha, (Professor Civil Engg Deptt, IIT Delhi: Expert nominated by Vice Chancellor, MITS-DU) could not attend the meeting. Leave of absence was granted to him.

Following agendas were discussed & deliberated upon:

| | |
|---|---|
| **Item No. / CE - 1** | **To confirm the minutes of previous BoS Meeting held in the month of September 2024**<br>The minutes of previous BoS Meeting held on 13th September, 2024 are confirmed. |
| **Item No. / CE – 2** | **To review the scheme structure for the Batch admitted in 2024-25 academic session under the Madhav Institute of Technology & Science-Deemed University (MITS-DU)**<br>The scheme structure of B.Tech Civil Engineering for the batch admitted in 2024-25 academic session under MITS-DU along with tentative list of DE & OC courses was recommended in the previous BoS meeting. Minor changes in the scheme structure were proposed by Academic Advisory cell of Institute which have been incorporated in the scheme structure and the scheme was further discussed and reviewed in this meeting. The recommended scheme structure is being attached in Annexure – I. |
| **Item No. / CE – 3** | **To review & finalize the syllabi for all courses of B. Tech II Semester (for batch admitted in 2024-25) under the flexible curriculum along with their COs.**<br>The syllabi for all the courses of B.Tech Civil Engineering II Semester (for batch admitted in 2024-25) were reviewed and finalized. The finalized syllabi for the courses is attached in Annexure – II. |
| **Item No. / CE – 4** | **To review and finalize the Experiment list/ Lab manual and Micro Project-II for all the laboratory courses to be offered in B.Tech. II semester (for batch admitted in 2024-25)**<br>The experiment list for all the laboratory courses offered in B.Tech Civil Engineering II Semester was reviewed and finalized. The list of Micro Project – II to be offered in B.Tech Civil Engineering II Semester was discussed and finalized. The experiment list and list of Micro Project is attached in Annexure – III. |

| | |
|---|---|
| **Item No. / CE - 5** | **To review and finalize the syllabi of II semester PG Programme under the Madhav Institute of Technology & Science-Deemed University (MITS-DU) (M.E./M.Tech./MCA/MBA/MUP) along with their Course Outcomes (COs)**<br><br>Civil Engineering Department is offering two PG Programme:<br>(i) M.E. in Construction Technology & Management<br>(ii) M.Tech in Environmental Engineering<br>The scheme structure for II semester for both these PG programme for the batch admitted in 2024-25 academic session was discussed and following SWAYAM/NPTEL courses are proposed in the curriculum to be offered as DE-2 through SWAYAM/NPTEL platform.<br>**DE-2 course (SWAYAM/NPTEL) offered for M.E. CTM:**<br>1. 51241208, Strategies for Sustainable Design<br>**DE-2 course (SWAYAM/NPTEL) offered for M.Tech Environmental Engg:**<br>1. 53241208, Plastic Waste Management.<br><br>Also the scheme structure for I semester for both the PG programmes is modified by adding the course code for CNEC course which was offered in I semester as per directions received. The scheme structure for both the PG programme is attached in Annexure – IV.<br><br>The syllabi for II Semester for both these PG programmes for batch admitted in 2024-25 academic session was also discussed and finalized. The finalized syllabi is attached in Annexure – V. |
| **Item No. / CE - 6** | **To review and finalize the syllabus/module of Classified Novel Engaging Course to be offered in II semester of PG programme.**<br><br>The following course will be offered as Classified Novel Engaging Course in II Semester of PG Programme<br>1. Fire Safety and Regulation in Building<br>The module for this course was finalized and the same is attached in Annexure – VI. |
| **Item No. / CE – 7** | **To ratify the syllabus of DC and DLC courses of PhD scholars admitted in 2024-25 academic session under MITS-DU**<br><br>The syllabus of DC and DLC courses of PhD scholars admitted in 2024-25 academic session under MITS DU as proposed by the respective Research advisory committee (RAC) of the scholar is being ratified in the meeting, the syllabus is attached in Annexure – VII. |
| **Item No. / CE – 8** | **Any other matter**<br><br>None |

The meeting ended with vote of thanks to the chair & external members.

| | | |
|---|---|---|
| 9/12/2024 | 9/12/24 | |
| (Prof. Aditya K. Agarwal) | (Prof. G. Bhadoriya) | (Prof. A. K. Saxena) |
| Member BoS | Member BoS | Member BoS |

(Prof. A. K. Dwivedi)
Member BoS

09/12/2024
(Dr. M. K. Trivedi)
Member BoS

09.12.2024
((Dr. S. K. Jain)
Member BoS

Online Present
(Prof. Pradeep Bhargav)
Expert Nominated by Vice Chancellor, MITS-DU

(Dr. Sanjay Tiwari)
Head of Department & Chairperson, BoS

Dean
Faculty of Engineering & Technology
MITS-DU

## Summary of Board of Studies Meeting held on 09th December 2024

### COURSES WHERE SYLLABUS REVISION WAS CARRIED OUT
### (Session: Jan – June 2025)

| Course name | Course Code | Year/Date of introduction | Year/Date of revision | Percentage of content added or replaced | Agenda Item No. | Page No. |
|---|---|---|---|---|---|---|
| Strength of Materials | 11241202 | — | 09/12/2024 | 20% (removed) | 3 | 3,19 |

## Summary of Board of Studies Meeting held on 09th December 2024

### NEW COURSES ADDED
### (Session: Jan - June 2025)

| Course name | Course Code | Activities/contents which have a bearing on increasing skill and employability | Agenda Item No. | Page No. |
|---|---|---|---|---|
| Repair, Rehabilitation & Retrofitting of Structures | 51241204 | Structural conditional assessment, methods of repair and retrofitting of structure | 5 | 3,54,67 |
| Strategies for Sustainable Design | 51241208 | Vernacular and responsive design using Net-Zero energy, lighting, ventilation, system design tools such as SPSS, MSDS, design for sustainability. | 5 | 3,54 |
| Emerging Technologies for Environmental Management | 53241204 | Emerging contaminants, innovative strategies for pollution control, environmental technology transfer future trends. | 5 | 3,58,76 |
| Plastic Waste Management | 53241108 | Plastic waste management practices, greener alternatives, use of plastics in road. | 5 | 3,58 |
| Micro Project – II | 11241209 | Micro Project based learning. | 2,3,4 | 2,3,7, |
| Sustainability & Environmental Science | 11241212 | Sustainable solutions, circular economy, global environmental frameworks. | 2,3 | 2,3,7,32,47 |
| Problem Solving through Python Programming | 11241207 | Developing python programs | 2,3,4 | 2,3,7,29,45 |
| Concrete Technology | 11241203 | Concrete mix design, special concretes | 2,3 | 2,3,7,21 |
| Matrices & Calculus | 11241205 | Matrix problem solving, differential calculus | 2,3 | 2,3,7,25 |

# *ANNEXURE – I*

## *Scheme Structure for B.Tech Civil Engineering 2024-25 admitted batch students*

# Semester-Wise General Scheme Structure & Important Guidelines for Flexible Curriculum

## (Batch admitted in Academic Session 2024-25 onwards)

### Abbreviations Used

| | |
|---|---|
| **L** | Lecture |
| **T** | Tutorial |
| **P** | Practical |
| **HSMC** | Humanities and Social Sciences including Management Courses |
| **BSC** | Basic Science Courses |
| **ESC** | Engineering Science Courses |
| **DC** | Departmental Core |
| **DE** | Departmental Elective |
| **SPC** | Specialization Courses |
| **OC** | Open Category |
| **DLC** | Departmental Laboratory Courses |
| **MOOC** | Massive Open Online Course |
| **MWS** | Mandatory Workshop |
| **SP** | Semester Proficiency |
| **SIP** | Skill Internship Program |
| **SLP** | Self-learning Presentation |
| **PDC** | Professional Development Component |
| **PBL** | Project Based Learning |
| **PC** | Professional Certification |
| **MAC** | Mandatory Audit Course |
| **NEC** | Novel Engaging Course |

# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
## (Deemed University)
### (Declared Under Distinct Category by Ministry of Education, Government of India)
NAAC Accredited with A++ Grade

## Department of Civil Engineering
## Scheme of Evaluation
## B. Tech. I Semester *(Civil Engineering)*

**(for batch admitted in academic session 2024-25)**

| S. No. | Course Code | Category Code | Course Name | Maximum Marks Allotted | | | | | | Total Marks | Contact Hours per week | | | Total Credits | Mode of Learning | Mode of Major Evaluation | Duration of Major Evaluation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Block | | | | Practical Block | | | | | | | | | |
| | | | | Continuous Evaluation | | | Major Evaluation | Continuous Evaluation | Major Evaluation | | L | T | P | | | | |
| | | | | Minor Evaluation I | Minor Evaluation II | Quiz/ Assignment | | Lab Work & Sessional | | | | | | | | | |
| 1. | 11241101 | DC | Civil Engineering Materials & Construction | 20 | 20 | 30 | 30 | - | - | 100 | 3 | - | - | 3 | Face to Face | PP | 2 Hrs |
| 2. | 11241102 | ESC | Computer Programming | 20 | 20 | 30 | 30 | - | - | 100 | 2 | - | - | 2 | Face to Face | MCQ | 2 Hrs |
| 3. | 11241103 | DC | Engineering Mechanics | 20 | 20 | 30 | 30 | - | - | 100 | 2 | 1 | - | 3 | Face to Face | MCQ | 2 Hrs |
| 4. | 11241104 | DC | Building Design & Drawing | 20 | 20 | 30 | 30 | - | - | 100 | 2 | 1 | - | 3 | Face to Face | PP | 2 Hrs |
| 5. | 11241105 | ESC | Basic Electrical & Electronics Engineering | 20 | 20 | 30 | 30 | - | - | 100 | 2 | - | - | 2 | Face to Face | MCQ | 2 Hrs |
| 6. | 11241106 | DLC | Computer Programming Lab | - | - | - | - | 70 | 30 | 100 | - | - | 2 | 1 | Experimental | AO | - |
| 7. | 11241107 | DLC | Electrical & Electronics Engineering Lab | - | - | - | - | 70 | 30 | 100 | - | - | 2 | 1 | Experimental | AO | - |
| 8. | 11241108 | SP | Semester Proficiency[$] | - | - | - | - | 50 | - | 50 | - | - | 2 | 1 | Face to Face | SO | - |
| 9. | 11241109 | PBL | Micro Project-I[#] | - | - | - | - | 70 | 30 | 100 | - | - | 2 | 1 | Experiential | SO | - |
| 10. | 11241110 | ESC | Engineering Chemistry Lab[$$] | - | - | - | - | 70 | 30 | 100 | - | - | 2 | 1 | Experimental | AO | - |
| 11. | NECXXXXX | NEC | Novel Engaging Course (Activity Based Learning) | - | - | - | - | 50 | - | 50 | - | 1 | - | 1 | Interactive | SO | - |
| | | | Total | 100 | 100 | 150 | 150 | 380 | 120 | 1000 | 11 | 03 | 10 | 19 | - | - | - |
| 12. | 11241111 | MAC | Universal Human Values & Professional Ethics (UHVPE) | 20 | 20 | 30 | 30 | - | - | 100 | 2 | - | - | GRADE | Blended | MCQ | 1.5 Hrs. |
| 13. | 11241112 | MWS | Mandatory Workshop on Indian Constitution and Traditional Knowledge at Department Level (Duration: Two Days) | | | | | | | | | | | GRADE | Interactive | MCQ | - |
| Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations. | | | | | | | | | | | | | | | | | |
| Skill Internship Program (Soft Skill): Minimum 45 hours duration: To be credited in II Semester. | | | | | | | | | | | | | | | | | |

[$]Semester Proficiency– includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses.

MCQ: Multiple Choice Question AO: Assignment + Oral PP: Pen Paper SO: Submission + Oral OB: Open Book

[$$] This course will be distributed in the I Year Group wise among the programmes where ever required.

[#] Micro Project-I will be presented and evaluated through an interdisciplinary project evaluation committee.

| HSMC | BSC | ESC | DC | DE | SPC | OC | DLC | NEC | SP | SIP | SLP | PDC | PBL | MAC | MWS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 3 | 3 | 0 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |

| Mode of Learning | | | | | | Mode of Examination | | | | | | | Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Theory | | NEC | Lab | | | Theory | | | | Lab | | NEC | |
| Face to Face | Online | Interactive | Face to Face | Experiential | Experimental | PP | AO | MCQ | OB | SO | AO | SO | |
| 13 | | 1 | 1 | 1 | 3 | 6 | | 7 | | 2 | 3 | 1 | 19 |
| 68.42% | | 5.26% | 5.26% | 5.26% | 15.8% | 31.6% | | 36.84% | | 10.52% | 15.8% | 5.26% | Credits % |

Recommended in the Board of Studies Meeting of Department of Civil Engineering held on 9 Dec 2024

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# Department of Civil Engineering
# Scheme of Evaluation
# B. Tech. II Semester *(Civil Engineering)*

**(for batch admitted in academic session 2024-25)**

| S. No. | Course Code | Category Code | Course Name | Maximum Marks Allotted | | | | | | Total Marks | Contact Hours per week | | | Total Credits | Mode of Learning | Mode of Major Evaluation | Duration of Major Evaluation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Block | | | | Practical Block | | | | | | | | | |
| | | | | Continuous Evaluation | | | Major Evaluation | Continuous Evaluation | Major Evaluation | | | | | | | | |
| | | | | Minor Evaluation I | Minor Evaluation II | Quiz/ Assignment | | Lab Work & Sessional | | | L | T | P | | | | |
| 1. | 11241201 | DC | Surveying | 20 | 20 | 30 | 30 | - | - | 100 | 3 | - | - | 3 | Face to Face | MCQ | 2 Hrs |
| 2. | 11241202 | DC | Strength of Material | 20 | 20 | 30 | 30 | - | - | 100 | 2 | 1 | - | 3 | Face to Face | MCQ | 2 Hrs |
| 3. | 11241203 | DC | Concrete Technology | 20 | 20 | 30 | 30 | - | - | 100 | 2 | 1 | - | 3 | Face to Face | MCQ | 2 Hrs |
| 4. | 11241204 | DC | Fluid Mechanics – I | 20 | 20 | 30 | 30 | - | - | 100 | 2 | 1 | - | 3 | Face to Face | PP | 2 Hrs |
| 5. | 11241205 | BSC | Matrices & Calculus | 20 | 20 | 30 | 30 | - | - | 100 | 3 | - | - | 3 | Face to Face | PP | 2 Hrs |
| 6. | 11241206 | DLC | Building Materials & Construction Lab | - | - | - | - | 70 | 30 | 100 | - | - | 2 | 1 | Experimental | AO | - |
| 7. | 11241207 | DLC | Problem Solving through Python Programming | - | - | - | - | 70 | 30 | 100 | - | - | 2 | 1 | Experimental | AO | - |
| 8. | 11241208 | SP | Semester Proficiency[$] | - | - | - | - | 50 | - | 50 | - | - | 2 | 1 | Face to Face | SO | - |
| 9. | 11241209 | PBL | Micro Project-II[^] | - | - | - | - | 70 | 30 | 100 | - | - | 2 | 1 | Experiential | SO | - |
| 10. | 11241210 | ESC | Engineering Physics Lab[$$] | - | - | - | - | 70 | 30 | 100 | - | - | 2 | 1 | Experimental | AO | - |
| 11. | 11241211 | HSMC | Language Lab | - | - | - | - | 70 | 30 | 100 | - | - | 2 | 1 | Blended | AO | - |
| 12. | NECXXXXX | NEC | Novel Engaging Course (Activity Based Learning) | - | - | - | - | 50 | - | 50 | - | 1 | - | 1 | Interactive | SO | - |
| 13. | SIP1XXXX | SIP | Skill Internship Program (Soft Skills) | - | - | - | - | 60 | - | 60 | - | - | - | 2** | Experiential | SO | - |
| Total | | | | 100 | 100 | 150 | 150 | 510 | 150 | 1160 | 12 | 04 | 12 | 24 | - | - | - |
| 14. | 11241212 | MAC | Sustainability & Environmental Science | 20 | 20 | 30 | 30 | - | - | 100 | 2 | - | - | GRADE | Blended | MCQ | 1.5 Hrs |
| 15. | 11241213 | MWS | Mandatory Workshop on Indian Knowledge System at Department Level (Duration: Two Days). | | | | | | | | | | | GRADE | Interactive | MCQ | - |

**Summer Semester of six-eight weeks duration will be conducted for makeup of I & II semester examination.**

[$]Semester Proficiency– includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

**MCQ:** Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral **OB:** Open Book

[$$] This course will be distributed in the I Year Group wise among the programmes where ever required.

** These credits will be transferred from Skill Internship Program (Soft Skills).

[^]Micro Project-II will be presented and evaluated through an interdisciplinary project evaluation committee.

| HSMC | BSC | ESC | DC | DE | SPC | OC | DLC | NEC | SP | SIP | SLP | PDC | PBL | MAC | MWS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 4 | 0 | 0 | 0 | 2 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 |

| Mode of Learning | | | | | | | Mode of Examination | | | | | | | Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Theory | | NEC | Lab | | | | Theory | | | | Lab | | NEC | |
| Face to Face | Online | Interactive | Face to Face | Blended | Experiential | Experimental | PP | AO | MCQ | OB | SO | AO | SO | |
| 15 | | 1 | 1 | 1 | 3 | 3 | 6 | | 9 | | 4 | 4 | 1 | 24 |
| 62.5% | | 4.17% | 4.17% | 4.17% | 12.5% | 12.5% | 25% | | 37.5% | | 16.67% | 16.67% | 4.17% | Credits % |

Recommended in the Board of Studies Meeting of Department of Civil Engineering held on 9 Dec 2024

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## Department of Civil Engineering

## Scheme of Evaluation
## B. Tech. III Semester *(Civil Engineering)*

**(for batch admitted in academic session 2024-25)**

| S. No. | Course Code | Category Code | Course Name | Maximum Marks Allotted | | | | | | Total Marks | Contact Hours per week | | | Total Credits | Mode of Learning | Mode of Major Evaluation | Duration of Major Evaluation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Block | | | | Practical Block | | | | | | | | | |
| | | | | Continuous Evaluation | | | Major Evaluation | Continuous Evaluation | Major Evaluation | | | | | | | | |
| | | | | Minor Evaluation I | Minor Evaluation II | Quiz/ Assignment | | Lab Work & Sessional | | | L | T | P | | | | |
| 1. | 11242101 | BSC | Transforms & Vector Calculus | 20 | 20 | 30 | 30 | - | - | 100 | 3 | - | - | 3 | Face to Face | PP | 2 Hrs |
| 2. | 11242102 | DC | Data Structures | 20 | 20 | 30 | 30 | - | - | 100 | 2 | 1 | - | 3 | Face to Face | MCQ | 2 Hrs |
| 3. | 11242103 | DC | Fluid Mechanics – II | 20 | 20 | 30 | 30 | - | - | 100 | 2 | 1 | - | 3 | Face to Face | PP | 2 Hrs |
| 4. | 11242104 | DC | Geotechnical Engineering | 20 | 20 | 30 | 30 | - | - | 100 | 2 | 1 | - | 3 | Face to Face | MCQ | 2 Hrs |
| 5. | 11242105 | DC | Structural Analysis | 20 | 20 | 30 | 30 | - | - | 100 | 2 | 1 | - | 3 | Face to Face | OB | 2 Hrs |
| 6. | 11242106 | DLC | Fluid Mechanics Lab | - | - | - | - | 70 | 30 | 100 | - | - | 2 | 1 | Experimental | AO | - |
| 7. | 11242107 | DLC | Survey Practice Lab | - | - | - | - | 70 | 30 | 100 | - | - | 2 | 1 | Experimental | SO | - |
| 8. | 11242108 | SP | Semester Proficiency[$] | - | - | - | - | 50 | - | 50 | - | - | 2 | 1 | Face to Face | SO | - |
| 9. | 11242109 | PBL | Macro Project-I[#] | - | - | - | - | 70 | 30 | 100 | - | - | 2 | 1 | Experiential | SO | - |
| 10. | 11242110 | SLP | Self-learning/Presentation[$$$] (SWAYAM/NPTEL/MOOC) | - | - | - | - | 40 | - | 40 | - | - | 2 | 1 | Mentoring | SO | - |
| 11. | NECXXXXX | NEC | Novel Engaging Course (Activity Based Learning) | - | - | - | - | 50 | - | 50 | - | 1 | - | 1 | Interactive | SO | - |
| Total | | | | 100 | 100 | 150 | 150 | 350 | 90 | 940 | 11 | 05 | 10 | 21 | - | - | - |
| 12. | 11242111 | MAC | Cyber Security | 20 | 20 | 30 | 30 | - | - | 100 | 2 | - | - | GRADE | Blended | MCQ | 1.5 Hrs |
| 13. | 11242112 | MWS | Mandatory Workshop on Internet of Things (IoT) at Department Level (Duration: Two Days) | | | | | | | | | | | GRADE | Interactive | MCQ | - |
| **Skill Internship Program (Institute Level) (Qualifier): Minimum 30 hours duration: To be credited in IV Semester** | | | | | | | | | | | | | | | | | |

[$]Semester Proficiency– includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

**MCQ:** Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral **OB:** Open Book

[#] Macro Project-I will be presented and evaluated through an interdisciplinary project evaluation committee.

[$$$] Compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance and presentation.

| HSMC | BSC | ESC | DC | DE | SPC | OC | DLC | NEC | SP | SIP | SLP | PDC | PBL | MAC | MWS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0 | 4 | 0 | 0 | 0 | 2 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 |

| Mode of Learning | | | | | | | Mode of Examination | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Theory | | NEC | Lab | | | | Theory | | | | Lab | | NEC | Total Credits |
| Face to Face | Online | Interactive | Face to Face | Mentoring | Experiential | Experimental | PP | AO | MCQ | OB | SO | AO | SO | |
| 15 | | 1 | 1 | 1 | 1 | 2 | 6 | | 6 | 3 | 4 | 1 | 1 | 21 |
| 71.5% | | 4.76% | 4.76% | 4.76% | 4.76% | 9.5% | 28.6% | | 28.6% | 14.3% | 19.05% | 4.76% | 4.76% | Credits % |

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## (Deemed University)
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# Department of Civil Engineering
# Scheme of Evaluation
# B. Tech. IV Semester *(Civil Engineering)*

**(for batch admitted in academic session 2024-25)**

| S. No. | Course Code | Category Code | Course Name | Maximum Marks Allotted | | | | | | Total Marks | Contact Hours per week | | | Total Credits | Mode of Learning | Mode of Major Evaluation | Duration of Major Evaluation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Block | | | | Practical Block | | | | | | | | | |
| | | | | Continuous Evaluation | | | Major Evaluation | Continuous Evaluation | Major Evaluation | | | | | | | | |
| | | | | Minor Evaluation I | Minor Evaluation II | Quiz/ Assignment | | Lab Work & Sessional | | | L | T | P | | | | |
| 1. | 11242201 | DC | Highway Engineering | 20 | 20 | 30 | 30 | - | - | 100 | 2 | 1 | - | 3 | Face to Face | MCQ | 2 Hrs |
| 2. | 11242202 | DC | Water Supply Engineering | 20 | 20 | 30 | 30 | - | - | 100 | 2 | 1 | - | 3 | Face to Face | MCQ | 2 Hrs |
| 3. | 11242203 | DC | Estimating Costing & Contracting | 20 | 20 | 30 | 30 | - | - | 100 | 2 | 1 | - | 3 | Face to Face | PP | 2 Hrs |
| 4. | 11242204 | DC | Foundation Engineering | 20 | 20 | 30 | 30 | - | - | 100 | 2 | 1 | - | 3 | Face to Face | MCQ | 2 Hrs |
| 5. | 11242205 | DC | Structural Design & Drawing (RCC) | 20 | 20 | 30 | 30 | - | - | 100 | 3 | - | - | 3 | Face to Face | PP | 2 Hrs |
| 6. | 11242206 | DLC | Highway Engineering Lab | - | - | - | - | 70 | 30 | 100 | - | - | 2 | 1 | Experimental | AO | - |
| 7. | 11242207 | DLC | Geotechnical Engineering Lab | - | - | - | - | 70 | 30 | 100 | - | - | 2 | 1 | Experimental | AO | - |
| 8. | 11242208 | DLC | Strength of Materials Lab | - | - | - | - | 70 | 30 | 100 | - | - | 2 | 1 | Experimental | AO | - |
| 9. | 11242209 | SP | Semester Proficiency[$] | - | - | - | - | 50 | - | 50 | - | - | 2 | 1 | Face to Face | SO | - |
| 10. | 11242210 | PBL | Macro Project-II[*] | - | - | - | - | 70 | 30 | 100 | - | - | 2 | 1 | Experiential | SO | - |
| 11. | 11242211 | PC | Professional Certification | - | - | - | - | 50 | - | 50 | - | - | 2 | 1 | Blended | SO | - |
| 12. | NECXXXXX | NEC | Novel Engaging Course (Activity Based Learning) | - | - | - | - | 50 | - | 50 | - | 1 | - | 1 | Interactive | SO | - |
| 13. | SIP2XXXX | SIP | Skill Internship Program (Institute Level) | - | - | - | - | 60 | - | 60 | - | - | - | 2** | Experiential | SO | - |
| | | | Total | 100 | 100 | 150 | 150 | 490 | 120 | 1110 | 11 | 05 | 12 | 24 | - | - | - |
| 14. | 11242212 | MAC | Project Management, Economics & Financing | 20 | 20 | 30 | 30 | - | - | 100 | 2 | - | - | GRADE | Blended | MCQ | 1.5 Hrs |
| 15. | 11242213 | MWS | Mandatory Workshop on Computer Vision at Department Level (Duration: Two Days) | | | | | | | | | | | GRADE | Interactive | MCQ | - |
| 16. | 11242214 | MWS | Mandatory Workshop on Life Skills at Department Level (Duration: Two Days) | | | | | | | | | | | GRADE | Interactive | MCQ | - |
| | | | Summer Semester of six-eight weeks duration will be conducted for makeup of previous semester examination. | | | | | | | | | | | | | | |
| | | | Additional Course for Honours or Minor Degree: Permitted to opt for maximum two additional courses for the award of Honours or Minor Degree | | | | | | | | | | | | | | |

[$]Semester Proficiency– includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

MCQ: Multiple Choice Question AO: Assignment + Oral PP: Pen Paper SO: Submission + Oral OB: Open Book

[*]Macro Project-II will be presented and evaluated through an interdisciplinary project evaluation committee.

[**] These credits will be transferred from Skill Internship Program (Institute Level).

| PC | BSC | ESC | DC | DE | SPC | OC | DLC | NEC | SP | SIP | SLP | PDC | PBL | MAC | MWS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 5 | 0 | 0 | 0 | 3 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 2 |

| Mode of Learning | | | | | | | Mode of Examination | | | | | | | Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Theory | | NEC | Lab | | | | Theory | | | | Lab | | NEC | |
| Face to Face | Online | Interactive | Face to Face | Blended | Experiential | Experimental | PP | AO | MCQ | OB | SO | AO | SO | |
| 15 | | 1 | 1 | 1 | 3 | 3 | 6 | | 9 | | 5 | 3 | 1 | 24 |
| 62.5% | | 4.17% | 4.17% | 4.17% | 12.5% | 12.5% | 25% | | 37.5% | | 20.83% | 12.5% | 4.17% | Credits % |

Recommended in the Board of Studies Meeting of Department of Civil Engineering held on 9 Dec 2024

# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
## (Deemed University)
(Declared Under Distinct Category by Ministry of Education, Government of India)

NAAC Accredited with A++ Grade

## Department of Civil Engineering

## Scheme of Evaluation

## B. Tech. V Semester *(Civil Engineering)*

**(for batch admitted in academic session 2024-25)**

| S. No. | Course Code | Category Code | Course Name | Maximum Marks Allotted | | | | | | | | Total Marks | Contact Hours per week | | | Total Credits | Mode of Learning | Mode of Major Evaluation | Duration of Major Evaluation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Block | | | | Practical Block | | MOOCs | | | | | | | | | |
| | | | | Continuous Evaluation | | | Major Evaluation | Continuous Evaluation | Major Evaluation | Assignment | Exam | | L | T | P | | | | |
| | | | | Minor Evaluation I | Minor Evaluation II | Quiz/ Assignment | | Lab Work & Sessional | | | | | | | | | | | |
| 1. | 11243101 | DC | Waste Water Engineering | 20 | 20 | 30 | 30 | - | - | - | - | 100 | 2 | 1 | - | 3 | Face to Face | MCQ | 2 Hrs |
| 2. | 11243102 | DC | Structural Design & Drawing (Steel) | 20 | 20 | 30 | 30 | - | - | - | - | 100 | 2 | 1 | - | 3 | Face to Face | PP | 2 Hrs |
| 3. | 11243103 | DC | Data Science | 20 | 20 | 30 | 30 | - | - | - | - | 100 | 2 | 1 | - | 3 | Face to Face | MCQ | 2 Hrs |
| 4. | 112431XX | DE | Departmental Elective* (DE-1) | - | - | - | - | - | - | 25 | 75 | 100 | 3 | - | - | 3 | Online | MCQ | 3 Hrs |
| 5. | 112431XX | SPC | Specialization Course (SPC-1) | 20 | 20 | 30 | 30 | - | - | - | - | 100 | 2 | 1 | - | 3 | Face to Face | PP | 2 Hrs |
| 6. | 11243104 | DLC | Environmental Lab | - | - | - | - | 70 | 30 | - | - | 100 | - | - | 2 | 1 | Experimental | AO | |
| 7. | 11243105 | DLC | Data Science Lab | - | - | - | - | 70 | 30 | - | - | 100 | - | - | 2 | 1 | Experimental | AO | - |
| 8. | 11243106 | SP | Semester Proficiency[$] | - | - | - | - | 50 | - | - | - | 50 | - | - | 2 | 1 | Face to Face | SO | - |
| 9. | 11243107 | PBL | Cornerstone Project | - | - | - | - | 70 | 30 | - | - | 100 | - | - | 4 | 2 | Experiential | SO | - |
| **Total** | | | | **80** | **80** | **120** | **120** | **260** | **90** | **25** | **75** | **850** | **11** | **04** | **10** | **20** | - | - | - |
| 10. | 11243108 | MAC | Supply Chain Management | 20 | 20 | 30 | 30 | - | - | | | 100 | 2 | - | - | GRADE | Blended | MCQ | 1.5 Hrs |
| 11. | 11243109 | MWS | Mandatory Workshop on Blockchain at Department Level (Duration: Two Days) | | | | | | | | | | | | | GRADE | Interactive | MCQ | - |
| **Additional Course for Honours or Minor Degree: Permitted to opt for maximum two additional courses for the award of Honours or Minor Degree** | | | | | | | | | | | | | | | | | | | |

[$]Semester Proficiency– includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

**MCQ:** Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral **OB:** Open Book

* Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform

| HSMC | BSC | ESC | DC | DE | SPC | OC | DLC | NEC | SP | SIP | SLP | PDC | PBL | MAC | MWS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 3 | 1 | 1 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |

| Mode of Learning | | | | | Mode of Examination | | | | | | Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Theory | | Lab | | | Theory | | | | Lab | | |
| Face to Face | Online | Face to Face | Experiential | Experimental | PP | AO | MCQ | OB | SO | AO | |
| 12 | 3 | 1 | 2 | 2 | 6 | | 9 | | 3 | 2 | 20 |
| 60% | 15% | 5% | 10% | 10% | 30% | | 45% | | 15% | 10% | Credits % |

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## Department of Civil Engineering

## Scheme of Evaluation

## B. Tech. VI Semester *(Civil Engineering)*

**(for batch admitted in academic session 2024-25)**

| S. No. | Course Code | Category Code | Course Name | Maximum Marks Allotted | | | | | | | | Total Marks | Contact Hours per week | | | Total Credits | Mode of Learning | Mode of Major Evaluation | Duration of Major Evaluation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Block | | | | Practical Block | | MOOCs | | | | | | | | | |
| | | | | Continuous Evaluation | | | Major Evaluation | Continuous Evaluation | Major Evaluation | Assignment | Exam | | L | T | P | | | | |
| | | | | Minor Evaluation I | Minor Evaluation II | Quiz/ Assignment | | Lab Work & Sessional | | | | | | | | | | | |
| 1. | 11243201 | DC | Engineering Hydrology & Irrigation | 20 | 20 | 30 | 30 | - | - | - | - | 100 | 2 | 1 | - | 3 | Face to Face | MCQ | 2 Hrs |
| 2. | 11243202 | DC | Artificial Intelligence & Machine Learning | 20 | 20 | 30 | 30 | - | - | - | - | 100 | 2 | 1 | - | 3 | Face to Face | MCQ | 2 Hrs |
| 3. | 112432XX | DE | Departmental Elective* (DE-2) | - | - | - | - | - | - | 25 | 75 | 100 | 3 | - | - | 3 | Online | MCQ | 3 Hrs |
| 4. | 112432XX | OC | Open Category Course (OC-1) | 20 | 20 | 30 | 30 | - | - | - | - | 100 | 2 | 1 | - | 3 | Face to Face | PP | 2 Hrs |
| 5. | 112432XX | SPC | Specialization Course (SPC-2) | 20 | 20 | 30 | 30 | - | - | - | - | 100 | 3 | - | - | 3 | Face to Face | PP | 2 Hrs |
| 6. | 11243203 | DLC | Civil Engineering Drawing Lab | - | - | - | - | 70 | 30 | - | - | 100 | - | - | 2 | 1 | Experimental | SO | - |
| 7. | 11243204 | DLC | Artificial Intelligence & Machine Learning Lab | - | - | - | - | 70 | 30 | - | - | 100 | - | - | 2 | 1 | Experimental | AO | - |
| 8. | 11243205 | SP | Semester Proficiency[$] | - | - | - | - | 50 | - | - | - | 50 | - | - | 2 | 1 | Face to Face | SO | - |
| 9. | 11243206 | PBL | Capstone Project | - | - | - | - | 70 | 30 | - | - | 100 | - | - | 4 | 2 | Experiential | SO | - |
| | | | **Total** | **80** | **80** | **120** | **120** | **260** | **90** | **25** | **75** | **850** | **12** | **03** | **10** | **20** | - | - | - |
| 10. | 11243207 | MAC | Disaster Management | 20 | 20 | 30 | 30 | - | - | - | - | 100 | 2 | - | - | GRADE | Blended | MCQ | 1.5 Hrs |
| 11. | 11243208 | MWS | Mandatory Workshop on Intellectual Property Rights at Department Level (Duration: Two Days) | | | | | | | | | | | | | GRADE | Interactive | MCQ | - |
| **Skill Enhancement Program/Research Internship/On Job Training for Four weeks duration** | | | | | | | | | | | | | | | | | | | |
| **Summer Semester of six-eight weeks duration will be conducted for makeup of previous semester examination.** | | | | | | | | | | | | | | | | | | | |
| **Additional Course for Honours or Minor Degree: Permitted to opt for maximum two additional courses for the award of Honours or Minor Degree** | | | | | | | | | | | | | | | | | | | |

[$]Semester Proficiency– includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

**MCQ:** Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral **OB:** Open Book

* Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform.

| HSMC | BSC | ESC | DC | DE | SPC | OC | DLC | NEC | SP | SIP | SLP | PDC | PBL | MAC | MWS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 2 | 1 | 1 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |

| Mode of Learning | | | | | Mode of Examination | | | | | | Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Theory | | Lab | | | Theory | | | | Lab | | |
| Face to Face | Online | Face to Face | Experiential | Experimental | PP | AO | MCQ | OB | SO | AO | |
| 12 | 3 | 1 | 2 | 2 | 6 | | 9 | | 4 | 1 | 20 |
| 60% | 15% | 5% | 10% | 10% | 30% | | 45% | | 20% | 5% | Credits % |

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## Department of Civil Engineering

## Scheme of Evaluation

## B. Tech. VII Semester *(Civil Engineering)*

**(for batch admitted in academic session 2024-25)**

| S. No. | Course Code | Category Code | Course Name | Maximum Marks Allotted | | | | | | | | Total Marks | Contact Hours per week | | | Total Credits | Mode of Learning | Mode of Major Evaluation | Duration of Major Evaluation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Block | | | | Practical Block | | MOOCs | | | | | | | | | |
| | | | | Continuous Evaluation | | | Major Evaluation | Continuous Evaluation | Major Evaluation | Assignment | Exam | | L | T | P | | | | |
| | | | | Minor Evaluation I | Minor Evaluation II | Quiz/ Assignment | | Lab Work & Sessional | | | | | | | | | | | |
| 1. | 112441XX | DE | Departmental Elective # (DE-3) | 20 | 20 | 30 | 30 | - | - | - | - | 100 | 3 | - | - | 3 | Blended | PP | 2 Hrs |
| 2. | 112441XX | DE | Departmental Elective* (DE-4) | - | - | - | - | - | - | 25 | 75 | 100 | 3 | - | - | 3 | Online | MCQ | 3 Hrs |
| 3. | 112441XX | OC | Open Category Course* (OC-2) | - | - | - | - | - | - | 25 | 75 | 100 | 3 | - | - | 3 | Online | MCQ | 3 Hrs |
| 4. | 112441XX | SPC | Specialization Course # (SPC-3) | 20 | 20 | 30 | 30 | - | - | - | - | 100 | 2 | 1 | - | 3 | Blended | MCQ | 2 Hrs |
| 5. | 11244101 | SEP | Skill Enhancement Program/Research Internship/ On Job Training | - | - | - | - | - | 50 | - | - | 50 | - | - | 2 | 1** | Experiential | SO | - |
| 6. | 11244102 | DLC | Creative Problem Solving | - | - | - | - | - | 50 | - | - | 50 | - | - | 2 | 1 | Experiential | SO | - |
| Total | | | | 60 | 60 | 90 | 90 | - | 100 | 25 | 75 | 500 | 10 | 02 | 04 | 14 | - | - | - |
| Additional Course for Honours or Minor Degree: Permitted to opt for maximum two additional courses for the award of Honours or Minor Degree | | | | | | | | | | | | | | | | | | | |

$Semester Proficiency– includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses.

**MCQ:** Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral **OB:** Open Book

* Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform.

** These credits will be transferred from Skill Enhancement Program/Research Internship/On Job Training

# Course run through MITS-DU MOOCs

| HSMC | BSC | ESC | DC | DE | SPC | OC | DLC | NEC | SEP | SIP | SLP | PDC | PBL | MAC | MWS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 2 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |

| Mode of Learning | | | | | Mode of Examination | | | | | Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| Theory | | Lab | | | Theory | | | | Lab | |
| Blended | Online | Face to Face | Experiential | Experimental | PP | AO | MCQ | OB | SO | |
| 6 | 6 | | 2 | | 3 | | 9 | | 2 | 14 |
| 43% | 43% | | 14% | | 21.5% | | 64.5% | | 14% | Credits % |

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## Department of Civil Engineering

## Scheme of Evaluation

## B. Tech. VIII Semester *(Civil Engineering)*

**(for batch admitted in academic session 2024-25)**

| S. No. | Course Code | Category Code | Course Name | Maximum Marks Allotted | | | | | | | | Total Marks | Contact Hours per week | | | Total Credits | Mode of Learning | Mode of Major Evaluation | Duration of Major Evaluation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Block | | | | Practical Block | | MOOCs | | | | | | | | | |
| | | | | Continuous Evaluation | | | Major Evaluation | Continuous Evaluation | Major Evaluation | Assignment | Exam | | L | T | P | | | | |
| | | | | Minor Evaluation I | Minor Evaluation II | Quiz/ Assignment | | | | | | | | | | | | | |
| 1. | 112442XX | DE | Departmental Elective* (DE-5) | - | - | - | - | - | - | 25 | 75 | 100 | 3 | - | - | 3 | Online | MCQ | 3 Hrs |
| 2. | 112442XX | OC | Open Category Course* (OC-3) | - | - | - | - | - | - | 25 | 75 | 100 | 3 | - | - | 3 | Online | MCQ | 3 Hrs |
| 3. | 11244201 | PBL | Industry Internship/ Research Internship/ Innovation & Start-up | - | - | - | - | 280 | 120 | - | - | 400 | - | - | 20 | 10 | Experiential | SO | - |
| 4. | 11244202 | PDC | Professional Development## | - | - | - | - | - | 50 | - | - | 50 | - | - | 4 | 2 | Interactive | SO | - |
| Total | | | | - | - | - | - | 280 | 170 | 50 | 150 | 650 | 06 | - | 24 | 18 | - | - | - |
| **Summer Semester of six-eight weeks duration will be conducted to complete any backlog courses.** | | | | | | | | | | | | | | | | | | | |
| **Additional Course for Honours or Minor Degree: Permitted to opt for maximum two additional courses for the award of Honours or Minor Degree** | | | | | | | | | | | | | | | | | | | |

**MCQ:** Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral **OB:** Open Book

*Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform

## Evaluation will be based on participation/laurels brought by the students to the institution in national/state level technical and other events during the complete tenure of the UG programme (participation in professional chapter activities, club activities, cultural events, sports, personality development activities, collaborative events, MOOCs, technical events, institute/department committees, etc.)

| HSMC | BSC | ESC | DC | DE | SPC | OC | DLC | NEC | SP | SIP | SLP | PDC | PBL | MAC | MWS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |

| Mode of Learning | | | | | Mode of Examination | | | | | Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| Theory | | Lab | | | Theory | | | | Lab | |
| Face to Face | Online | Interactive | Experiential | Experimental | PP | AO | MCQ | OB | SO | |
| | 6 | 2 | 10 | | | | 6 | | 12 | 18 |
| | 33.33% | 11.11% | 55.56% | | | | 33.33% | | 66.67% | Credits % |

# DEPARTMENT OF CIVIL ENGINEERING

| *Departmental Elective Courses* |
|---|
| 1. Hydraulic Structure |
| 2. Railway Airport & Tunnel Engineering |
| 3. Traffic Engineering & Design |
| 4. Engineering Geology |
| 5. Pavement Management System |
| 6. Applied Stress Analysis |
| 7. Green Buildings |
| 8. Advanced Surveying |
| 9. Bridge Engineering |
| 10. Groundwater Development |
| 11. River Hydraulics |
| 12. Design of Earthquake Resistant Structures |
| 13. Remote Sensing & GIS Applications in Civil Engineering |
| 14. Ground Improvement Techniques |
| 15. Rock Engineering |
| 16. Building Information Modelling |
| 17. Seismic Hazard Analysis |
| 18. Watershed Management |
| 19. Hydropower Engineering |
| 20. Rehabilitation of Structures |
| 21. Ecology and Stream Pollution |
| 22. Finite Element Methods |
| 23. Strategic Management in Construction |
| 24. Energy Efficient Buildings |

| |
|---|
| 25. Design of Bridges |
| 26. Sustainable Construction & Practices |
| 27. Lean Construction |
| 28. Photogrammetry and UAV |
| 29. Geodesy and GNSS |
| ***Open Category Courses*** |
| 1. Maintenance Management |
| 2. Integrated Waste Management System |
| 3. Air Pollution & Noise Pollution |
| 4. Sustainable Materials & Green Buildings |
| 5. Safety & Quality Management |
| 6. Ecology and Stream Pollution |
| 7. Environmental Impact Assessment |
| 8. Greenfield Projects |
| 9. Engineering Economics and Project Appraisal |
| 10. Entrepreneurship for Engineers |

# DEPARTMENT OF CIVIL ENGINEERING

| Specialization in Structures | | | | | | |
|---|---|---|---|---|---|---|
| Description | | This module will help in providing in-depth knowledge of advanced topics like design of bridge, tall buildings etc. so that students can demonstrate their expertise in designing structural projects and also ensure development of safe, resilient, and Efficient structures. | | | | |
| Courses and Credits required | | 3 courses and 9 credits | | | | |
| Course Category | | Course ID | Course Title | Contact Hours per week | | |
| | | | | L | T | P |
| SPC-1 (Core) | | | Advanced Structural Analysis | 3 | 0 | 0 |
| SPC-2 (Core) | | | Advanced Reinforced Concrete Design | 3 | 0 | 0 |
| SPC-3 | Elective-1 | | Advanced Structural Design (Steel) | 3 | 0 | 0 |
| | Elective-2 | | Structural Dynamics | 3 | 0 | 0 |

| Specialization in Construction Management | | | | | | |
|---|---|---|---|---|---|---|
| Description | | This module will help in providing in-depth knowledge of various aspects of construction management like project scheduling, resource allocation, advanced equipment's etc. This specialization will help students to pursue careers as construction project managers. | | | | |
| Courses and Credits required | | 3 courses and 9 credits | | | | |
| Course Category | | Course ID | Course Title | Contact Hours per week | | |
| | | | | L | T | P |
| SPC-1 (Core) | | | Contract Management | 3 | 0 | 0 |
| SPC-2 (Core) | | | Basic Scheduling Techniques | 3 | 0 | 0 |
| SPC-3 | Elective-1 | | Infrastructure & Finance | 3 | 0 | 0 |
| | Elective-2 | | Building Services & Maintenance | 3 | 0 | 0 |

| Specialization in Environmental Engineering | | | | | | |
|---|---|---|---|---|---|---|
| Description | | This module will help in providing interdisciplinary knowledge and skills so that students can address environmental challenges, comply with environmental standards and contribute positively to society. | | | | |
| Courses and Credits required | | 3 courses and 9 credits | | | | |
| Course Category | | Course ID | Course Title | Contact Hours per week | | |
| | | | | L | T | P |
| SPC-1 (Core) | | | Solid Waste Management | 3 | 0 | 0 |
| SPC-2 (Core) | | | Air Pollution & Control | 3 | 0 | 0 |
| SPC-3 | Elective-1 | | Environmental Impact Assessment | 3 | 0 | 0 |
| | Elective-2 | | Industrial Waste Management | 3 | 0 | 0 |

# *ANNEXURE – II*

## *Syllabus for B.Tech Civil Engineering Second Semester 2024-25 admitted batch students*

## Course Code: 11241201

## Course Name: Surveying

| L | T | P | Credit |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objective:**

The course aims to provide knowledge of surveying instruments, techniques for distance, direction, and elevation measurement, field surveying, setting out works, and the application of curves and specialized surveying methods.

**SYLLABUS**

**Unit I Surveying Measurements:**

Introduction to surveying, their classification, methods and principles, Measurement of distance and direction. Introduction to Remote Sensing & LiDAR technology in Survey, Global Positioning System (GPS) and its application.

**Unit II Levelling & Contouring:**

Method of levelling, methods of reduction of level, Reciprocal and trigonometric levelling, Contouring and Plotting, Use of Contour maps, Measurement of area and volume.

**Unit III Tachometry & Traversing:**

Principles and Instruments used in Tachometry, Methods of Theodolite traversing, Plotting and Adjustment, Omitted measurement in traverse, Plane Table Suverying.

**Unit IV Curves:**

Curve surveying, their use, elements of circular curves, Methods of setting out curves, obstacles and special problems, compound curves, reverse curves, transition curves, vertical curve, computation and setting out.

**Unit V Surveying Techniques:**

Systems and Principles of Triangulation, Baseline measurement and its extension, Total Station and its application in surveying, Introduction to Aerial Survey using UAV/ Drones, Introduction to photogrammetry and hydrographic survey.

**Text Books:**

1. Surveying Vol. I, II, III, B.C. Punmia, Laxmi Publications New Delhi, 2016
2. Surveying Vol. I & II, K.R. Arora, Standard book House, New Delhi, 13th edition 2016
3. Surveying Volume – I & II, S. K. Duggal, McGraw Hill Publication, 2015

**Reference Books:**

1. Surveying theory & Practice, R.E. Devise, McGraw Hill, New York, 4th revised edition 2001
2. Fundamentals of surveying, S.K. Roy, Prentice Hall of India New Delhi, 2nd edition, 1999
3. Surveying & Levelling, N N Basak, McGraw Hill Publications, 2015
4. Plane & Geodetic surveying Vol. I & II, David Clark & J Clendinning, Constable & C. London, 2017

**Course Outcomes:**

Upon completion of the course, a student will be able to

**CO1: Explain** the techniques used for linear and angular measurements in surveying.

**CO2: Explain** the various concepts of levelling, contours and its application.

**CO3: Apply** various methods of surveying.

**CO4: Analyze** various techniques of controlling points.

**CO5: Evaluate** various methods for curve setting.

**Course Articulation Matrix**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | - | 1 | - | - | - | 2 | 2 | - | - | 2 | - | - |
| CO2 | 3 | 1 | - | 1 | - | - | - | 2 | 2 | - | - | 2 | - | - |
| CO3 | 3 | 2 | - | 1 | - | - | - | 2 | 2 | - | - | 3 | - | - |
| CO4 | 3 | 2 | - | 1 | - | - | - | 2 | 2 | - | - | 3 | - | - |
| CO5 | 3 | 2 | - | 1 | - | - | - | 2 | 2 | - | - | 3 | - | - |

1 - Slightly; 2 - Moderately; 3 – Substantially

## Course Code: 11241202

## Course Name: Strength of Material

| L | T | P | Credit |
|---|---|---|---|
| 2 | 1 | 0 | 3 |

**Course Objective:**

To understand the concepts of simple and compound stress & strain; behavior of elastic material in bending, shear and torsion; behavior of column with different end condition; stress and strain in pressure vessel; determine deflection in statically determinate structure

**SYLLABUS**

**Unit-I:**

**Stress and Strains:** Concept of Elastic body, stress and strain. Hooke's law various types of stress and strains. Elastic constants and their relation Stresses in compound bars, composite and tapering bars, temperature stresses.

**Unit-II:**

Two-dimensional stress system, Normal and tangential stresses, Principal Planes, Principal Stresses and strains, Mohr's circle of stresses, Strain energy and theories of failure.

**Unit-III:**

**Theory of simple bending:** Concept of pure bending and bending stress, equation of bending, Neutral axis, Section-Modulus, Bending stress distribution across a section, Shear Stresses in Beams, beams of uniform strength, shear centre.

**Unit-IV:**

**Torsion of Shafts:** Concept of pure torsion, Torsion equation, Determination of shear stress and angle of twist of shafts of circular section, Hollow circular shafts. Combined bending and torsion.

**Pressure Vessels:** Thin cylinders and spheres. Stress due to internal pressure. Change in diameter and volumes.

**Unit-V:**

**Columns and Struts:** Euler's buckling load for uniform section, various end conditions. Slenderness Ratio. Merchant Ranking formulae, Eccentric loading on columns.

**Text Books:**

1. Strength of Materials, Sadhu Singh, Khanna Publishing, 1st edition 2016
2. Strength of Materials, S. Ramamrutham, R. Narayanan, Dhanpat Rai Publishing Company, 18th edition 2014
3. Strength of Materials, R.K.Bansal, Laxmi Publication; 6th edition 2018

**Reference Books:**

1. Strength of Materials, Timoshenko, Publisher CBS, 3rd edition 2004
2. Strength of Materials, Higdon Style, Publisher Wiley, 3rd edition 1978

3. Strength of Materials Vol. I & II, B.C. Punmia, Laxmi Publication, 10th edition 2018
4. Mechanics of Materials, R.C. Hibbler, Pearson Publication, 2016
5. Mechanics of Materials, J.M. Gere & B.J. Goodno, Cengage Publisher,8th edition 2014

**Course Outcomes:**

Upon completion of the course, a student will be able to

**CO1: Apply** the concepts of simple stress and strain.

**CO1: Apply** the concepts of complex stress and strain.

**CO3: Apply** theory of simple bending in beams.

**CO4: Apply** the concept of pure torsion in shaft and determine the stresses in pressure vessels.

**CO5: Evaluate** columns & struts with different end conditions.

**Course Articulation Matrix**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 2 | - | - |
| CO2 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 2 | - | - |
| CO3 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 2 | - | - |
| CO4 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 2 | - | - |
| CO5 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 2 | - | - |

1 - Slightly; 2 - Moderately; 3 – Substantially

## Course Code: 11241203
## Course Name: Concrete Technology

| L | T | P | Credit |
|---|---|---|---|
| 2 | 1 | 0 | 3 |

**Course Objective:**

The course intends to provide students with a comprehensive understanding of the materials, mix design, properties, testing, and applications of concrete in construction.

**SYLLABUS**

**Unit-I Ingredients of Concrete:**

**Portland cement:** Chemical composition of cement, Hydration of cement.

**Cement:** Types of Portland cement as per IS and ASTM classification, Fly ash; use of pozzolanas.

**Aggregates:** General classification of aggregates, natural and artificial aggregates, particle shape and texture, bond of aggregate, strength of aggregate, Mechanical properties of aggregate, specific gravity, Bulk density, porosity and absorption of aggregate, moisture content of aggregate, Bulking of sand deleterious substances in aggregates, organic impurities. Soundness of aggregates.

**Admixtures:** Introduction, functions of admixtures, classification of admixtures, Accelerators, Retarders, Water Reducing Agents, Super plasticisers.

**Unit-II Fresh and Hardened Concrete:**

**Fresh Concrete:** Workability of concrete, factors affecting workability, measurement of workability using slump test, Compaction factor test, Flow test, Vee-Bee Test, Ball penetration test, Segregation and Bleeding of concrete, Mixing of concrete, Vibration of concrete, Different types of mixers and vibrators.

**Hardened Concrete:** Mechanical properties of concrete, Stress and strain characteristics of concrete, drying shrinkage of concrete, Creep of concrete, Permeability and durability of concrete, Fire resistance of concrete, Thermal properties of concrete.

**Unit-III Testing & Quality Control of Concrete:**

(a) Compression tests-cube test, Cylinder test, effect of end conditions on specimen and capping. Flexure test, splitting test, influence of size of specimen on strength, rebound hammer test, penetration resistance test, Pull-out-test, ultrasonic pulse velocity test.

(b) Field control for Quality of Concrete, Advantages of Quality Control, Statistical quality control, Measure of variability & its applications, Quality management in concrete construction.

**Unit-IV Concrete Mix Design:**

Basic considerations, factors in the choice of mix proportions, design of standard concrete mixes by IS code methods.

**Unit-V Special Concretes**:

High strength concrete, High performance concrete, Fibre reinforced concrete, Ready mixed concrete, Pumped concrete, mass concreting composites, Ferro cement, Light weight concrete, High density concrete, Cellular foam concrete, recent advances in concrete manufacturing.

**Books Recommended:**

1. Neville M. Properties of Concrete, ELBS, PHI Publishers
2. M.S Shetty, Concrete Technology, S. Chand Publishers
3. M.L Gambhir, Concrete Technology, McGraw Hill Publications
4. Varshney, Concrete Technology, Oxfiord Publications
5. Nawy E.G., Concrete Construction Engineering Hand Book, CRC Press
6. D.F. Orchard, Concrete Technology, App Science Publishers

**Course Outcomes**

Upon completion of the course, a student will be able to

**CO1**: **Explain** the basic components of concrete.

**CO2**: **Analyze** properties of fresh and hardened concrete.

**CO3**: **Apply** quality control measures in concrete construction.

**CO4**: **Design** concrete mixes using standard guidelines.

**CO5**: **Evaluate** the use of special concretes for advanced applications.

**Course Articulation Matrix**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | - | - | 2 | - | 2 | - | - | - | - | - | 2 | 2 | - |
| CO2 | 2 | 2 | 2 | 2 | - | 2 | - | - | - | - | - | 3 | 2 | - |
| CO3 | 2 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | 3 | 2 | - |
| CO4 | 3 | 2 | 3 | 2 | 2 | 2 | - | 2 | - | - | - | 3 | 3 | - |
| CO5 | 2 | 2 | 2 | 2 | - | 2 | - | - | - | - | - | 2 | 2 | - |

1 - Slightly; 2 - Moderately; 3 – Substantially

## Course Code: 11241204
## Course Name: Fluid Mechanics - I

| L | T | P | Credit |
|---|---|---|---|
| 2 | 1 | 0 | 3 |

**Course Objective:**

To provide a comprehensive understanding of fluid properties, fluid continuum, kinematics and dynamics of fluid flow, fluid measurement mechanisms, simulation and dimensional analysis methods, and the concepts of laminar flow, enabling students to apply these principles to various fluid flow problems.

**SYLLABUS**

**Unit I**

Review of Fluid Properties: Engineering units of measurement, density, specific weight, specific volume, specific gravity, surface tension, capillary, viscosity, bulk modulus of elasticity, pressure and vapour pressure.

Fluid Statics: Pressure at a point, pressure variation in static fluid, Absolute and gauge pressure, manometers, Forces on plane and curved surfaces (Problems – gravity dams and Tainter gates), buoyant force, Stability of floating and submerged bodies, Relative equilibrium.

**Unit II**

Kinematics of Flow: Types of flow-ideal & real, steady and unsteady, uniform & non-uniform, one, two and three dimensional flow, path lines, streamlines, streamlines and stream tubes, continuity equation for one and three dimensional flow, rotational &irrotational flow, circulation, stagnation point, separation of flow, sources & sinks, velocity potential, stream function, flownets-their utility & method of drawing flownets.

**Unit III**

Dynamics of Flow: Euler's equation of motion along a streamline and derivation of Bernoulli's equation, application of Bernoulli's equation, energy correction factor, linear momentum equation for steady flow, momentum equation, forces of fixed and moving vanes, velocity triangles.

Fluid Measurements: Velocity measurement, flow measurement (Orifices, nozzles, mouth pieces, orifice meter, Nozzle meter, venturimeter, weirs and notches).

**Unit IV**

Dimensional Analysis and Hydraulic Similitude: Dimensional analysis, dimensional homogeneity, use of Buckingham-pie theorem, calculation of dimensionless numbers, similarity laws, specific model investigations (submerged bodies, partially submerged bodies, weirs, spillways, etc.)

**Unit V**

Laminar Flow: Introduction to laminar, transition & turbulent flow, Reynolds experiment & Reynolds number, relation between shear & pressure gradient, laminar flow through circular pipes, laminar flow between parallel plates, laminar flow through porous media, stokes law, Bach wash processing, Instability of laminar flow to turbulent flow.

**Text Books:**

1. Fluid Mechanics, Modi & Seth, Standard Book House, Delhi, 21st edition, 2018.
2. Fluid mechanics, Girde & Mirazgaonkar, SCI Tech Publishers, 2019
3. Fluid Mechanics, R.K. Bansal, Laxmi Publishers, 2015

**Reference Books:**

1. Fluid Mechanics, A.K. Jain, Khanna Publishers, Delhi, 2014
2. Fluid Mechanics, Streeter, McGraw Hill Publishers, 9th edition, 2017

**Courses Outcomes**

Upon completion of the course, a student will be able to

**CO 1: Explain** fundamental fluid properties & concepts of fluid statics.
**CO 2: Apply** principles of fluid flow & dimensional analysis.
**CO 3: Solve** fluid flow problems.
**CO 4: Analyze** characteristics of fluid at rest, fluid at motion & dimensionless numbers.
**CO 5: Discriminate** different types of fluid flow, measurement techniques & principles.

**Course Articulation Matrix**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| CO2 | 2 | 2 | 1 | 2 | - | - | - | - | - | - | - | 2 | - | - |
| CO3 | 2 | 3 | 1 | 2 | - | - | - | - | - | - | - | 2 | - | - |
| CO4 | 2 | 3 | 1 | 2 | - | - | - | - | - | - | - | 2 | - | - |
| CO5 | 2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | - | - |

1 - Slightly; 2 - Moderately; 3 – Substantially

## Course Code: 11241205
## Course Name: Matrices & Calculus

| L | T | P | Credit |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objectives:**

- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of eigen values and eigenvectors and to reduce the quadratic form to canonical form
- To expose the concept of ordinary and partial differentiation
- Evaluation of improper integrals using Beta and Gamma functions.
- Finding maxima and minima of function of two and three variables.
- Evaluation of multiple integrals and their applications

**SYLLABUS**

**Unit I Matrices-I:**

Types of Matrix, Hermitian and skew Harmition matrix, unitary matrix, Matrix Rank of a matrix by Echelon Form and Normal Form, Inverse of Non-singular matrix by elementary transformation, solution of system of Homogeneous and non-homogeneous equations by elementary transformation, Consistency of equation.

**Unit II Matrices-II:**

Linear dependence of vectors, Eigen values and Eigenvectors with their properties, Cayley Hamilton theorem and its application to finding inverse of matrix, Diagonalization of a matrix

**Unit III Differential Calculus –I:**

nth Derivative ,Leibnitz's theorem, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables.

**Unit IV Differential calculus-II:**

Taylor's and Maclaurin's Theorems, Expansion of function of several variables, Jacobian, properties of Jacobian, Approximation of errors, Extrema of functions of several variables (Maxima and Minima of function of one and two variables), Lagrange's method of multipliers (Simple applications).

**Unit V Integral Calculus:**

Beta and Gamma function and its properties, transformation of Beta function, Gama functions, transformation of Gama function, relation between Beta and Gama function, Double and triple integrals, Change of order of integration, Application of Integration to Volumes and Surface areas.

**Recommended Books:**

1. E. Kreyszig: Advance Engineering Mathematics, John Wiley & Sons, 10th Edition (2011).
2. C.L Liu: Discrete Mathematics, 4th Edition 2012.

3. R. K. Jain, S. R. K. Iyengar: Advance Engineering Mathematics, Narosa Publishing House Pvt. Ltd, 5th Edition (2016).

4. F. B .Hildebrand: Advanced Calculus for application, Englewood Cliffs, N. J. Prentice- Hall, 2nd Edition (1980).

5. B. S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Edition (2015).

6. B.V. Ramanna: Higher Engineering Mathematics, McGraw Hill Education, 1st Edition (2017).

**Courses Outcomes:**

Upon completion of the course, a student will be able to

**CO 1. Solve** the problem of matrix.

**CO 2. Application** of various matrix in engineering problems.

**CO 3. Use** of differential calculus.

**CO 4. Apply** differential calculus in basic engineering problems.

**CO 5. Use** integration techniques to determine the solution of various complex problems.

**Course Articulation Matrix**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | 1 | - | - | - | - | - | - | - | - | - | - |
| CO2 | 3 | 2 | - | 1 | - | - | - | - | - | - | - | - | - | - |
| CO3 | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| CO4 | 3 | 2 | - | 1 | - | - | - | - | - | - | - | - | - | - |
| CO5 | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |

1 - Slightly; 2 - Moderately; 3 – Substantially

## Course Code: 11241206
## Course Name: Building Materials & Construction Lab

| L | T | P | Credit |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Laboratory Objectives:**

To provide students the practical knowledge of testing and assessing the properties of various building materials.

**LIST OF EXPERIMENT'S**

**I. TEST ON FINE AGGREGATES**

1. Gradation of aggregates.
2. Test for specific gravity.
3. Compacted and loose bulk density of fine aggregate.

**II. TEST ON COARSE AGGREGATE**

1. Determination of impact value of coarse aggregate.
2. Determination of elongation index
3. Determination of flakiness index
4. Determination of aggregate crushing value of coarse aggregate

**III. TEST ON CONCRETE**

1. Test for Slump
2. Test for Compaction factor
3. Test for Compressive strength - Cube & Cylinder

**IV. TEST ON BRICKS AND BLOCKS**

1. Test for compressive strength of bricks and blocks
2. Test for Water absorption of bricks and blocks
3. Determination of Efflorescence of bricks
4. Test on tiles

**Course Outcomes:**

Upon completion of the course, a student will be able to

**CO 1.** **Analyze** the properties of fine and coarse aggregates

**CO 2.** **Evaluate** concrete workability and strength

**CO 3.** **Assess** the quality of bricks and blocks for construction.

**CO 4.** **Understand** the durability and performance of building materials

**CO 5.** **Apply** testing knowledge to construction practices

**Course Articulation Matrix**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | - | - | - | 3 | - | 2 | - | 2 | 3 | - | - | 3 | - | - |
| CO2 | - | - | - | 3 | - | 2 | - | 2 | 3 | - | - | 3 | - | - |
| CO3 | - | - | - | 3 | - | 2 | - | 2 | 3 | - | - | 3 | - | - |
| CO4 | - | - | - | 3 | - | 2 | - | 2 | 3 | - | - | 3 | - | - |
| CO5 | - | - | - | 3 | - | 2 | - | 2 | 3 | - | - | 3 | - | - |

1 - Slightly; 2 - Moderately; 3 – Substantially

## Course Code: 11241207

## Course Name: Problem Solving through Python Programming

| L | T | P | Credit |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Objectives:**

- To apply various Python datatypes and Control Structure
- To Implement Classes and objects in Python
- To develop Python GUI.

**Unit I**

**Introduction to Python:** Setting up the Python environment (Anaconda, Jupyter Notebook), Basic syntax usage: variables, data types, and operators, First Python program, Control Structures: Conditional statements: if, elif, else, Looping constructs: for and while loops Nested control structures

**Unit II**

**List/ Set/ Tuple operations**: List, List Operations (Access, Slice, Append, Delete, Unpack, Loop etc), Tuple, Tuple operations ( Access, Append, Delete, Unpack, Loop, etc.), Set, Set Operations (Access, Append, Delete, Method, Loop, etc.), Dictionary (Access, Append, Delete, Methods, Loop, etc.), Array (Access, Append, Delete, Methods, Loop, etc.) Strings: Reverse, Palindrome, Character count, Replacing Character

**Unit III**

**Matrix and Array:** Define matrix and print, Arithmetic operation between Matrix,

**Functions and Modules implementation:** Defining and calling functions, Function parameters and return values, Scope and lifetime of variables, Importing and using modules, In-Built Functions, Recursion, Lambda function

**Unit IV**

**Classes, and Objects:** Create class and object, Self-parameter, Attribut and methods, Implement Inheritance and polymorphism.

**File Handling:** Read and write to files, Working with CSV and JSON file, Implement try-except blocks, Debug a piece of code

**Unit V**

**GUI:** Work with Canvas, draw geometric shapes, Fill colour, Creating Simple GUI, GUI packages, Tkinter, Buttons, Labels, Entry Fields, Dialogs; Widget Attributes - Sizes, Fonts, Colours, Layouts, Nested Frames, Widget window – Bg, Bd, Cursor, font, Fg, Command, Minimal Application

**Reference Books:**

- "Python for Data Science For Dummies" by John Paul Mueller and Luca Massaron
- "Python Machine Learning" by Sebastian Raschka and Vahid Mirjalili
- "Python Web Scraping Cookbook" by Michael Heydt
- "Python GUI Programming Cookbook" by Burkhard A.
- "Python for Finance" by Yves Hilpisch.

**List of Experiments:**

1. Python Program to
    a. Generate a Random Number
    b. Convert Kilometers to Miles
    c. Check if a Number is Positive, Negative or 0
    d. Print the Fibonacci sequence
    e. Find ASCII Value of Character
    f. Shuffle Deck of Cards
    g. Display Calendar
2. Python Program to
    a. Display the Fibonacci Sequence Using Recursion
    b. Find the Sum of Natural Numbers Using Recursion
    c. Find the Factorial of Number Using Recursion
    d. Convert Decimal to Binary Using Recursion
3. Python Program to Add Two Matrices, Transpose a Matrix, Multiply Two Matrices
4. Python Program to
    a. Check Whether a String is Palindrome or Not
    b. Remove Punctuations from a String
    c. Sort Words in Alphabetic Order
5. Python Program to Illustrate Different Set, Tuple, and List operations.
6. Python Program to Iterate Over Dictionaries Using for Loop
7. Python Program to Catch Multiple Exceptions in One Line
8. Python Program to Copy a File
9. Python Program to Get Line Count of a File
10. Python Program to Find All Files with .txt Extension Present Inside a Directory
11. Python Program to Return Multiple Values from a Function
12. Write a Python program to create a person class. Include attributes like name, country, and date of birth. Implement a method to determine the person's age
13. Write a Python program to create a class representing a bank. Include methods for managing customer accounts and transactions.
14. Write a Python program to create a class representing a shopping cart. Include methods for adding and removing items and calculating the total price.
15. Create Python GUI using Tkinter
    a. Displaying Text and Images with Label Widgets
    b. Displaying Clickable Buttons with Button Widgets
    c. Getting User Input with Entry Widgets
    d. Getting Multiline User Input with Text Widgets
    e. Assigning Widgets to Frames with Frame Widgets
    f. Adjusting Frame Appearance with Relief

**Course Outcomes:**

Upon completion of the course, a student will be able to

**CO1: Implement** Python built-in functions and control statements.

**CO2: Implement** Python user-defined functions and classes.

**CO3: Create** Python GUI.

**Course Articulation Matrix**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 1 | 3 | 1 | - | 1 | 2 | 1 | - | 3 | - | - |
| CO2 | 3 | 3 | 3 | 2 | 3 | 1 | - | 1 | 2 | 1 | - | 3 | - | - |
| CO3 | 2 | 2 | 3 | 3 | 3 | 1 | - | 1 | 2 | 3 | - | 3 | - | - |

1 - Slightly; 2 - Moderately; 3 – Substantially

## Course Code: 11241209
## Course Name: Micro Project – II

| L | T | P | Credit |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**LIST OF MICRO PROJECTS**

1. Calculation of Area by offset with reference to chain line.
2. Determine height of an object by trigonometrical levelling.
3. Traversing by Theodolite and tape.
4. Determine the distance between two inaccessible points by Prismatic/compass and tape.
5. Establish a regular pentagonal traverse by tape and Prismatic compass.
6. Conduct a profile levelling and cross-sectioning for a portion of proposed road.
7. Conduct a fly levelling to transfer Bench mark from one station point to another proposed station point.
8. Traversing by using Total station.
9. Locate building with respect to chain line by taking offsets.
10. Traversing by chain and Prismatic compass.
11. Study of Eco friendly self-compacted concrete.
12. Study of Eco friendly self-curing concrete.
13. Effect of ground water on concrete properties.
14. Study of ready mix concrete.
15. Design Mix of M-25 grade of concrete.
16. Design Mix of M-30 grade of concrete.
17. Design Mix of M-20 grade of concrete.
18. Comparative study on workability of different grade of concrete.
19. Study of pervious concrete.
20. Study of permeable concrete.
21. Use of ferro cement in concrete preparation.
22. Study of silica fume concrete.
23. Study of green concrete.
24. Non-Destructive testing of concrete
25. Study of light weight concrete.
26. Study of curing free concrete structure.
27. Study of fiber reinforced concrete.
28. Study of concrete workability using super plasticizers.
29. Study on durability of concrete in aggressive environments.

30. Investigation of the stability of floating objects, create charts comparing metacentric heights.
31. Study hydraulic similitude and scale modeling for different types of submerged bodies
32. Perform dimensional analysis for fluid systems like flow over spillways or pipe flow.
33. Study and classify flow regimes (laminar, transitional, and turbulent) for different engineering applications.
34. Analyze the variation of viscosity with temperature for different fluids and its impact on pipeline design.
35. Prepare a case study or report on how specific fluid properties (e.g., viscosity, surface tension, vapor pressure) influence the design of engineering systems like pipelines, pumps, or hydraulic systems.
36. Computation of capillary rise for different liquids in tubes of various diameters.
37. Develop an understanding of flow types and streamline behavior by visualizing the flow patterns and drawing streamlines.
38. Determine the impact of different material using Charpy impact test.
39. Determine the impact of differential material using Izod impact test.
40. Determine the tensile strength of different grade of steel and draw stress-strain curve.
41. Determine the compression strength of different grade of steel.
42. Evaluate the buckling strength of columns with different end conditions.
43. Determine the flexural stress in steel beam.
44. Determine the bending strength of simply supported beam using one point loading.
45. Determine the bending strength of simply supported beam using two point loading.

**Course Outcomes:**

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

**CO1**: **Develop** proficiency in surveying techniques for Infrastructure Layout and Analysis

**CO2**: **Analyze** the properties and performance of various concrete types and design sustainable concrete mixes to meet specific construction requirements.

**CO3**: **Evaluate** the properties of different materials.

**CO4**: **Analyze** fluid properties and flow behavior for engineering systems

**CO5**: **Develop** the writing skills to prepare reports.

**Course Articulation Matrix**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | - | 2 | 3 | - | - | 2 | 3 | - | - | 2 | - | - |
| CO2 | 2 | 2 | 2 | 2 | 2 | 3 | - | 2 | 3 | - | - | 3 | 3 | - |
| CO3 | 2 | 2 | - | 2 | 2 | - | - | 2 | 3 | - | - | 2 | - | - |
| CO4 | 2 | 3 | - | 2 | - | 2 | - | 2 | 3 | - | - | 2 | - | - |
| CO5 | - | - | - | - | - | - | - | - | - | 3 | - | - | - | - |

1 - Slightly; 2 - Moderately; 3 – Substantially

## Course Code: 11241210
## Course Name: Engineering Physics Lab

| L | T | P | Credit |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Objective:**
The main objective of the course is to enable the students to become familiar with the key areas of physics that are fundamental to emerging technologies and impart knowledge about Quantum mechanics, Lasers, Fiber Optics, Holography, Superconductor, Nano materials, Dielectric materials.

**Syllabus:**

**Unit I Quantum mechanics:**

Planck's quantum hypothesis, Wave-particle duality of radiation, de-Broglie matter waves, Compton effect, Phase and group velocity, Heisenberg uncertainty principle and its applications.

**Unit II Lasers:**

Properties of lasers, the basic process of lasers, Population-inversion, classification of lasers, working of He-Ne, Ruby, Nd: YAG and $CO_2$ lasers, Applications of Lasers in Communication, Medical and Industry.

**Unit III Fiber Optics:**

Light guidance through optical fibers, the qualitative idea of critical and acceptance angle, types of fibers, numerical aperture, V-Number, intermodal &material dispersions in fiber.

**UNIT IV Semiconductors & Nanomaterials**:

Semiconductor basics P type-N type, Fermi function, Junction Diodes, LED and its working principle, Transistor.

**Nanomaterials**: Basic principle of nanoscience and technology, Quantum confinement effect and applications and Properties of quantum dots and Carbon nanotubes, Two-dimensional materials, Metal nanoparticles.

**UNIT-V Dielectrics Materials:**

Polar and Non-Polar Dielectrics, Dipole moment and Polarization, Dielectric constant& Polarization, Relation between electric field vectors E, P and D. applications of dielectrics.

**Course Outcomes:**

Upon completion of the course the student will be able to:

**CO 1: Explain** the quantum physics and applies it to the behavior of a system at the microscopic level and solve the problems.

**CO 2**: **Interpret** the requirements classification, properties and application of laser.

**CO 3**: **Describe** the basic concepts about optical fibers.

**CO 4**: **Explain** the principle, types, properties and application of semiconductors and nano-materials.

**CO 5**: **Apply** the knowledge of characteristic of Dielectrics and Piezoelectric materials.

**Course Articulation Matrix:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | - | 1 | - | - | - | - | - | - | - | 1 | - | - |
| CO2 | 1 | - | - | - | - | - | - | - | - | - | - | 1 | - | - |
| CO3 | 1 | - | - | - | - | - | - | - | - | - | - | 1 | - | - |
| CO4 | 2 | 1 | - | 1 | 1 | - | - | - | - | - | - | 2 | - | - |
| CO5 | 2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | - | - |

1 - Slightly; 2 - Moderately; 3 – Substantially

**LIST OF EXPERIMENT'S**

At least 10 of the following experiments must be performed during the session.

| S. No. | Aim of experiment |
|---|---|
| 1 | To determine the specific charge (e/m) of an electron by Thomson method. |
| 2 | To measure the planks constant using light emitting diode. |
| 3 | To determine the energy band gap of a given sample material. |
| 4 | To measure the dielectric constant of a substance by resonance method. |
| 5 | To study and verify the outputs of various logic gates |
| 6 | To study the input and output characteristics of a transistor in common BASE/Emitter/collector (anyone) configuration |
| 7 | To study the V-I characteristics of semiconductor diode |
| 8 | To study V-I Characteristics of LED |
| 9 | To determine the numerical aperture of given optical fiber using optical fiber kit. |
| 10 | To determine the wavelength of laser light with laser educational kit. |
| 11 | To measure the optical power attenuation in the given optical fiber. |
| 12 | To determine the V-number of given optical fiber using optical fiber kit. |

**Lab Course Outcomes:** Upon completion of the course the student will be able to:

**CO 1: Develop** experimental skill required for application of physics in engineering.

**CO 2**: **Operate** different instruments specified in course safely and efficiently.

**CO 3**: **Demonstrate** the working principles in optics, semiconductors, Quantum Physics.

**CO 4**: **Function** as a member of a team for problem solving.

**Lab Course Articulation Matrix**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | - | - | 2 | 1 | - | - | - | - | 2 | - | 2 | - | - |
| CO2 | 1 | - | - | 1 | 2 | - | - | - | - | 2 | - | 1 | - | - |
| CO3 | 2 | - | - | 2 | 1 | - | - | - | - | 2 | - | 2 | - | - |
| CO4 | - | - | - | - | - | - | - | - | 3 | - | - | - | - | - |

1 - Slightly; 2 - Moderately; 3 – Substantially

## Course Code: 11241211
## Course Name: Language Lab

| L | T | P | Credit |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Objectives:**

- The course intends to build the required communication skills of the students to communicate effectively in real-life situations like starting a talk and be comfortable using English language.
- It aims at teaching students to appreciate English language through the study of scientific, creative, and academic text.
- The course is designed to acquaint students with structure of English language used in literature, functional varieties, figurative language, and verbal concomitance.
- The students are expected to enrich their knowledge of language, culture, and ethics through this course.

**Course Contents:**

**Unit I: Communication [CO1, CO2]**

Communication: Approaches, Elements, Verbal and Nonverbal Communication; Barriers to Communication; Johari Communication Window.

**Unit II: Listening [CO1, CO2]**

Listening: Factors Affecting Listening and Improving Listening.

**Unit III: Speaking: [CO2, CO3, CO5]**

Public Speaking & Delivering Presentation.

**Unit IV: Reading: [CO3, CO4, CO5]**

Reading Passages & Comprehension: Steps and Methods.

**Unit V: Writing: [CO4]**

Writing: Essentials of good writing; Drafting CV/biodata/Résumé)

***Reading Material for story and poetry is to be selected by concerned teacher in class.**

**Language Laboratory:**

The objective of the language lab is to expose students to a variety of listening and speaking drills. This would especially benefit students who are deficient in English and it also aims at confidence building for interviews and competitive examinations.

The Lab is to cover following syllabus.

1. Communication lab exercises as specified in Lab Manual
2. Listening skills (using Marc Hancock, CUP).
3. Speaking skills
4. Oral presentation.

**Laboratory Tasks:**

| **Lab Exercise No. 1**<br>**Listening** |
|---|
| Learning Objectives:<br>1. The student will learn the correct pronunciation and acquire knowledge English sound system.<br>2. The student will understand the need of learning proper pronunciation and its help in picking context and spellings.<br>3. He will get a pre hand knowledge of TOEFL and IELTS exams.<br>4. The student will learn to differentiate between hearing and listening.<br>5. The student will learn to listen and identify sound, pick context, infer meaning, and to retain the sound 'heard.' |
| Referred books and tools:<br>1. English Pronunciation in Use by Marc Hancock<br>2. Listening Exercises from English Pronunciation in Use by Marc Hancock or assigned by teacher taking class on spot.<br>3. Material will be selected by the teacher taking respective class and used as exercises. (A Sample exercise is appended at last)<br>4. Oxford Advanced Learner's Dictionary [free online version] |

| **Lab Exercise No. 2**<br>**Vocabulary Exercise**<br>**Word for Word** |
|---|
| Learning Objectives:<br>1. The student will learn to differentiate between words that look similar but are different in meaning and use.<br>2. The student will also learn to use such words in sentences so as to differentiate between these words. |
| Referred books and tools:<br>1. The exercise has been modelled on a book titled Word for Word by Clark Pointon published by OUP, India.<br>2. The students will also learn to form structures of a sentence. |

**Vocabulary Word for Word**

Student is required to distinguish between these set of words on following basis:

- Part of speech
- Pronunciation

- Meaning
- Usage – using them in sentences
- Synonym
- Antonym

**Lab Exercise No. 3**

**Speaking**

Learning Objectives:

1. The student will get hands on practice on delivering a short speech or a talk.
2. The student will develop confidence while speaking.

Presentation: 01

Guidelines for delivering the Project:

Students will have to deliver a 10 Minute presentation preferably on Power Point.

1. He will be judged on basis of Presentation rubrics available in shared document folder for I Year students.
2. They can choose a topic of their choice but the same should be from the syllabi—from any paper under study in I/II Semester/I Year
3. The students will have to communicate the same to the teacher in advance before delivering the same, and get the topic approved. The teacher can change, modify, and suggest one instead.
4. The students will be allowed to share their screen and present the same online in laboratory sessions and in additional classes as called by the teacher.
5. The marks/grades for the same will be displayed on their moodle portal.
6. All students will also be required to submit the PPT (preferable uploading the same on google drive shared folder for the purpose).
7. The said activity has to be completed before the teaching ends.

Book Review: 02

Guidelines for delivering the Project:

Students will have to review a book namely, a novella, a travelogue, a memoir, Science text from short-listed books.

1. He will have to deliver a Presentation, Oral/PPT as per individual choice, in a prescribed format either online or offline as decided by the respective teacher.
2. Student will also have to submit a written report based on that.
3. There will be online sessions for each class by the teacher assigned to teach branch.
4. The students will be allowed to share their screen and present the same online in laboratory sessions and in additional classes as called by the teacher.
5. The marks/grades for the same will be displayed on their moodle portal.
6. All students will also be required to submit the PPT or the written assignment in doc/jpeg/pdf format (preferable uploading the same on google drive shared folder for the purpose).

7. The said activity has to be completed before the teaching ends.
8. The lists of books adopted by the students have to be one from the lists allocated for the purpose.

Rationale:

1. This will give students a practice how to deliver presentations on a variety of topics in his/her core stream.

**Lab Exercise No. 4**

**Reading**

Learning Objectives:

1. The student will get hands on practice on skimming and scanning.
2. The student will also learn role of language in communicating Meanings.

Referred books and tools:

1. The student will be provided passages to read. This will include:
   a. A passage from Science/Engineering text
   b. A short Story
   c. A Poem
2. Material will be adapted in discussion with the student by the teacher.

Sample Examples Include:

1. Passage, The Language of Science (Open Source)
2. Story, Araby (James Joyce), The Fatalist (I B Singer), A Horse & Two Goats (R K Narayan) etc.
3. Poem / Song

Rationale:

1. The student will learn to differentiate how the use of words varies from a scientific to a literary text and how meanings are construed.

**Course Outcomes:**

Upon completion of the course the student will be able to:

**CO 1: Speak** clearly effectively and appropriately in a public forum to a variety of audiences and purposes. (LOT1)

**CO 2**: **Prepare** oral dialogues and arguments within the Engineering Profession effectively. (LOT2)

**CO 3**: **Demonstrate** knowledge and comprehension of major text and traditions in language as well as its social, cultural, and historical context. (LOT3)

**CO 4**: **Read** a variety of Text analytically to demonstrate in writing and/or speech the interpretation of texts. (HOT4)

**CO 5**: **Interpret** text written in English assessing the results in written and oral arguments using appropriate material for support. (LOT3)

**Reference Books:**

- Understanding Human Communication — By Ronald Alderman by OUP
- Communication Skills for Engineers — Pearson Education.
- Practical English Grammar by Thomson Martinet — Oxford University Press
- A Handbook of Language laboratory by P Sreekumar — Cambridge University Press.

**Course Articulation Matrix**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | - | - | - | - | - | - | - | - | - | 3 | - | - | - | - |
| CO2 | - | - | - | - | - | - | - | - | - | 3 | - | - | - | - |
| CO3 | - | - | - | - | - | - | - | - | - | 3 | - | - | - | - |
| CO4 | - | - | - | - | - | - | - | - | - | 3 | - | - | - | - |
| CO5 | - | - | - | - | - | - | - | - | - | 3 | - | - | - | - |

1 - Slightly; 2 - Moderately; 3 – Substantially

## Course Code: 11241212

## Course Name: Sustainability & Environmental Science

| L | T | P | Credit |
|---|---|---|---|
| 2 | 0 | 0 | GRADE |

**Course Objectives:**

To equip students with a comprehensive understanding of environmental science, pollution control, sustainability, and global frameworks, enabling them to analyze environmental challenges and contribute to sustainable solutions through informed decision-making and responsible practices.

**SYLLABUS**

**Unit I**

**Introduction to Environmental Science**: definition, importance and its components. Ecosystem and its components. Water cycle, carbon cycle, food chain, energy flow in ecosystem. Current state of environment in India and world; Underlying reasons (root causes) of modern environmental degradation (social, psychological, cultural). Introduction to Environmental pollution: air, water, noise, soil, thermal and radioactive.

**Unit II**

**Environmental Pollution and Management**: air, water, noise, soil, thermal and radioactive. Causes, impacts, pollution control techniques and mitigation strategies. Solid waste management: Principles of waste management, different components of waste management system and introduction to management of hazardous waste like e-waste, plastic waste. Global environmental Issues: Climate change, global warming, ozone layer depletion, urban heat island.

**Unit III**

**Environmental policies and laws in India**: Environmental Protection Act, Water Act, Air Act. **Overview of global environmental policies and frameworks**: Kyoto protocol, Montreal protocol, COP summits. Introduction to clean development mechanism, carbon credit, carbon trading. Environmental audit.

**Unit IV**

**Sustainability concepts**: definition, importance, pillars of sustainability (economic, environmental, and social). Sustainable development. Overview of UN Sustainable Development Goals (SDGs) and their global relevance. Concept of circular economy, resource efficiency, energy conservation, green buildings and sustainable manufacturing.

**Unit V**

**Sustainable Energy solutions**: New energy sources: need of new sources, different types of new energy sources, application of hydrogen energy, ocean energy sources, and tidal energy conversion. Concept, origin and power plant of geothermal energy. Renewable energy sources like water, wind etc. Overview of sustainable materials and construction practices. Introduction to sustainable transportation systems and sustainable water infrastructure.

**Course Outcomes:**

Upon completion of the course the student will be able to:

**CO 1: Explain** the fundamental concepts of environmental science, including ecosystems and the causes of environmental degradation.

**CO 2**: **Analyze** the sources, causes, and impacts of air, water, and solid waste pollution and propose appropriate mitigation strategies.

**CO 3**: **Evaluate** the effectiveness of environmental policies and global frameworks in addressing environmental challenges.

**CO 4**: **Explain** the concepts of sustainability and sustainable development goals.

**CO 5**: **Apply** various solutions for achieving sustainable development.

**Course Articulation Matrix**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | - | - | - | - | - | 1 | - | - | - | - | 1 | - | - |
| CO2 | 2 | 2 | 2 | - | - | - | 3 | - | - | - | - | 2 | - | - |
| CO3 | - | - | 1 | - | - | 2 | 2 | - | - | - | - | 2 | - | - |
| CO4 | - | - | - | - | - | - | 2 | - | - | - | - | 2 | - | - |
| CO5 | 2 | 2 | 2 | - | - | 1 | 3 | - | - | - | - | 2 | - | - |

1 - Slightly; 2 - Moderately; 3 – Substantially

**Reference Book**

1. D. K. Asthana, Meera Asthana, A Text Book of Environmental Studies, S Chand & Co., New Delhi.
2. S. K. Dhameja, Environmental Engineering & Management, S K Kataria & Sons, New Delhi
3. C. S. Rao, Environmental Pollution Control Engineering, C.S. Rao, New Age International Publishers
4. A. K. Gupta, Environmental Sustainability and Green Technologies, PHI Learning.

# *ANNEXURE – III*

## *Experiment List / List of Micro Project – II for B.Tech Civil Engineering Second Semester 2024-25 admitted batch students*

## Course Code: 11241206
## Course Name: Building Materials & Construction Lab

**LIST OF EXPERIMENT'S**

**I. TEST ON FINE AGGREGATES**

1. Gradation of aggregates.
2. Test for specific gravity.
3. Compacted and loose bulk density of fine aggregate.

**II. TEST ON COARSE AGGREGATE**

1. Determination of impact value of coarse aggregate.
2. Determination of elongation index
3. Determination of flakiness index
4. Determination of aggregate crushing value of coarse aggregate

**III. TEST ON CONCRETE**

1. Test for Slump
2. Test for Compaction factor
3. Test for Compressive strength - Cube & Cylinder

**IV. TEST ON BRICKS AND BLOCKS**

1. Test for compressive strength of bricks and blocks
2. Test for Water absorption of bricks and blocks
3. Determination of Efflorescence of bricks
4. Test on tiles

**Course Outcomes:**

Upon completion of the course, a student will be able to

- **CO 1.** **Analyze** the properties of fine and coarse aggregates
- **CO 2.** **Evaluate** concrete workability and strength
- **CO 3.** **Assess** the quality of bricks and blocks for construction.
- **CO 4.** **Understand** the durability and performance of building materials
- **CO 5.** **Apply** testing knowledge to construction practices

## Course Code: 11241207
## Course Name: Problem Solving through Python Programming

### LIST OF EXPERIMENT'S

1. Python Program to
    a. Generate a Random Number
    b. Convert Kilometers to Miles
    c. Check if a Number is Positive, Negative or 0
    d. Print the Fibonacci sequence
    e. Find ASCII Value of Character
    f. Shuffle Deck of Cards
    g. Display Calendar
2. Python Program to
    a. Display the Fibonacci Sequence Using Recursion
    b. Find the Sum of Natural Numbers Using Recursion
    c. Find the Factorial of Number Using Recursion
    d. Convert Decimal to Binary Using Recursion
3. Python Program to Add Two Matrices, Transpose a Matrix, Multiply Two Matrices
4. Python Program to
    a. Check Whether a String is Palindrome or Not
    b. Remove Punctuations from a String
    c. Sort Words in Alphabetic Order
5. Python Program to Illustrate Different Set, Tuple, and List operations.
6. Python Program to Iterate Over Dictionaries Using for Loop
7. Python Program to Catch Multiple Exceptions in One Line
8. Python Program to Copy a File
9. Python Program to Get Line Count of a File
10. Python Program to Find All Files with .txt Extension Present Inside a Directory
11. Python Program to Return Multiple Values from a Function
12. Write a Python program to create a person class. Include attributes like name, country, and date of birth. Implement a method to determine the person's age
13. Write a Python program to create a class representing a bank. Include methods for managing customer accounts and transactions.
14. Write a Python program to create a class representing a shopping cart. Include methods for adding and removing items and calculating the total price.
15. Create Python GUI using Tkinter
    a. Displaying Text and Images with Label Widgets
    b. Displaying Clickable Buttons with Button Widgets
    c. Getting User Input with Entry Widgets
    d. Getting Multiline User Input with Text Widgets
    e. Assigning Widgets to Frames with Frame Widgets
    f. Adjusting Frame Appearance with Relief

**Course Outcomes:**

Upon completion of the course, a student will be able to

**CO1: Implement** Python built-in functions and control statements.

**CO2: Implement** Python user-defined functions and classes.

**CO3: Create** Python GUI.

## Course Code: 11241209

## Course Name: Micro Project – II

**LIST OF MICRO PROJECTS**

1. Calculation of Area by offset with reference to chain line.
2. Determine height of an object by trigonometrical levelling.
3. Traversing by Theodolite and tape.
4. Determine the distance between two inaccessible points by Prismatic/compass and tape.
5. Establish a regular pentagonal traverse by tape and Prismatic compass.
6. Conduct a profile levelling and cross-sectioning for a portion of proposed road.
7. Conduct a fly levelling to transfer Bench mark from one station point to another proposed station point.
8. Traversing by using Total station.
9. Locate building with respect to chain line by taking offsets.
10. Traversing by chain and Prismatic compass.
11. Study of Eco friendly self-compacted concrete.
12. Study of Eco friendly self-curing concrete.
13. Effect of ground water on concrete properties.
14. Study of ready mix concrete.
15. Design Mix of M-25 grade of concrete.
16. Design Mix of M-30 grade of concrete.
17. Design Mix of M-20 grade of concrete.
18. Comparative study on workability of different grade of concrete.
19. Study of pervious concrete.
20. Study of permeable concrete.
21. Use of ferro cement in concrete preparation.
22. Study of silica fume concrete.
23. Study of green concrete.
24. Non-Destructive testing of concrete
25. Study of light weight concrete.
26. Study of curing free concrete structure.
27. Study of fiber reinforced concrete.
28. Study of concrete workability using super plasticizers.
29. Study on durability of concrete in aggressive environments.

30. Investigation of the stability of floating objects, create charts comparing metacentric heights.
31. Study hydraulic similitude and scale modeling for different types of submerged bodies
32. Perform dimensional analysis for fluid systems like flow over spillways or pipe flow.
33. Study and classify flow regimes (laminar, transitional, and turbulent) for different engineering applications.
34. Analyze the variation of viscosity with temperature for different fluids and its impact on pipeline design.
35. Prepare a case study or report on how specific fluid properties (e.g., viscosity, surface tension, vapor pressure) influence the design of engineering systems like pipelines, pumps, or hydraulic systems.
36. Computation of capillary rise for different liquids in tubes of various diameters.
37. Develop an understanding of flow types and streamline behavior by visualizing the flow patterns and drawing streamlines.
38. Determine the impact of different material using Charpy impact test.
39. Determine the impact of differential material using Izod impact test.
40. Determine the tensile strength of different grade of steel and draw stress-strain curve.
41. Determine the compression strength of different grade of steel.
42. Evaluate the buckling strength of columns with different end conditions.
43. Determine the flexural stress in steel beam.
44. Determine the bending strength of simply supported beam using one point loading.
45. Determine the bending strength of simply supported beam using two point loading.

**Course Outcomes:**

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

**CO1**: **Develop** proficiency in surveying techniques for Infrastructure Layout and Analysis

**CO2**: **Analyze** the properties and performance of various concrete types and design sustainable concrete mixes to meet specific construction requirements.

**CO3**: **Evaluate** the properties of different materials.

**CO4**: **Analyze** fluid properties and flow behavior for engineering systems

**CO5**: **Develop** the writing skills to prepare reports.

# Course Code: 11241210
# Course Name: Engineering Physics Lab

## LIST OF EXPERIMENT'S

At least 10 of the following experiments must be performed during the session.

| S. No. | Aim of experiment |
|---|---|
| 1 | To determine the specific charge (e/m) of an electron by Thomson method. |
| 2 | To measure the planks constant using light emitting diode. |
| 3 | To determine the energy band gap of a given sample material. |
| 4 | To measure the dielectric constant of a substance by resonance method. |
| 5 | To study and verify the outputs of various logic gates |
| 6 | To study the input and output characteristics of a transistor in common BASE/Emitter/collector (anyone) configuration |
| 7 | To study the V-I characteristics of semiconductor diode |
| 8 | To study V-I Characteristics of LED |
| 9 | To determine the numerical aperture of given optical fiber using optical fiber kit. |
| 10 | To determine the wavelength of laser light with laser educational kit. |
| 11 | To measure the optical power attenuation in the given optical fiber. |
| 12 | To determine the V-number of given optical fiber using optical fiber kit. |

**Course Outcomes:** Upon completion of the course the student will be able to:

**CO 1: Develop** experimental skill required for application of physics in engineering.

**CO 2**: **Operate** different instruments specified in course safely and efficiently.

**CO 3**: **Demonstrate** the working principles in optics, semiconductors, Quantum Physics.

**CO 4**: **Function** as a member of a team for problem solving.

# Course Code: 11241211
# Course Name: Language Lab

**LIST OF TASK'S**

| **Lab Exercise No. 1**<br>**Listening** |
|---|
| Learning Objectives:<br>1. The student will learn the correct pronunciation and acquire knowledge English sound system.<br>2. The student will understand the need of learning proper pronunciation and its help in picking context and spellings.<br>3. He will get a pre hand knowledge of TOEFL and IELTS exams.<br>4. The student will learn to differentiate between hearing and listening.<br>5. The student will learn to listen and identify sound, pick context, infer meaning, and to retain the sound 'heard.' |
| Referred books and tools:<br>1. English Pronunciation in Use by Marc Hancock<br>2. Listening Exercises from English Pronunciation in Use by Marc Hancock or assigned by teacher taking class on spot.<br>3. Material will be selected by the teacher taking respective class and used as exercises. (A Sample exercise is appended at last)<br>4. Oxford Advanced Learner's Dictionary [free online version] |

| **Lab Exercise No. 2**<br>**Vocabulary Exercise**<br>**Word for Word** |
|---|
| Learning Objectives:<br>1. The student will learn to differentiate between words that look similar but are different in meaning and use.<br>2. The student will also learn to use such words in sentences so as to differentiate between these words. |
| Referred books and tools:<br>1. The exercise has been modelled on a book titled Word for Word by Clark Pointon published by OUP, India.<br>2. The students will also learn to form structures of a sentence. |

**Vocabulary Word for Word**

Student is required to distinguish between these set of words on following basis:

- Part of speech
- Pronunciation

- Meaning
- Usage – using them in sentences
- Synonym
- Antonym

**Lab Exercise No. 3**

**Speaking**

Learning Objectives:

1. The student will get hands on practice on delivering a short speech or a talk.
2. The student will develop confidence while speaking.

Presentation: 01

Guidelines for delivering the Project:

Students will have to deliver a 10 Minute presentation preferably on Power Point.

1. He will be judged on basis of Presentation rubrics available in shared document folder for I Year students.
2. They can choose a topic of their choice but the same should be from the syllabi—from any paper under study in I/II Semester/I Year
3. The students will have to communicate the same to the teacher in advance before delivering the same, and get the topic approved. The teacher can change, modify, and suggest one instead.
4. The students will be allowed to share their screen and present the same online in laboratory sessions and in additional classes as called by the teacher.
5. The marks/grades for the same will be displayed on their moodle portal.
6. All students will also be required to submit the PPT (preferable uploading the same on google drive shared folder for the purpose).
7. The said activity has to be completed before the teaching ends.

Book Review: 02

Guidelines for delivering the Project:

Students will have to review a book namely, a novella, a travelogue, a memoir, Science text from short-listed books.

1. He will have to deliver a Presentation, Oral/PPT as per individual choice, in a prescribed format either online or offline as decided by the respective teacher.
2. Student will also have to submit a written report based on that.
3. There will be online sessions for each class by the teacher assigned to teach branch.
4. The students will be allowed to share their screen and present the same online in laboratory sessions and in additional classes as called by the teacher.
5. The marks/grades for the same will be displayed on their moodle portal.
6. All students will also be required to submit the PPT or the written assignment in doc/jpeg/pdf format (preferable uploading the same on google drive shared folder for the purpose).
7. The said activity has to be completed before the teaching ends.

| |
|---|
| 8. The lists of books adopted by the students have to be one from the lists allocated for the purpose. |
| Rationale:<br>1. This will give students a practice how to deliver presentations on a variety of topics in his/her core stream. |

| **Lab Exercise No. 4**<br>**Reading** |
|---|
| Learning Objectives:<br>1. The student will get hands on practice on skimming and scanning.<br>2. The student will also learn role of language in communicating Meanings. |
| Referred books and tools:<br>1. The student will be provided passages to read. This will include:<br>a. A passage from Science/Engineering text<br>b. A short Story<br>c. A Poem<br>2. Material will be adapted in discussion with the student by the teacher.<br>Sample Examples Include:<br>1. Passage, The Language of Science (Open Source)<br>2. Story, Araby (James Joyce), The Fatalist (I B Singer), A Horse & Two Goats (R K Narayan) etc.<br>3. Poem / Song |
| Rationale:<br>1. The student will learn to differentiate how the use of words varies from a scientific to a literary text and how meanings are construed. |

**Course Outcomes:**

Upon completion of the course the student will be able to:

**CO 1: Speak** clearly effectively and appropriately in a public forum to a variety of audiences and purposes. (LOT1)

**CO 2**: **Prepare** oral dialogues and arguments within the Engineering Profession effectively. (LOT2)

**CO 3**: **Demonstrate** knowledge and comprehension of major text and traditions in language as well as its social, cultural, and historical context. (LOT3)

**CO 4**: **Read** a variety of Text analytically to demonstrate in writing and/or speech the interpretation of texts. (HOT4)

**CO 5**: **Interpret** text written in English assessing the results in written and oral arguments using appropriate material for support. (LOT3)

# *ANNEXURE – IV*

## *Scheme structure for PG Programmes (M.E. CTM & M.Tech Environmental Engineering) Second Semester 2024-25 admitted batch students*

# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

**(Deemed University)**

**(Declared Under Distinct Category by Ministry of Education, Government of India)**

NAAC Accredited with A++ Grade

## Department of Civil Engineering

## Scheme of Evaluation

## M. E. I Semester *(Construction Technology & Management)*

***(for batch admitted in academic session 2024-25)***

| S. No. | Course Code | Category Code | Course Name | Maximum Marks Allotted | | | | | | Total Marks | Contact Hours per week | | | Total Credits | Mode of Learning | Mode of Major Evaluation | Duration of Major Evaluation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Block | | | | Practical Block | | | | | | | | | |
| | | | | Continuous Evaluation | | | Major Evaluation | Continuous Evaluation | Major Evaluation | | L | T | P | | | | |
| | | | | Minor Evaluation I | Minor Evaluation II | Quiz/ Assignment | | Lab Work & Sessional | | | | | | | | | |
| 1. | 51241101 | DC | Computational Techniques | 20 | 20 | 30 | 30 | - | - | 100 | 3 | - | - | 3 | Face to Face | PP | 2 Hrs |
| 2. | 51241102 | DC | Construction Project Management | 20 | 20 | 30 | 30 | - | - | 100 | 2 | 1 | - | 3 | Face to Face | PP | 2 Hrs |
| 3. | 51241103 | DC | Construction Materials, Machines & Techniques | 20 | 20 | 30 | 30 | - | - | 100 | 2 | 1 | - | 3 | Face to Face | PP | 2 Hrs |
| 4. | 5124111XX | DE | Departmental Elective (DE-1) | 20 | 20 | 30 | 30 | - | - | 100 | 3 | - | - | 3 | Face to Face | PP | 2 Hrs |
| 5. | 51241104 | SPC | Management Theory (SPC-1) | 20 | 20 | 30 | 30 | - | - | 100 | 3 | - | - | 3 | Face to Face | PP | 2 Hrs |
| 6. | 51241105 | DLC | Materials Lab [#] | - | - | - | - | 70 | 30 | 100 | - | - | 4 | 2 | Experiential | SO | - |
| 7. | 51241106 | SLP | Seminar/Presentation[$] | - | - | - | - | 70 | 30 | 100 | - | - | 4 | 2 | Mentoring | SO | - |
| 8. | 51241111 | NEC | Classified Novel Engaging Course (Activity Based Learning) MS Project & Excel | - | - | - | - | - | 50 | 50 | - | 1 | - | 1 | Interactive | SO | - |
| Total | | | | 100 | 100 | 150 | 150 | 140 | 110 | 750 | 13 | 03 | 08 | 20 | - | - | - |

**MCQ:** Multiple Choice Question **PP:** Pen Paper **SO:** Submission + Oral **OB:** Open Book

[#] During lab, students have to perform practical/assignments/minor projects related to the courses of respective semester using recent technologies / languages / tools etc.

[$] Seminar/Presentation through SWAYAM / NPTEL (Registration in a course will be compulsory for students but assessment will be based on internal seminar presentation).

| DE-1 | | |
|---|---|---|
| S. No. | Course Code | Course Name |
| 1. | 51241107 | Maintenance Management |
| 2. | 51241108 | Infrastructure Development |
| 3. | 51241109 | Formwork for Concrete Structures |
| 4. | 51241110 | Environmental Auditing & Management Systems |

| Mode of Learning | | | | | Mode of Examination | | | | | Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| Theory | | Lab | | NEC | Theory | | | Lab | NEC | |
| Face to Face | Online | Mentoring | Experiential | Interactive | PP | MCQ | OB | SO | SO | |
| 15 | | 2 | 2 | 1 | 15 | | | 4 | 1 | 20 |
| 75% | | 10% | 10% | 5% | 75% | | | 20% | 5% | Credits % |

# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

**(Deemed University)**

**(Declared Under Distinct Category by Ministry of Education, Government of India)**

NAAC Accredited with A++ Grade

## Department of Civil Engineering

## Scheme of Evaluation

## M. E. II Semester *(Construction Technology & Management)*

***(for batch admitted in academic session 2024-25)***

| S. No. | Course Code | Category Code | Course Name | Maximum Marks Allotted | | | | | | | | Total Marks | Contact Hours per week | | | Total Credits | Mode of Learning | Mode of Major Evaluation | Duration of Major Evaluation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Block | | | | Practical Block | | MOOCs | | | | | | | | | |
| | | | | Continuous Evaluation | | | Major Evaluation | Continuous Evaluation | Major Evaluation | Assignment | Exam | | L | T | P | | | | |
| | | | | Minor Evaluation I | Minor Evaluation II | Quiz/ Assignment | | Lab Work & Sessional | | | | | | | | | | | |
| 1. | 51241201 | DC | Project Economics & Financing | 20 | 20 | 30 | 30 | - | - | - | - | 100 | 3 | - | - | 3 | Face to Face | PP | 2 Hrs |
| 2. | 51241202 | DC | Construction Cost Management | 20 | 20 | 30 | 30 | - | - | - | - | 100 | 2 | 1 | - | 3 | Face to Face | PP | 2 Hrs |
| 3. | 51241203 | DC | Contract Management | 20 | 20 | 30 | 30 | - | - | - | - | 100 | 2 | 1 | - | 3 | Face to Face | PP | 2 Hrs |
| 4. | 512412XX | DE | **Departmental Elective[*] (DE-2)** | - | - | - | - | - | - | 25 | 75 | 100 | 3 | - | - | 3 | Online | MCQ | 3 Hrs |
| 5. | 51241204 | SPC | Repair, Rehabilitation & Retrofitting of Structures **(SPC-2)** | 20 | 20 | 30 | 30 | - | - | - | - | 100 | 2 | 1 | - | 3 | Face to Face | PP | 2 Hrs |
| 6. | 51241205 | DLC | **Computational Lab [#]** | - | - | - | - | 70 | 30 | - | - | 100 | - | - | 4 | 2 | Experiential | SO | - |
| 7. | 51241206 | SLP | **Seminar/Presentation[$]** | - | - | - | - | 70 | 30 | - | - | 100 | - | - | 4 | 2 | Mentoring | SO | - |
| 8. | 51241207 | NEC | **Classified Novel Engaging Course (Activity Based Learning)** Fire Safety & Regulation in Building | - | - | - | - | - | 50 | - | - | 50 | - | 1 | - | 1 | Interactive | SO | - |
| **Total** | | | | **80** | **80** | **120** | **120** | **140** | **110** | **25** | **75** | **750** | **12** | **04** | **08** | **20** | - | - | - |

**MCQ:** Multiple Choice Question **PP:** Pen Paper **SO:** Submission + Oral **OB:** Open Book

[*] This course will run through SWAYAM / NPTEL /MOOC based learning platform (with credit transfer facility). The course can be related & relevant to other domain as well.

[#] During lab, students have to perform practical/assignments/minor projects related to the courses of respective semester using recent technologies / languages / tools etc.

[$] Seminar/Presentation through SWAYAM / NPTEL (Registration in a course will be compulsory for students but assessment will be based on internal seminar presentation).

| **DE-2[*]** *(through SWAYAM / NPTEL /MOOC)* | | |
|---|---|---|
| **S. No.** | **Course Code** | **Course Name** |
| 1. | 51241208 | Strategies for Sustainable Design |

| Mode of Learning | | | | | Mode of Examination | | | | | Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| Theory | | Lab | | NEC | Theory | | | Lab | NEC | |
| Face to Face | Online | Mentoring | Experiential | Interactive | PP | MCQ | OB | SO | SO | |
| 12 | 3 | 2 | 2 | 1 | 12 | 3 | | 4 | 1 | 20 |
| 60% | 15% | 10% | 10% | 5% | 60% | 15% | | 20% | 5% | Credits % |

Recommended in the Board of Studies Meeting of Department of Civil Engineering held on 9 Dec 2024

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## Department of Civil Engineering

## Scheme of Evaluation

## M. E. III Semester *(Construction Technology & Management)*

***(for batch admitted in academic session 2024-25)***

| S. No. | Course Code | Category Code | Course Name | Maximum Marks Allotted | | | | | | Total Marks | Contact Hours per week | | | Total Credits | Mode of Learning | Mode of Major Evaluation | Duration of Major Evaluation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Block | | | | Practical Block | | | | | | | | | |
| | | | | Continuous Evaluation | | | Major Evaluation | Continuous Evaluation | Major Evaluation | | L | T | P | | | | |
| | | | | Minor Evaluation I | Minor Evaluation II | Quiz/ Assignment | | Lab Work & Sessional | | | | | | | | | |
| I. | 51242101 | DLC | **Preliminary Dissertation** *(Literature Review/ Problem Foundation/ Synopsis/ survey paper, etc.)* | - | - | - | - | 175 | 75 | 250 | - | - | 28 | 14 | Interactive | SO | - |
| **Total** | | | | - | - | - | - | 175 | 75 | 250 | - | - | 28 | 14 | - | - | - |

# Scheme of Evaluation
## M. E. IV Semester *(Construction Technology & Management)*

*(for batch admitted in academic session 2024-25)*

| S. No. | Course Code | Category Code | Course Name | Maximum Marks Allotted | | | | | | Total Marks | Contact Hours per week | | | Total Credits | Mode of Learning | Mode of Major Evaluation | Duration of Major Evaluation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Block | | | | Practical Block | | | | | | | | | |
| | | | | Continuous Evaluation | | | Major Evaluation | Continuous Evaluation | Major Evaluation | | L | T | P | | | | |
| | | | | Minor Evaluation I | Minor Evaluation II | Quiz/ Assignment | | Lab Work & Sessional | | | | | | | | | |
| 1. | 51242201 | DLC | Dissertation | - | - | - | - | 350 | 150 | 500 | - | - | 32 | 16 | Interactive | SO | - |
| Total | | | | - | - | - | - | 350 | 150 | 500 | - | - | 32 | 16 | - | - | - |

# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
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# Department of Civil Engineering
# Scheme of Evaluation
## M. Tech. I Semester *(Environmental Engineering)* *(for batch admitted in academic session 2024-25)*

| S. No. | Course Code | Category Code | Course Name | Maximum Marks Allotted | | | | | | Total Marks | Contact Hours per week | | | Total Credits | Mode of Learning | Mode of Major Evaluation | Duration of Major Evaluation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Block | | | | Practical Block | | | | | | | | | |
| | | | | Continuous Evaluation | | | Major Evaluation | Continuous Evaluation | Major Evaluation | | | | | | | | |
| | | | | Minor Evaluation I | Minor Evaluation II | Quiz/ Assignment | | Lab Work & Sessional | | | L | T | P | | | | |
| 1. | 53241101 | DC | Environmental Chemistry & Microbiology | 20 | 20 | 30 | 30 | - | - | 100 | 3 | - | - | 3 | Face to Face | PP | 2 Hrs |
| 2. | 53241102 | DC | Solid Waste Management | 20 | 20 | 30 | 30 | - | - | 100 | 2 | 1 | - | 3 | Face to Face | PP | 2 Hrs |
| 3. | 53241103 | DC | Advanced Treatment Process – I (Waste Water Engineering) | 20 | 20 | 30 | 30 | - | - | 100 | 2 | 1 | - | 3 | Face to Face | PP | 2 Hrs |
| 4. | 532411XX | DE | Departmental Elective (DE-1) | 20 | 20 | 30 | 30 | - | - | 100 | 3 | - | - | 3 | Face to Face | PP | 2 Hrs |
| 5. | 53241104 | SPC | Urban Water Infrastructure (SPC-1) | 20 | 20 | 30 | 30 | - | - | 100 | 3 | - | - | 3 | Face to Face | PP | 2 Hrs |
| 6. | 53241105 | DLC | Environmental Engineering Lab* | - | - | - | - | 70 | 30 | 100 | - | - | 4 | 2 | Experiential | SO | - |
| 7. | 53241106 | SLP | Seminar/Presentation$ | - | - | - | - | 70 | 30 | 100 | - | - | 4 | 2 | Mentoring | SO | - |
| 8. | 53241111 | NEC | Classified Novel Engaging Course (Activity Based Learning) MS Project & Excel | - | - | - | - | - | 50 | 50 | - | 1 | - | 1 | Interactive | SO | - |
| Total | | | | 100 | 100 | 150 | 150 | 140 | 110 | 750 | 13 | 03 | 08 | 20 | - | - | - |

MCQ: Multiple Choice Question PP: Pen Paper SO: Submission + Oral OB: Open Book

* During lab, students have to perform practical/assignments/minor projects related to the courses of respective semester using recent technologies / languages / tools etc.

$ Seminar/Presentation through SWAYAM / NPTEL (Registration in a course will be compulsory for students but assessment will be based on internal seminar presentation).

| DE-1 | | |
|---|---|---|
| S. No. | Course Code | Course Name |
| 1. | 53241107 | Industrial Waste Management |
| 2. | 53241108 | Hazardous Waste Management |
| 3. | 53241109 | Environmental Auditing & Management System |
| 4. | 53241110 | Maintenance Management |

| Mode of Learning | | | | | Mode of Examination | | | | | Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| Theory | | Lab | | NEC | Theory | | | Lab | NEC | |
| Face to Face | Online | Mentoring | Experiential | Interactive | PP | MCQ | OB | SO | SO | |
| 15 | | 2 | 2 | 1 | 15 | | | 4 | 1 | 20 |
| 75% | | 10% | 10% | 5% | 75% | | | 20% | 5% | Credits % |

# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
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## Department of Civil Engineering
## Scheme of Evaluation
## M. Tech. II Semester *(Environmental Engineering)* *(for batch admitted in academic session 2024-25)*

| S. No. | Course Code | Category Code | Course Name | Maximum Marks Allotted | | | | | | | | Total Marks | Contact Hours per week | | | Total Credits | Mode of Learning | Mode of Major Evaluation | Duration of Major Evaluation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Block | | | | Practical Block | | MOOCs | | | | | | | | | |
| | | | | Continuous Evaluation | | | Major Evaluation | Continuous Evaluation | Major Evaluation | Assignment | Exam | | L | T | P | | | | |
| | | | | Minor Evaluation I | Minor Evaluation II | Quiz/ Assignment | | Lab Work & Sessional | | | | | | | | | | | |
| 1. | 53241201 | DC | Air Pollution & Control | 20 | 20 | 30 | 30 | - | - | - | - | 100 | 3 | - | - | 3 | Face to Face | PP | 2 Hrs |
| 2. | 53241202 | DC | Advanced Treatment Process – II (Water Supply Engineering) | 20 | 20 | 30 | 30 | - | - | - | - | 100 | 2 | 1 | - | 3 | Face to Face | PP | 2 Hrs |
| 3. | 53241203 | DC | Environmental Impact Assessment | 20 | 20 | 30 | 30 | - | - | - | - | 100 | 2 | 1 | - | 3 | Face to Face | PP | 2 Hrs |
| 4. | 532412XX | DE | **Departmental Elective* (DE-2)** | - | - | - | - | - | - | 25 | 75 | 100 | 3 | - | - | 3 | Online | MCQ | 3 Hrs |
| 5. | 53241204 | SPC | Emerging technologies for Environmental Management **(SPC-2)** | 20 | 20 | 30 | 30 | - | - | - | - | 100 | 2 | 1 | - | 3 | Face to Face | PP | 2 Hrs |
| 6. | 53241205 | DLC | Advanced Environmental Engineering Lab^ | - | - | - | - | 70 | 30 | - | - | 100 | - | - | 4 | 2 | Experiential | SO | - |
| 7. | 53241206 | SLP | **Seminar/Presentation$** | - | - | - | - | 70 | 30 | - | - | 100 | - | - | 4 | 2 | Mentoring | SO | - |
| 8. | 53241207 | NEC | **Classified Novel Engaging Course (Activity Based Learning)** Fire Safety & Regulation in Building | - | - | - | - | - | 50 | - | - | 50 | - | 1 | - | 1 | Interactive | SO | - |
| **Total** | | | | **80** | **80** | **120** | **120** | **140** | **110** | **25** | **75** | **750** | **12** | **04** | **08** | **20** | - | - | - |

**MCQ:** Multiple Choice Question **PP:** Pen Paper **SO:** Submission + Oral **OB:** Open Book

* This course will run through SWAYAM / NPTEL /MOOC based learning platform (with credit transfer facility). The course can be related & relevant to other domain as well.

^ During lab, students have to perform practical/assignments/minor projects related to the courses of respective semester using recent technologies / languages / tools etc.

$ Seminar/Presentation through SWAYAM / NPTEL (Registration in a course will be compulsory for students but assessment will be based on internal seminar presentation).

| **DE-2*** *(through SWAYAM / NPTEL /MOOC)* | | |
|---|---|---|
| **S. No.** | **Course Code** | **Course Name** |
| 1. | 53241208 | Plastic Waste Management |

| Mode of Learning | | | | | Mode of Examination | | | | | Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| Theory | | Lab | | NEC | Theory | | | Lab | NEC | |
| Face to Face | Online | Mentoring | Experiential | Interactive | PP | MCQ | OB | SO | SO | |
| 12 | 3 | 2 | 2 | 1 | 12 | 3 | | 4 | 1 | 20 |
| 60% | 15% | 10% | 10% | 5% | 60% | 15% | | 20% | 5% | Credits % |

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## Department of Civil Engineering

## Scheme of Evaluation
## M. Tech. III Semester *(Environmental Engineering)*

**(for batch admitted in academic session 2024-25)**

| S. No. | Course Code | Category Code | Course Name | Maximum Marks Allotted | | | | | | Total Marks | Contact Hours per week | | | Total Credits | Mode of Learning | Mode of Major Evaluation | Duration of Major Evaluation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Block | | | | Practical Block | | | | | | | | | |
| | | | | Continuous Evaluation | | | Major Evaluation | Continuous Evaluation | Major Evaluation | | L | T | P | | | | |
| | | | | Minor Evaluation I | Minor Evaluation II | Quiz/ Assignment | | Lab Work & Sessional | | | | | | | | | |
| 1. | 53242101 | DLC | **Preliminary Dissertation** *(Literature Review/ Problem Foundation/ Synopsis/ survey paper, etc.)* | - | - | - | - | 175 | 75 | 250 | - | - | 28 | 14 | Interactive | SO | - |
| **Total** | | | | - | - | - | - | **175** | **75** | **250** | - | - | **28** | **14** | - | - | - |

Recommended in the Board of Studies Meeting of Department of Civil Engineering held on 9 Dec 2024

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## Department of Civil Engineering

## Scheme of Evaluation
## M. Tech. IV Semester *(Environmental Engineering)* *(for batch admitted in academic session 2024-25)*

| S. No. | Course Code | Category Code | Course Name | Maximum Marks Allotted | | | | | | Total Marks | Contact Hours per week | | | Total Credits | Mode of Learning | Mode of Major Evaluation | Duration of Major Evaluation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Block | | | | Practical Block | | | | | | | | | |
| | | | | Continuous Evaluation | | | Major Evaluation | Continuous Evaluation | Major Evaluation | | L | T | P | | | | |
| | | | | Minor Evaluation I | Minor Evaluation II | Quiz/ Assignment | | Lab Work & Sessional | | | | | | | | | |
| 1. | 53242201 | DLC | Dissertation | - | - | - | - | 350 | 150 | 500 | - | - | 32 | 16 | Interactive | SO | - |
| **Total** | | | | - | - | - | - | **350** | **150** | **500** | - | - | **32** | **16** | - | - | - |

# *ANNEXURE – V*

## *Syllabi for PG Programmes (M.E. CTM & M.Tech Environmental Engineering) Second Semester 2024-25 admitted batch students*

## Course Code: 51241201

## Course Name: Project Economics & Financing

| L | T | P | Credit |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objective:**

To provide a comprehensive understanding of managerial economics in the construction industry, including demand analysis, forecasting, time value of money, cost of capital, budgeting, project selection and evaluation, project financing, risk management, and accounting processes.

**SYLLABUS**

**Unit-I**

**Basic Economic Theories:** Principles of managerial economics. Economic theories. Demand analysis and forecasting. Demand elasticity. Cost and production analysis. Production function. Pricing decisions. Policies & practice.

**Unit-II**

**Money:** Time value of money. Different methods & comparisons. Cash flow, discounted cash flow, cash flow forecasting. Financial ratios and statements. Cost of Capital.

**Unit-III**

**Capital Budgeting:** Working capital. Capital budgeting and performance budgeting. Break even analysis. Project selection. Project appraisals

**Unit-IV**

**Project Financing:** Means of Finance, Financial institutions in India, Policies of financial institutions, financial assistance, Special schemes, Project risk

**Unit-V**

**Financial Accounting:** Book keeping processes of construction industry. Accountancy cycle. Journals. Forms and ledgers etc. for accounting and monitoring labor, equipment and material costs. PWD accounting procedure and types of financial statements in Government.

**Course Outcomes:**

Upon completion of the course, a student will be able to

**CO1: Apply** principles of managerial economics.

**CO2: Perform** demand analysis in construction sector.

**CO3: Workout** time value of money and cost of capital.

**CO4: Analyze** break-even point and appraisal of projects.

**CO5: Determine** appropriate means of financing a project.

**CO6: Monitor** the various cost components of construction projects by using accounting Procedures.

**Reference Books:**

1. Project Planning, Analysis, Selection, Financing, Implementation & Review by Prasanna Chandra, Publisher Tata McGraw-Hill Education.
2. Engineering Economics & Analysis, by Donald G Newnan, Publisher Oxford University Press.
3. Economic Theory and The Construction Industry by P. Hillebrandt, Publisher Palgrave Macmillan UK
4. Construction Economics: A New Approach by Danny Myers, Publisher Routledge
5. Construction and Project Management Theory And Practices by K.N. Jha, Publisher Pearson Education India
6. Construction Project Management: Planning, Scheduling and Controlling by K.K. Chitkara, Publisher Tata McGraw-Hill Education

## Course Code: 51241202

## Course Name: Construction Cost Management

| L | T | P | Credit |
|---|---|---|---|
| 2 | 1 | 0 | 3 |

**Course Objective:**

To understand and apply trade-offs in construction projects, including time-cost trade-offs, multi-objective optimization techniques, MCDM methods, value engineering, and productivity enhancement.

**SYLLABUS**

**Unit-I**

**Trade off Analysis in construction project:** Development of Network. Time-cost trade off curves. Non – convex discontinuous and discrete cost time trade – off curves. Crashing of projects. Resource-constrained project scheduling. Multi-objective trade-off problems. Introduction to deterministic, heuristic and meta-heuristics methods for making multi-objective trade-off. Siemen's method of project cost curve.

**Unit – II**

**Multi criteria Decision Making Methods:** Analytical Hierarchy Process, and its application in planning and management, Introduction to Fuzzy Set Theory and its Application in MCDM.

**Unit-III**

**Multi-objective optimization methods:** Single and multi-objective optimization problems. Pareto-optimality. Introduction to NSGA. Selection. Crossover. Mutation. Non-dominated Sorting. Differences among GA, MOGA, NSGA, NSGA-II. Particle Swarm Optimization. Particle and its position. Local best and global best position. Updating the position of particle. Multi-objective PSO.

**Unit-IV**

**Productivity in Construction:** Definition of Productivity. Productivity measurements. Productivity of production components, Labors, Equipment and Material Capital Productivity. Need for Productivity Planning – Short term and long term productivity planning, Productivity improvement approaches, Productivity Improvement techniques – Technology based, Material based, Employee based and Product based.

**Unit-V**

**Value Engineering:** Principles of value engineering in Project Management, Value engineering team, Value engineering technique, Job Plans, Role of value engineering in productivity, Life cycle costing and its applications.

**Course Outcomes:**

Upon completion of the course, a student will be able to

**CO1: Explain** the concept of trade-off in construction.

**CO2: Analyze** the trade-off phenomenon in construction using MCDM.

**CO3: Evaluate** the multi-objective trade-off problems using metaheuristic methods.

**CO4: Apply** the value engineering and LCC in construction projects.

**CO5: Evaluate** the labour, material and equipment in construction productivity.

**Reference books**

1. Golden, Bruce L., Wasil, Edward A., Harker, Patrick T. (Eds.) The Analytic Hierarchy Process, Springer.
2. Joseph J. Moder., PROJECT MANAGEMENT with CPM, PERT and Precedence Diagramming.
3. S. Rajasekaran. and G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic, and Evolutionary algorithms". Eastern Economic edition.
4. Kalyanamoy Deb, "Multi-objective optimization using evolutionary algorithms". Wiley.
5. Sumanth, D.J, Productivity Engineering and Management, TMH, New Delhi, 1990
6. Sudit, Ephraim F., "Productivity Based Management", Springer 1984
7. Alphonse Dell'Isola, "Value Engineering: Practical Applications for Design, Construction, Maintenance & Operations", R S Means Co., 1997.
8. Richard Park, "Value Engineering: A Plan for Invention", St. Lucie Press, 1999.

## Course Code: 51241203

## Course Name: Contract Management

| L | T | P | Credit |
|---|---|---|---|
| 2 | 1 | 0 | 3 |

**Course Objective:**

To learn estimating, specifications, rate analysis, valuation, claims & arbitration, laws related to construction labour, conditions of contract and construction contracts in infrastructure projects.

**SYLLABUS**

**Unit-I**

**Quantity Surveying:** Basic principles of estimating. Construction costs. Different methods and stages of estimating. Specification of construction items and method of statement. Principles of rate analysis and valuation.

**Unit-II**

**Claims and Arbitration:** Indian contract act and arbitration act. Variations in work and conditions. Claims and disputes. Liquidated damages. Rights. Responsibilities and duties of client (Owner). Architect. Engineer. Contractor etc. Purchase order as contracts insurance contract and claims.

**Unit-III**

**Legal Frame Work of Construction:** Contract labors act 1970 and other acts and laws relating to labors management. Wages. Bonus and Industrial disputes.

**Unit-IV**

**Contract Conditions:** Important contract clauses. Terms of payments. Retention. Acceptance and final payment. Time of completion. Extension of time. Maintenance period etc.

**Unit-V**

**Construction Contracts:** BOT projects, Variation in BOT projects. Infrastructural projects, International contract rules and regulation.

**Courses Outcomes:**

Upon completion of the course, a student will be able to

**CO1: Write** the specifications and perform rate analysis of various construction items.

**CO2: Prepare** estimate of building/roadwork's and valuation.

**CO3: Differentiate** between rights and responsibilities of Architect, Engineer, Contractor and Owner in a construction project.

**CO4: Apply** the provisions of various acts and laws applicable in construction.

**CO5: Draft** tender document for construction project.

**CO6: Identify** the role of project participants and financing of infrastructure projects.

**Reference Books**

1. Construction Engineering and Management by S. Seetharaman, Publisher Umesh Pub.
2. Construction Planning and Management by B. Sengupta, Pub. Tata McGraw-Hill Education
3. Construction Project Management Theory And Practices by K.N. Jha, Pub. Pearson Education India
4. Construction Contracts by Jimmie Hinze, Publisher Tata McGraw-Hill Education
5. Estimating and Costing by B.N. Datta

## Course Code: 51241204

## Course Name: Repair, Rehabilitation & Retrofitting of Structures

| L | T | P | Credit |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objective:**

To understand the concept of repair, rehabilitation and retrofitting; various methodology for assessment of structure and methods for repair and retrofitting of structures

**SYLLABUS**

**Unit 1:**

Introduction to Repair, Rehabilitation and Retrofitting; Principles of Repair, Rehabilitation and Retrofitting; Terminology and Criteria for Repair, Rehabilitation and Retrofitting.

**Unit 2:**

Testing Methodology for RC Structures and Masonry Structures; Techniques for assessment of Structure Condition; Non-Destructive Testing.

**Unit 3:**

Various Techniques for Structural Repair; Materials for Repair; Repair and Retrofitting using FRP Materials.

**Unit 4:**

Methods for Repair and Retrofitting of RC Structure and Masonry Structure.

**Unit 5:**

Methods for Repair and Retrofitting of Heritage Structures; Case Studies.

**Reference Books:**

1. P. C. Varghese: Maintenance Repair & Rehabilitation & Minor Works of Buildings, PHI Learning Pvt. Ltd.
2. P. I. Modi and C. N. Patel: Repair and Rehabilitation of Concrete Structures, PHI Learning Pvt. Ltd.

**Courses Outcomes:**

Upon completion of the course, a student will be able to

**CO1**: **Understand** the terminology and principles for repair, rehabilitation and retrofitting.

**CO2**: **Apply** various methods for assessment of structures.

**CO3**: **Apply** various methods for repair of structures

**CO4**: **Apply** various methods for retrofitting of structures.

**CO5**: **Evaluate** various repairs and retrofitting technique.

## Course Code: 51241205
## Course Name: Computational Lab

| L | T | P | Credit |
|---|---|---|---|
| 0 | 0 | 4 | 2 |

**Course Objective:**

This lab course is aimed to make students familiar with the use of software in construction projects such as MATLAB, MS Excel, Primavera, BIM 4D.

**List of Experiments:**

1. Introduction to MATLAB and its application.
2. Error estimation and methods of roots finding.
3. Order of convergence of various methods using MATLAB.
4. Curve fitting and Interpolation using MATLAB.
5. Descriptive Analytics through Data Visualization using MS EXCEL.
6. Descriptive Analytics - Data statistics using MS EXCEL.
7. Diagnostic Analytics using MS EXCEL.
8. Primavera and its application in networking and scheduling.
9. Basics of BIM 4D.
10. Case study analysis using Primavera and BIM 4D

**Course Outcomes:**

Upon completion of the course, a student will be able to

**CO1: Apply** the concepts of MATLAB in problem solving.

**CO2: Analyze** the data using different tools of MS Excel.

**CO3: Apply** the concepts of PrimaVera, BIM 4D in project scheduling and management.

## Course Code: 51241206

## Course Name: Seminar / Presentation

| L | T | P | Credit |
|---|---|---|---|
| 0 | 0 | 4 | 2 |

**Course Objective:**

To enhance students' understanding of Construction Technology & Management by encouraging the study of diverse literature, fostering lifelong learning, and developing the soft skills necessary for effective presentation.

**Syllabus**

Any relevant topic related to Construction Technology & Management from within or beyond the syllabus through Swayam / NPTEL/MOOC.

**Course Outcomes:**

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

**CO 1: Analyze** contemporary issues in Construction management & its allied areas.

**CO 2: Demonstrate** good oral communication skills.

**CO 3: Develop** poster and power point presentations for effective communication.

## Course Code: 53241201

## Course Name: Air Pollution & Control

| L | T | P | Credit |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objective:**

To impart a comprehensive knowledge on the sources and effects of air pollution, air quality standards, and monitoring techniques, as well as to equip students with the skills to understand and apply control measures to reduce air as well as noise pollution.

**Syllabus:**

### Unit I Introduction:

Definition of Air Pollution, Sources and classification of air pollutants – Man made – Natural sources – Type of air pollutants – Pollution due to automobiles, Units of measurements of pollutants, Air quality criteria - emission standards – National ambient air quality standards – Air pollution indices – Air quality management in India, Air pollution survey, Air pollution from major industrial operations, Air pollution in Indian cities, Major Air pollution episodes, Air Act.

### Unit II Effects of Air Pollution:

Analysis of air pollutants – Chemical, Instrumental and biological methods, Air pollution and its effects on human beings, plants and animals – Economic effects of air pollution – Effect of air pollution on meteorological conditions – Changes on the Meso scale, Micro scale and Macro scale, Global Warming, Acid Rain, Ozone Layer Depletion, Indoor Air Pollution & Occupational Diseases.

### Unit III Sampling, Meteorology and Air Quality Modeling:

Sampling and measurement of particulate and gaseous pollutants – Ambient air sampling – Stack sampling. Environmental factors – Meteorology – temperature lapse rate and stability – Adiabatic lapse rate – Wind Rose – Inversion – Wind velocity and turbulence – Plume behavior – Dispersion of air pollutants- Air Quality Modeling.

### Unit IV Air Pollution Control Measures:

Control – Source correction methods – Control equipments – Particulate control methods – Bag house filter – Settling chamber – cyclone separators – inertial devices – Electrostatic precipitator – scrubbers – Control of gaseous emissions – Absorption – Absorption equipments – adsorption and combustion devices (Theory and working of equipments only), odour and its control, stack monitoring kit, auto exhaust analyser.

### Unit V Noise Pollution & its Control:

Sources of noise – Units and Measurements of Noise – Noise Standards, Noise rating system, Characterization of Noise from Construction, Mining, Transportation and Industrial Activities, Airport Noise – General Control Measures – Effects of noise pollution – auditory effects, non - auditory effects. Noise Menace– Prevention and Control of Noise Pollution – Control of noise at source, control of transmission, protection of exposed person – Control of other types of Noise Sound Absorbent, Sound level meter.

**Course Outcomes:**

**CO 1: Explain** the concepts of air & noise pollution.
**CO 2: Illustrate** the effects of air pollution on environment.
**CO 3: Apply** various techniques to measure air & noise pollution.
**CO 4: Solve** air and noise pollution problems by devising solutions to the identified problems
**CO 5: Apply** various techniques used in reducing the environmental pollution.

**Text Books:**

1. Air pollution & Control, M. N. Rao & H. V. N Rao, Tata McGraw Hill Publications., 2017
2. Air Pollution and Control Technologies, Dr. Y. Anjaneyulu, Allied publishers Pvt. Ltd., 2002.

**Reference Books:**

1. Sewage Disposal & Air Pollution Engineering, S.K. Garg, Khanna Publishers, 31st edition, 2008
2. Environmental Pollution Control Engineering, C. S. Rao, New Age Intl Pub., 3rd edition, 2018
3. Environmental Engineering, Rowe, Peavy & Tchobanogolous, Tata McGraw Hill Publication, 2017

## Course Code: 53241202

## Course Name: Advance Treatment Process – II (Water Supply Engineering)

| L | T | P | Credit |
|---|---|---|---|
| 2 | 1 | 0 | 3 |

**Course Objective:**

To provide in-depth knowledge of planning, designing, operating, and maintaining water distribution and treatment system, including the determination of water quality parameters and application of advanced water treatment techniques for urban water supply systems.

**Syllabus:**

**Unit I:**

Water supply, Components of distribution system, Principles and design of distribution system, Equivalent pipe method, Hardy Cross and Section method, Electrical network analogy method, Construction and maintenance of distribution system, Corrosion and methods of control, Computer applications in distribution network analysis.

**Unit II:**

Quality of water: Factors affecting water quality in various sources, Protection of water quality, Classification of natural water with reference to the best use, Bacteriological quality of water, Effect on health, Standards of water for various uses, Water quality index, Minimal National Standards (MINAS), their significance in relation to Industrial pollution control.

**Unit III:**

Preliminary Treatment and Sedimentation: Degree of treatment required, various operation and flow sheet, Preliminary treatment methods such as screening, coagulation, perikinetic and orthokinetic, flocculation, Coagulants and coagulants aids, Polyelectrolyte, Sedimentation, Class I and Class II clarification, Column settling test, zone and compression settling, Design of sedimentation tank – various types and their working, Tube settlers and their design.

**Unit IV:**

Filtration and Disinfection: Slow and rapid sand filters, Theory of filtration, Design, Operation, Performance and evaluation of filters, Pressure filter, Multi-media filter, Diatomaceous earth filter, Disinfection of water kinetics, Amount of chemicals required for disinfection, Free and combined chlorine, Fixed end disinfector.

**Unit V:**

Non – Conventional treatment units: Water softening, Methods of softening, Application of Membrane process, Reverse osmosis, Electro-dialysis, Various practices, Removal of fluorides, iron and manganese, Taste and odour removal, Industrial water conditioning, Langliear saturation index, Management of water treatment plant residues, Design of complete treatment scheme.

**Course Outcomes:**

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

**CO 1: Explain** the concepts of water distribution systems including its operation & maintenance.

**CO 2: Design** a water distribution scheme for an area / city.

**CO 3: Evaluate** the water quality of an area / city with the help of available standards & guidelines.

**CO 4: Explain** the concepts of various water treatment techniques.

**CO 5: Design** a water treatment scheme for an area / city.

**Text Books:**

1. Water Supply Engg., S. K. Garg, Khanna Publishers New Delhi, 2017

2. Environmental Engineering, Peavy, Rowe & Tchobanoglous, McGraw Hill Publication, 2017

**Reference Books:**

1. Water Supply & Sanitary Engg., G.S. Birdie, Dhanpat Rai Publishing Company, 2014

2. Water & Waste Water Technology, Mark J Hammer, Prentice Hall of India, 6th edition, 2008

3. Manual of Water Supply and Treatment by CPHEEO, GOI, 2009

4. Water Supply Engg., B. C. Punmia, Laxmi Publication (P) Ltd. New Delhi, 2016

5. Water Supply & Sanitary Engineering by S.K. Husain (Oxford & IBH Publishing Co. New Delhi, India)

## Course Code: 53241203

## Course Name: Environmental Impact Assessment

| L | T | P | Credit |
|---|---|---|---|
| 2 | 1 | 0 | 3 |

**Course Objective:**

To develop a comprehensive understanding of the need for environmental impact assessment (EIA), its processes, and methods, alongside practical knowledge of conducting EIA through case studies, while gaining insights into environmental laws and regulations in India.

**Syllabus:**

**Unit I:** Environment and its components, Concept of Ecological imbalances, Carrying capacity and Sustainable development, EIA: Definitions, Necessity of EIA, Historical Evolution of EIA: Indian EIA rules 1994 & 2006, Environmental clearance process, Procedure for carrying out EIA in India, Post project monitoring, EIA documentation, EMP, Risk Assessment, Environmental Audit: Introduction, Necessity, Types, and Process of audit.

**Unit II Environmental Impact Assessment Methodologies:** Characteristics of EIA Methods, Ad- hoc method, Checklist, Matrices, Networks, Overlays, Environmental Quality Index, Predictive Models, Comparative study of EIA Methodologies.

**Unit III Prediction and assessment of impact on water & air environment:** Basic information of air & water quality, Data requirements for impact assessment, Existing standards for air & water quality (surface & subsurface), Identification of impacts, Prediction & assessment of impacts, Mitigation measures. Case Studies - Environmental Impacts of Road, Rail, Dam and thermal power projects or any other major projects on water & air environment.

**Unit IV Prediction and assessment of impact on cultural & socio-economic environment:** Basic information on cultural resources like archaeological, historical structures, Cultural system, Basic information of socio-economic environment, Description of existing socio-economic environment, Identification of impacts, Prediction & assessment of impacts, Mitigation measures, R & R study.

**Unit V:** Environmental Legislations: List of prevalent environmental acts in India, Brief about provisions in Water Act 1974, Air Act 1981, EPA 1986, International Environmental Laws & Protocols like Montreal Protocol, Rio Earth Summit, Kyoto Protocol.

**Course Outcomes:**

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

**CO1: Illustrate** the concepts of EIA.

**CO2: Apply** various methodologies for carrying out EIA.

**CO3: Analyse** impacts on various components of environment.

**CO4: Plan** for mitigation of impact & accordingly monitor the mitigation measures.

**CO5: Apply** various environmental legislations for managing the environment.

**Text Books:**

1) Y. Anjaneyulu & Valli Manickam, Environmental Impact Assessment Methodologies, B S Publishers.

2) R. R. Barthwal, Environmental Impact Assessment, New Age International Publishers.

**Reference Books:**

1) L.W. Canter, Environmental Impact Assessment, Mc Graw Hill International Publishers International Edition.

2) O. V. Nandimath, Handbook of Environmental Decision Making in India: An EIA Model, Oxford University Press.

3) Ministry of Environment and forest, Government of India Environmental Impact Assessment Notification, New Delhi, 2006.

## Course Code: 53241204

## Course Name: Emerging Technologies for Environmental Management

| L | T | P | Credit |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objective:**

To provide in-depth knowledge of advanced technologies and strategies for addressing global environmental issues, managing emerging contaminants, mitigating climate change, controlling pollution, and facilitating environmental technology transfer for sustainable development.

**Syllabus:**

**Unit-I Global Environmental Issues and Frameworks:**

Overview of micro and macro environmental issues: urbanization, industrialization, resource depletion. Global environmental challenges like climate change, trans boundary pollution. Resource sharing issues: water, energy and land issues. Role of global organizations and policy frameworks in environmental governance. Case study on international collaboration and conflict resolution in environmental management

**Unit-II Emerging Contaminants and Advanced Waste Management Technologies:**

Introduction to emerging contaminants: micro plastics, PFAS, pharmaceuticals, and nanomaterial's, detection and monitoring of emerging contaminants. Advanced waste management technologies: pyrolysis, gasification, anaerobic digestion, and resource recovery. Case study on successful application of emerging waste management technologies.

**Unit-III Innovative Strategies for pollution control:**

Innovative strategies for managing waste, Integration of circular economy principles in waste management. Water and soil remediation technologies: bioremediation, electrocoagulation, and permeable reactive barriers. AI-driven monitoring systems and predictive modeling. Role of non-conventional technologies in pollution control.

**Unit-IV Climate Change Adaptation and Mitigation Technologies:**

Understanding climate change: impacts, vulnerabilities, and mitigation strategies. Adaptation techniques: resilient infrastructure, sustainable urban design, and nature-based solutions. Carbon capture and storage (CCS), carbon farming. Emission trading mechanisms: carbon markets, carbon credits, and blockchain applications. Case studiy on climate change adaptation in urban and rural settings

**Unit-V Environmental Technology Transfer and Future Trends:**

Concept of environmental technology transfer: barriers, facilitators, and mechanisms. Policy and financial frameworks for technology transfer. Integration of environmental technologies into policy and planning. Role of innovation hubs, incubators, and international collaborations. Emerging trends: green technologies, bio-inspired designs, AI, IoT, and big data analytics in environmental management.

**Course Outcomes:**

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

**CO1: Analyze** global environmental issues, resource-sharing conflicts, and the role of international frameworks in promoting environmental governance and sustainable solutions.

**CO2: Apply** advanced waste management technologies for the effective treatment of contaminants and resource recovery.

**CO3: Develop** innovative strategies for pollution control by integrating circular economy principles and employing AI-driven monitoring systems and predictive models.

**CO4: Apply** climate change mitigation and adaptation technologies including carbon management, resilient infrastructure, and emission trading mechanisms.

**CO5: Demonstrate** understanding of environmental technology transfer processes, policy frameworks, and emerging trends to facilitate the adoption of sustainable environmental management practices.

**Reference Books:**

1. Environmental Science: A Global Concern, William Cunningham & Mary Cunningham, McGraw Hill Publications.
2. Emerging Contaminants in the Environment: Challenges and Sustainable Practices, Hemen Sarma, Delfina C. Dominguez, Wen-Yee Lee, Elsevier Publications.
3. Environmental Pollution & Control, Vesilind, Peirce and Weiner, Elsevier Publications.
4. Climate Change Mitigation and adaptation Strategies, Murali, Sambath, Sudarshan, COSMOS Scientific Publications.
5. Environmental Sustainability: Role of Green Technologies, Thanagvel & Sridevi, Springer publications.

## Course Code: 53241205

## Course Name: Advanced Environmental Engineering Lab

| L | T | P | Credit |
|---|---|---|---|
| 0 | 0 | 4 | 2 |

### Course Objective:

To provide knowledge and skills in sampling and analyzing air, solid waste, and wastewater samples, including the determination of various characteristics of wastewater, solid waste, air pollutants, and noise levels.

### Syllabus:

1. Introduction to waste water sampling procedure.
2. Introduction to air sampling procedure.
3. Introduction to solid waste sampling procedure.

### List of Experiments:

1. Determination of Solids (TS, TSS, VSS, FS) in waste water sample.
2. Determination of settling velocity of suspended solids in waste water sample.
3. Determination of D.O. in waste water sample.
4. Determination of B.O.D. in waste water sample.
5. Determination of C.O.D. in waste water sample.
6. Determination of Oil & Grease in waste water sample.
7. Analysis of solid waste sample (Proximate & Elemental).
8. Determination of calorific value of solid waste sample.
9. Determination of SPM, $SO_x$ & $NO_x$ in air using RSPM/HVS.
10. Monitoring of ambient & traffic noise levels using noise level meters.
11. Study of Stack Monitoring Kit.
12. Characterization of wastes from different industries.

### Course Outcomes:

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

**CO 1: Follow** sampling procedure & other guidelines for sampling & analysis of water samples, air & waste samples.

**CO 2: Check** various water quality parameters.

**CO 3: Analyze** various solid waste characteristics.

**CO 4: Analyze** the level of pollutants in air and noise in an area/city.

**Reference Books:**

1. BIS 10158, 9234, 9235: Analysis of Solid Wastes.
2. BIS 5182: Measurement of Air Pollution.
3. APHA Standard Methods for Examination of Water & Waste water, 2012.
4. Sawyer C.N., McCarty P. L., and Parkin G.F., Chemistry for Environmental Engineers, McGraw-Hill, New Delhi, 1994.
5. Water Supply Engineering, S.K. Garg, Khanna Publishers, New Delhi, 2017.

## Course Code: 53241206

## Course Name: Seminar / Presentation

| L | T | P | Credit |
|---|---|---|---|
| 0 | 0 | 4 | 2 |

### Course Objective:

To enhance students' understanding of Environmental Engineering by encouraging the study of diverse literature, fostering lifelong learning, and developing the soft skills necessary for effective presentation.

### Syllabus:

Any relevant topic related to Environmental Engineering from within or beyond the syllabus through Swayam / NPTEL/MOOC.

### Course Outcomes:

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

**CO 1: Analyze** contemporary issues in Environmental Engineering & its allied areas.

**CO 2: Demonstrate** good oral communication skills.

**CO 3: Develop** poster and power point presentations for effective communication.

# *ANNEXURE – VI*

## *Syllabus/ Modules for Classified Novel Engaging Courses to be offered in Second Semester of PG Programme for 2024-25 admitted batch students*

# Course Title: Fire Safety & regulation in Building

## Course Objective:

Understanding of Fire Hazards, Identify various fire protection systems and implement fire safety regulation

## Course Content:

- Fire alarm system and their types
- Fire suppression agents
- Types of water distribution system
- System readiness
- Building fire hazards
- Fire safety in buildings: basic principles
- Fire safety management
- Codes and regulations

## Course Outcomes:

**CO1:** Explain the working of fire alarm system, suppression system, and portable fire extinguishers.

**CO2:** Identify various types of water storage devices, type of pipe material and different valves used in water supply system

**CO3:** Apply fire safety principles, management and regulation in building

# *ANNEXURE – VII*

## *Syllabus of DC & DLC courses of PhD Scholars admitted in 2024-25 session*

| Subject Code | Category Code | Subject Name | Theory Slot | | | Practical Slot | | Total Marks | Contact Hr/ week | | | Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | End Sem Marks | Mid Sem Marks | Quiz/ Assignment Marks | End Sem Marks | Lab work & Sessional Mark | | L | T | P | |
| 17100001 | PhD Course Work | Chemical Safety & Hazards | 30 | 40 | 30 | - | - | - | 3 | - | 0 | 3 |

**Course Objective:**

This course will provide effective use of chemical industries utilities. This course also emphasis on the knowledge of loss prevention, personal safety, industrial safety, hazard analysis, toxicology and personal proactive equipment.

**Syllabus:**

**Unit 1: Origin of process hazards:** Laws Codes, Standards, Case Histories, properties of Chemicals, Health hazards of industrial substances.

**Unit 2: Toxicology:** Toxic materials and their properties, effect of dose and exposure time, Relationship and predictive models for response, Threshold value and its definitions, material safety data sheets, industrial hygiene evaluation.

**Unit 3: Fire & Explosion:** Fire are exposure hazards causes fire and preventive methods Flammability characteristics of chemical, fire and explosion hazard, rating of process plant, Propagation of fire and effect of environmental factors, Ventilation, Dispersion, Sprinkling, Safety and relief values.

**Unit 4: Other Energy Hazards:** Electrical hazards, noise hazards, Radiation hazards in Process operations, Hazards communication to employees, Plant management and maintenance to reduce energy hazards.

**Unit 5: Risk Analysis and Hazard Identification:** Event probability and failure, Plant reliability and risk analysis, HAZOP, HAZON event and consequence analysis, Measurement and calculation of Risk analysis, Safety Training program, Disaster management and emergency planning.

**Course Outcomes:**

**CO1. Analyze** the origin of Chemical hazards and fundamental principles of safety

**CO2. Analyze** the issues related to toxicants and minimize the toxicants dose.

**CO3. Explain** the fire & explosion hazard and the controlling measurement techniques used in the chemical industries

**CO4. Evaluate** the professional obligations related to the plant management and maintenance to reduced energy hazard.

**CO5. Analyze** the risk analysis and plant reliability to reduce the hazard.

**CO6. Formulate** the HAZOP study, event tree analysis and faulty tree analysis.

**Text Books:**

1. D. A. Crawl, J. A. Louvar (Prentice Hall of India, New Delhi, 1990) - Chemical Process Safety Fundamentals with Applications

**Reference Books:**

1. C. A. Wentz (2th Edition 2001, McGraw Hill) - Safety, Health and Environmental Protection
2. B. D. Smith (4th Edition 2003, McGraw Hill) - Design of Equilibrium State Process

## Course Code: 11100001

## Course Name: Environmental Modeling Lab

| L | T | P | Credit |
|---|---|---|---|
| 0 | 0 | 4 | 2 |

**Course Objective:**

The objective of this course is to equip students with the knowledge and skills to analyze quality parameters using experimental methods and computational tools like Fuzzy Logic and ANN.

**Syllabus:**

Introduction to Sampling Procedure, Types of Sampling, Collection of Samples & Preservation of Sample, Using ANN and Fuzzy logic to predict quality parameters.

**List of Experiments:**

1. Determination of pH of water sample.
2. Determination of Turbidity of water sample.
3. Determination of Total Solids (Suspended & Dissolved Solids) of water sample.
4. Determination of Acidity of water sample.
5. Determination of Total Alkalinity of water sample.
6. Determination of Total Hardness, Calcium Hardness, Magnesium Hardness of water sample.
7. Determination of Chloride of water sample.
8. Determination of Sulphate of water sample.
9. Determination of Residual Chlorine of water sample.
10. Quantify dissolved oxygen and predict depletion trends using ANN models.
11. Conduct jar tests for coagulant dosage optimization and model outcomes with ANN.
12. Assess water Quality parameters and classify it using Fuzzy Logic systems.
13. Measure water quality parameters and forecast variations using ANN-based models.

**Course Outcomes:**

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

**CO1: Develop** analytical and computational skills to assess and model critical water quality parameters using traditional methods, Fuzzy Logic, and Artificial Neural Networks (ANN).

**CO2: Apply** advanced predictive and optimization techniques to simulate environmental and contamination scenarios

**CO3: Integrate** multidisciplinary approaches to analyze, classify, and interpret water quality data

**Reference Books:**

1. Water Supply Engineering, S.K. Garg, Khanna Publishers, New Delhi, 2017.
2. BIS 3025 Methods of Sampling & Test for Water & Waste Water, BIS 1622.
3. APHA Standard Methods for Examination of Water & Waste water, 2012.

## Course Code: 11100002

## Course Name: WasteWater Treatment & Recycling

**Through SWAYAM/NPTEL (12 weeks course)**

| L | T | P | Credit |
|---|---|---|---|
| 2 | 1 | 0 | 3 |

**Course Layout:**

**Week 1:** Introduction: General outline; Introduction to wastewater; Various sources and types of wastewater; Need of wastewater management; Concept of wastewater treatment and recycling

**Week 2:** Wastewater Generation and Characteristics: Wastewater generation and quantity estimation; Water quality parameters and standards (COD, BOD, DO, Solids, Nutrients, metals and emerging contaminants); Sources specific wastewater physical and chemical characteristics

**Week 3:** Natural Attenuation of Pollutants in Wastewater: Concept of natural attenuation; Wastewater discharge in rivers; Attenuation of pollutants on land application.

**Week 4:** Treatment Philosophy: Objectives of wastewater treatment; Concept of mass balance; kinetics and equilibrium processes; Reactors tanks; Continuously mixed tank reactors; Plug-flow reactors Introduction to primary, secondary and tertiary treatment;

**Week 5:** Preliminary and Primary Treatment Processes: Screening; Grit removal; Equalization tank; Sedimentation theory; Rectangular and circular sedimentation tanks

**Week 6:** Secondary Treatment Processes: Biological treatment of wastewater; Microbial ecology and growth kinetics; Types of microorganisms; Aerobic and anaerobic processes; Suspended and attached growth systems; Activated sludge process; Tricking filters and Rotating biological contactors

**Week 7:** Secondary Treatment Processes - Anaerobic: Anaerobic treatment; Anaerobic decomposition of organic matter; Fluidized bed systems; Upflow anaerobic sludge blanket systems; Biogas production and collection; other reactor configurations

**Week 8:** Sludge Management: The quantity and characteristics of sewage sludge; Sludge dewatering, drying, and thickening; Sludge digestion; Aerobic and anaerobic sludge stabilization; Composting

**Week 9:** Tertiary (Advanced) Treatment Processes: Need and Objectives of advanced treatment; Nutrient (N and P) removal; Chemical treatment processes; Advanced oxidation processes; Adsorption and Ion-exchange; Membrane processes

**Week 10:** Current Treatment Approaches: Conventional systems; Integrated treatment systems; Advanced reactor configurations; SBR, MBR and MBBR; Application and case studies

**Week 11:** Wastewater Recycling: Scope and demands; Types and stages of recycling; Recycling requirements; Designated reuse criteria; centralized vs decentralized recycling systems.

**Week 12:** Technology Selection and Decision Making: Research trends in wastewater treatment and recycling; Choice modelling and decision making; Risks and challenges; Socio-economic perspectives; Case studies

**Books and references:**

1. Wastewater Engineering (2013) by Metcalf and Eddy; Publisher - McGraw-Hill

2. Environmental Engineering (2015) by Peavy, Rowe and Tchobanoglous; Publisher - McGraw-Hill

3. Water Quality Engineering: Physical / Chemical Treatment Processes (2013) by Lawler and Benjamin; Publisher - John Wiley & Sons

4. Industrial Wastewater Treatment, Recycling and Reuse (2014) by Bhandari and Ranade; Publisher - Elsevier

5. Unit Operations and Processes in Environmental Engineering (1996) by Reynolds and Richards Publisher - CL Engineering

6. Manual on Sewerage and Sewage Treatment (2013), Publisher - CPHEEO (MoUD) Additional reference material will be provided by the course instructor

## Course Code: 11100003

## Course Name: Construction Materials, Machines & Techniques

| L | T | P | Credit |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objective:**

1. To impart knowledge about ingredients of concrete, production of concrete at site and ready mix concrete.
2. To apprise about special concretes for different field requirements.
3. To apprise about various types of equipments/machineries used in construction industry.
4. To develop understanding of construction procedure for piles and well foundations.
5. To impart know-how of formwork and scaffolding.
6. To develop technical know-how of shop and insitu construction/fabrication.

**Syllabus:**

**Unit-I**

**Concrete and its ingredients:** Ingredients of concrete including mineral admixtures and chemical admixtures; Proportioning of ingredients; Stages in production of concrete i.e. Batching, Mixing, Transporting, Placing compacting and curing. Design of high strength concrete; Production of Ready mix concrete.

**Unit-II**

**Special Concrete:** Polymer concrete, Light weight concrete, Heavy weight concrete, Concrete for radiation shielding, No-Fines concrete, Pervious concrete; Ferro cement; Fiber reinforced concrete, Dry lean concrete and Pavement quality concrete; Self compacting concrete.

**Unit-III**

**Construction Equipments:** Characteristics, Operation and selection of different types of construction equipments viz. Power shovels, Drag lines, Scrapper, Bulldozer, Tractor, Rippers, Motor graders; Equipments for aggregate processing plant; Ready Mix Concrete Plant; and Hot Mix plant

**Unit-IV**

**Foundations:** Construction of piles, Well foundations, Cofferdams and diaphragms; Drilling and blasting, Underpinning, Shoring and shuttering.

**Formwork:** Different types of formworks, Stationary and slip formwork techniques, Formwork of special structures eg. Shells, Bridges, Towers etc; Scaffolding

**Unit-V**

**Steel Construction:** Shop and insitu construction techniques, Pre-engineered buildings; Erection of steel structures like bridges, and trusses.

**Prefabrication:** Application of prefabrication in construction, Modular coordination andstandardization; equipments for industrial production of prefabricated components.

**Prestressing:** Prestressing methods; Materials; Loss of prestress; equipments for industrial productionof prestressed components; Production of Railway Sleepers, Poles and Tanks.

**Course Outcomes:**

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

**CO 1: Define** the relevant characteristics of concrete and its ingredients.

**CO 2: Explain** the details of various stages in concrete production.

**CO 3: Design** concrete mix for specific requirements using codal provisions.

**CO 4: Determine** the suitability of special concretes for specific requirements.
**CO 5: Evaluate** the suitability of various equipments for a construction site.
**CO 6: Apply** shop and insitu methods and the pre-stressing concepts for a construction project.

**Reference Books:**

1. D. G. Gransberg, C. M. Popescu and R. C. Ryan, Construction Equipment Management for Engineers, Estimators, and Owners, Taylor & Francis, New York.
2. R. L. Peurifoy, C. J. Schexnayder, A. Shapira and R. Schmitt, Construction planning,equipment, and methods, 8th ed., McGraw Hill, New York, 2010.
3. A. R. Santha Kumar, Concrete Technology, Oxford University press.
4. A.M. Neville, Properties of concrete, Pearson Publication
5. M.L. Gambhir, Concrete Technology, Tata Mc Graw Hill Pub. Co.
6. Soil Mechanics by Gopal Ranjan, New Age Publishers.
7. Mahesh Verma, Construction Equipment, its planning & Application, Metropolitan Book Co.(P) Ltd.
8. Foundation Design Manual by Narayan V. Nayak, Dhanpat Rai Publications
9. Prestressed Concrete by T.Y. Lin and N.H. Burns, Wiley Publishers
10. Highway Engg by Justo and Khanna, Publisher: Nem Chand and Brothers

## Course Code: 11100004

## Course Name: Advanced Concrete Technology

**Through SWAYAM/NPTEL (12 weeks course)**

| L | T | P | Credit |
|---|---|---|---|
| 2 | 1 | 0 | 3 |

**Course Layout:**

WEEK 1 : Cement production and composition

WEEK 2 : Cement chemistry

WEEK 3 : Aggregates for concrete

WEEK 4 : Chemical admixtures

WEEK 5 : Chemical and Mineral admixtures

WEEK 6 : Mineral admixtures

WEEK 7 : High performance concrete mixture proportioning

WEEK 8 : Topics in fresh concrete

WEEK 9 : Topics in hardened concrete

WEEK 10 : Creep and shrinkage

WEEK 11 : Durability of concrete

WEEK 12 : Durability of concrete

**Books and References:**

**Textbook**

1. Mehta, P. K., and Monteiro, P. J. M., 'Concrete: Microstructure, Properties, and Materials,' Fourth Edition (Indian Edition), McGraw Hill, 2014.

**Reference Books**

1. Neville, A. M., 'Properties of Concrete,' Pitman Publishing, Inc., MA, 1981.
2. Hewlett, P. C., Ed., 'Lea's Chemistry of Cement and Concrete,' Fourth Edition, Arnold Publishers, NY, 1998.
3. Bentur, A., Diamond, S., and Berke, N.S., 'Steel Corrosion in Concrete,' E&FN Spon, UK, 1997.
4. Taylor, H. W. F., 'Cement Chemistry,' Academic Press, Inc., San Diego, CA, 1990.
5. Lea, F. M., 'The Chemistry of Cement and Concrete,' Chemical Publishing Company, Inc., New York, 1971.
6. Mindess, S., and Young, J. F., 'Concrete,' Prentice Hall, Inc., NJ, 1981.
7. J. Newman and B. S. Choo, Eds., 'Advanced Concrete Technology', Four Volume Set, Elsevier, 2003

## Course Code: 11100005

## Course Name: Material Lab

| L | T | P | Credit |
|---|---|---|---|
| 0 | 0 | 4 | 2 |

### Course Objective:

1. To study and understand basic knowledge of building materials, such as their identification and classification, relationships between physical characteristics and mechanical properties experimentally measuring them.
2. To understand the role of water in soil and concrete behavior.
3. To understand the concrete mix design and testing; non-destructive testing methods; Studies on simple building system components

### List of Experiments:

1. Mix Design of Concrete
2. Permeability Test of Concrete
3. Measurement of In-situ Strength determination by Rebound Hammer and Moisture contentin aggregates, soil and hardened concrete surface using NDT techniques.
4. Unconfined Compression Test
5. Direct Shear Test
6. Static Cone Penetration Test
7. Vane Shear Test
8. C.B.R Test of Soil
9. Consolidation Test
10. SPT Test (Demonstration)
11. Marshall stability test of bitumen

### Course Outcomes:

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

**CO1: Check** physical properties of soil, aggregate, and concrete.

**CO2: Check** strength properties of soil, aggregate, and concrete.

**CO3: Differentiate** the flow properties and stresses of soil.

**CO4: Apply** various non-destructive testing method on concrete.

**Reference Books:**

1. Metha P.K and Monteiro. P.J.M, " CONCRETE", Microstructure, Properties and Materials,Third Edition, Tata McGraw- Hill Publishing company Limited, New Delhi, 2006
2. Shetty .M.S., " Concrete Technology, Theory and Practice", Revised Edition, S. Chand & company Ltd., New Delhi,2006
3. Neville. A.M., " Properties of Concrete", 4th Edition Longman,1995
4. Soil Mech. & Found. Engg., Dr. K. R. Arora, Std. Publishers Delhi, 7th edition 2014
5. Soil Mech. & Foundation, Dr. B. C. Punmia, Laxmi Publications, Delhi, 16th edition 2017
6. Soil Mech. & Found Engg., S. K. Garg, Khanna Publishers, Delhi, 1st edition, 2003
7. Soil Testing for Engg., T.W. Lambe, John Wiley & Sons. Inc., 1969