

# HANDBOOK

## COURSE STRUCTURE AND DETAILED SYLLABUS

## B. Tech Programme Batch: 2017-21

# INSTITUTE OF ENGINEERING AND TECHNOLOGY JK LAKSHMIPAT UNIVERSITY

Near Mahindra SEZ, Mahapura, Ajmer Road, Jaipur 302 026 Ph.: +91-141-7107500/504

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#### **Program Education Objectives**

The B.Tech programs at IET, JKLU are designed to prepare students for continued learning and successful careers. Our alumni are expected to:

PEO1: Apply their technical knowledge, complex problem solving and research skills in professional practice.

- PEO2: Continue their intellectual development through critical thinking, self-study, apprenticeship, higher education, professional development courses, as well as participation in research groups and professional networks.
- PEO3: Serve as ambassadors for engineering and sustainability by exhibiting high professional standards with a deep sense of civic responsibility.
- PEO4: Effectively communicate about technical and related issues.
- PEO5: Embrace the roles of team members and leaders in their careers.

#### **Program Outcomes**

The graduates of B.Tech. programs at IET, JKLU will have the following competencies:

- PO 1: Life-long learning: Demonstrate inquisitiveness, open mindedness, and the ability to engage in independent and life-long learning in the broadest context of technological, organizational, economic, and societal changes.
- PO 2: Citizenship, Sustainability, and Professional ethics
- PO 2a: Demonstrate knowledge of constitutional values of liberty, equity, justice, and fraternity with an understanding of the impact of the engineering solutions in societal and environmental contexts as well as a sense of responsibility for sustainable development.
- PO 2b: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, cultural, and environmental issues and the consequent responsibilities relevant to professional engineering practice.
- PO 2c: Demonstrate commitment for professional integrity and excellence and respect for ethics, responsibilities and norms as prescribed for the engineering practice.
- PO 3: Engineering knowledge and Modern tool usage
- PO 3a: Demonstrate a clear conceptual understanding of the fundamentals of engineering specialization and cognitive flexibility to appropriately 'transfer' what has been learned in a context, to different situations.
- PO 3b: Apply engineering thinking, computational thinking, and the knowledge of mathematics, natural and social sciences, engineering fundamentals, information technology, engineering specialization, and engineering management to the solution of complex engineering problems.
- PO 3c: Create, select, modify, and apply appropriate techniques, best practices, standards, resources, and modern engineering and IT tools including prediction and modeling to engineering and social activities with an understanding of the limitations.
- PO 4: Complex problem solving, Design and Research
- PO 4a: Identify, formulate, review research literature, and analyze complex engineering problems to arrive at substantiated conclusions using critical thinking along with principles of mathematics, computing, engineering as well as natural and social sciences.

- PO 4b: Use systems thinking and reflection to identify and consider underlying structures, patterns, volatility, uncertainties, complexities, ambiguities, complications, and risks to design and develop engineering solutions for complex problems to meet the specified and anticipated needs with appropriate concern for constraints, performance, sustainability, and professional ethics.
- PO 4c: Use research-based knowledge and research methods including design of experiments, simulation, analysis and interpretation of data, and synthesis of the information to evaluate and improve the engineering solutions and practice.
- PO 5: Individual & teamwork and Engineering management
- PO 5a: Ability to work effectively as an individual and as a team member or a leader in diverse and distributed teams, and in multidisciplinary settings.
- PO 5b: Ability to apply engineering management principles to one's own and team's work to manage engineering projects and operations and in multidisciplinary environment.
- PO 6: Communication: Ability to communicate effectively on complex engineering and technology activities, situations, problems, and solutions using verbal, textual, and pictorial elements with the colleagues, engineering community, users, clients, policy makers, and society at large with intellectual honesty, clarity, empathy, and compassion.
- PO 7: Innovation and entrepreneurship:
- PO 7a: Demonstrate enthusiasm and understanding to identify opportunities and translate research in engineering and other disciplines to conceive and design innovative engineering solutions for business, industry, and societal problems.
- PO 7b: Demonstrate enthusiasm and understanding to conceive and plan technology based new ventures either as independent start-up businesses or within existing corporate structures.

#### **Program Specific Outcomes**

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

The civil engineering graduates of JKLU will be able to:

CEPSO1: Conceive, design, implement and manage civil infrastructure systems, structures and processes by using principles of structural engineering, transportation engineering, water management, geotechnical engineering, project management, computing, automation, sustainability, and contemporary materials and tools.

CEPSO2: Serve in fields of construction industry, infrastructure management or consultancy services.

#### JK Lakshmipat University, Jaipur Institute of Engineering and Technology Department of Civil Engineering Course Structure for the B. Tech (Batch 2017-2021)

| Sem   |  |  |  | Courses   | ×  | ,  |                             | Credits |  |  |
|---|--|--|--|---|--|--|-----------------------------|---------|--|--|
|   | English                                  | Calculus and   | Engineering                              | Electrical &  | Elements of  | Engineering                                    |                             |         |  |  |
|   | Communication                            | Linear   | Physics                                  | Electronics   | Engineering  | Drawing  |                             |         |  |  |
| I         I         II         II         II         IV         VI         VII*         VIII* | 5KIIIS<br>T A 101                        | MA102  | PH101                                    | FF101   | CM101  | CE102  |                             |         |  |  |
|   | (1021)                                   | (3 1 0 0)  | (3 1 2 0)                                |   |  | (2.0.2.0)                                      |                             |         |  |  |
| I         I         II         II         II         IV         VI         VII*         VIII* |  | (3100)   | (3120)                                   | (3020)  | (2040)   |  |                             | 22      |  |  |
|   | 3  | 4<br>Differential                                      | 5  | 4   | 4  | 3  |                             | 23      |  |  |
|   | Creativity and<br>Design Thinking        | Equations and  | Engineering                              | Environmental<br>Studies  | Engineering<br>Mechanics                                 | Object<br>Oriented                             | Introduction<br>to Critical |         |  |  |
| п   | Design Thinking                          | Analysis   | Chemistry                                | Studies   | Wieenumes  | Programming                                    | Thinking                    |         |  |  |
|   | LA203                                    | MA202  | CH101                                    | ID201   | ME201  | CSE202   | LA204                       |         |  |  |
|   | $(2\ 0\ 0\ 0)$                           | (3100)   | (3 1 2 0)                                | (2000)  | (3 1 0 0)  | (3 0 2 0)                                      | (2000)                      |         |  |  |
|   | 2  | 4  | 5  | 2   | 4  | 4  | 1                           | 22      |  |  |
| ш   | Structure<br>Analysis-I                  | Fluid<br>Mechanics                                     | Surveying                                | Computer<br>Based<br>Numerical and<br>Statistical<br>Techniques | Effective<br>Communication<br>Design                     | Intelligent<br>Machines (AI,<br>Robotics, IoT) |                             |         |  |  |
|   | CE305                                    | CE306  | CE308                                    | MA302   | CCT306   | ID303  |                             |         |  |  |
|   | (3 1 0 0)                                | (3 1 2 0)  | (3 0 2 0)                                | (3 0 2 0)   | (3000)   | (2000)   |                             |         |  |  |
|   | 4  | 5  | 4  | 4   | 3  | 2  |                             | 22      |  |  |
| IV  | Structure<br>Analysis-II                 | Engineering<br>Geology and<br>Building<br>Construction | Concrete<br>Technology                   | Hydraulic<br>Engineering  | Advanced<br>Communication<br>& Interpersonal<br>Dynamics | Articulation<br>and Elocution                  |                             |         |  |  |
|   | CE405                                    | CE402  | CE409                                    | CE403   | CCT401   | CCT202   |                             |         |  |  |
|   | (3 1 0 0)                                | (3 0 2 0)  | (3 0 2 0)                                | (3 0 2 0)   | (2000)   | (2 0 2 0)                                      |                             |         |  |  |
|   | 4  | 4  | 4  | 4   | 2  | Audit  |                             | 18      |  |  |
|   |  | Practi   | ce School - I (PS                        | (1101) - (4  to  6  We)   | eks Duration) - 4 Ci                                     | redits   | I                           | 1       |  |  |
| <b>X</b> 7  | Design of RCC<br>and Steel<br>Structures | Geotechnical<br>Engineering                            | Mechanical<br>and Electrical<br>Machines | Departmental<br>Elective-I/<br>Open Elective-<br>I              | Communication<br>and Identity                            | Management<br>Perspectives                     |                             |         |  |  |
| v   | CE1107                                   | CE1108   | ES1108                                   |   | CC1104   | IL1101   |                             |         |  |  |
|   | (3 0 2 0)                                | (3 0 2 0)  | (3 0 2 0)                                |   | (2000)   | (2000)   |                             |         |  |  |
|   | 4  | 4  | 4  | 4   | 2  | 2  |                             | 20      |  |  |
| V/I*  | Transportation<br>Engineering            | Construction<br>Project<br>Management                  | Departmental<br>Elective-II              | Open Elective -<br>II   | Critical<br>Thinking for<br>Decisions at<br>Workplace    | Introduction<br>to IoT                         | Automation<br>Project       |         |  |  |
| VI <sup>+</sup>   | CE1109                                   | CE1112   |  |   | CC1106   | EE1111   | PR1101                      |         |  |  |
|   | (3 0 2)                                  | (3 0 2 0)  |  |   | (2000)   | (1 0 2 0)                                      |                             |         |  |  |
|   | 4  | 4  | 4  | 4   | 2  | 2  | 2                           | 22      |  |  |
| VII*  | Departmental<br>Elective-III             | Departmental<br>Elective-IV                            | Departmental<br>Elective-V               | Open Elective-<br>III   | Minor Project  |  |                             |         |  |  |
|   |  |  |  |   | PR1103   |  |                             |         |  |  |
|   |  |  |  |   |  | 1  |                             |         |  |  |
|   | 4  | 4  | 4  | 4   | 4  | 1  |                             | 20      |  |  |
| VIII*   | Pra                                      | ctice School - II /                                    | Entrepreneurial P                        | roject/Research Pro   | oject/Semester at a I                                    | Partner University                             |                             |         |  |  |
|   |  |  |  | 16  |  |  |                             | 16      |  |  |
|   | Total Credits                            |  |  |   |  |  |                             |         |  |  |

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|----------------|--|---------|--|--|--|--|--|--|--|
|                | B.Tech (CE) (Batch: 2017-2021)   |         |  |  |  |  |  |  |  |
| Course<br>Code | Course Name  | Page No |  |  |  |  |  |  |  |
| LA101          | English Communication Skills   | 1       |  |  |  |  |  |  |  |
| MA102          | Calculus and Linear Algebra  | 3       |  |  |  |  |  |  |  |
| PH101          | Engineering Physics  | 5       |  |  |  |  |  |  |  |
| EE101          | Electrical & Electronics Engineering   | 7       |  |  |  |  |  |  |  |
| CM101          | Elements of Engineering  | 9       |  |  |  |  |  |  |  |
| CE102          | Engineering Drawing  | 12      |  |  |  |  |  |  |  |
| LA203          | Creativity and Design Thinking   | 14      |  |  |  |  |  |  |  |
| MA202          | Differential Equations and Complex Analysis  | 16      |  |  |  |  |  |  |  |
| CH101          | Engineering Chemistry  | 17      |  |  |  |  |  |  |  |
| ID201          | Environmental Studies  | 19      |  |  |  |  |  |  |  |
| ME201          | Engineering Mechanics  | 20      |  |  |  |  |  |  |  |
| CSE202         | Object Oriented Programming  | 22      |  |  |  |  |  |  |  |
| LA204          | Introduction to Critical Thinking  | 24      |  |  |  |  |  |  |  |
| CE305          | Structure Analysis–I   | 26      |  |  |  |  |  |  |  |
| CE306          | Fluid Mechanics  | 27      |  |  |  |  |  |  |  |
| CE308          | Surveying  | 29      |  |  |  |  |  |  |  |
| MA302          | Computer Based Numerical and Statistical Techniques  | 31      |  |  |  |  |  |  |  |
| CCT 306        | Effective Communication Design   | 33      |  |  |  |  |  |  |  |
| ID 303         | Intelligent Machines (AI, Robotics, IoT)   | 34      |  |  |  |  |  |  |  |
| CE405          | Structure Analysis –II   | 36      |  |  |  |  |  |  |  |
| CE402          | Engineering Geology and Building Construction  | 37      |  |  |  |  |  |  |  |
| CE409          | Concrete Technology  | 40      |  |  |  |  |  |  |  |
| CE403          | Hydraulic Engineering  | 41      |  |  |  |  |  |  |  |
| CCT401         | Advanced Communication & Interpersonal Dynamics  | 43      |  |  |  |  |  |  |  |
| CCT202         | Articulation and Elocution   | 45      |  |  |  |  |  |  |  |
| PS1101         | Practice School - I  | 47      |  |  |  |  |  |  |  |
| CE1107         | Design of RCC and Steel Structures   | 48      |  |  |  |  |  |  |  |
| CE1108         | Geotechnical Engineering   | 50      |  |  |  |  |  |  |  |
| ES1108         | Mechanical and Electrical Machines   | 53      |  |  |  |  |  |  |  |
| CC1104         | Communication and Identity   | 55      |  |  |  |  |  |  |  |
| IL1101         | Management Perspectives  | 57      |  |  |  |  |  |  |  |
| CE1109         | Transportation Engineering   | 60      |  |  |  |  |  |  |  |
| CE1112         | Construction Project Management  | 63      |  |  |  |  |  |  |  |
| CC1106         | Critical Thinking for Decisions at Workplace   | 66      |  |  |  |  |  |  |  |
| EE1111         | Introduction to IoT  | 67      |  |  |  |  |  |  |  |
| PR1101         | Automation Project   | 70      |  |  |  |  |  |  |  |
| PR1103         | Minor Project  | 71      |  |  |  |  |  |  |  |
| PS801          | Practice School - II /Entrepreneurial Project/Research<br>Project/Semester at a Partner University | 72      |  |  |  |  |  |  |  |
| Departmen      | tal Elective-I / Open Elective I   |         |  |  |  |  |  |  |  |
| CE1201         | Public Health Engineering (DE)   | 73      |  |  |  |  |  |  |  |

| IM311             | Basic Course in Entrepreneurship (OE)        | 76  |
|-------------------|--|-----|
| CE1202            | Municipal and Urban Engineering              | 78  |
| IL1203            | Economics and Finance for Engineers          | 81  |
| <b>Open Elect</b> | ive II                                       |     |
| CE1206            | Disaster Management                          | 84  |
| AS1203            | Optimization Techniques                      | 86  |
| IL1202            | Green Energy                                 | 88  |
| IL1201            | Mechatronics and Robotics                    | 91  |
| Departmen         | t Elective II, III, IV, V                    |     |
| CE1205            | Building Planning & Design                   | 94  |
| CE732             | Ground Improvement Techniques                | 95  |
| CE1210            | Advanced Foundation Engineering              | 97  |
| CE1111            | Earthquake Engineering                       | 100 |
| CE510             | Hydrology and Water Resources Engineering    | 102 |
| CE1209            | Railway and Airport Engineering              | 103 |
| CE1211            | Advanced Highway Engineering                 | 105 |
| CE1207            | Integrated Waste Management for Smart Cities | 108 |
| CE 1208           | Design of Advanced Concrete Structures       | 111 |
| CE1401            | CAD-BIM Specialization (Curated MOOC)        | 113 |

|                                   |  |                                     |  |                      |                       |                               |           | Tea                          | ching S              | Schem | ie     |
|-----------------------------------|--|-------------------------------------|--|----------------------|-----------------------|-------------------------------|-----------|------------------------------|----------------------|-------|--------|
| Cour                              | se code                                    |                                     | Course T   | fitle                |                       |                               | L T P S   |                              |                      |       | Credit |
| T.                                | A 101 English Communication Skills 1 0 2 1 |                                     |  |                      |                       |                               |           | 3                            |                      |       |        |
|                                   |  | English Communication Skins 1 0 2 1 |  |                      |                       |                               |           | 5                            |                      |       |        |
| <b>Evaluation Scheme (Theory)</b> |  |                                     |  |                      |                       | Evaluation Scheme (Practical) |           |                              |                      |       |        |
| Mid<br>Term<br>Test–<br>I         | Mid<br>Term<br>Test–<br>II                 | End<br>Ter<br>m<br>Test             | Class Participation/<br>Additional Continuous<br>Evaluation* | Total<br>Marks<br>** | Mid<br>Term<br>Test-I | End<br>Term<br>Test           | Cl<br>Add | ass Par<br>litional<br>Evalu | Total<br>Marks*<br>* |       |        |
| 20                                | 20   | 50                                  | 10   | 100                  | 20                    | 50                            | 30        |                              |                      |       | 100    |

\*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical

Records/Mock Interviews/others

\*\* The ratio of weightage between Theory and Practical content will be 60%: 40%.

#### Syllabus (Theory)

**UNIT I:** Basics of English Grammar, Applied English Grammar and Usage, Paragraph Writing: Definition, Structure of a Paragraph, Construction of a Paragraph, Unity and Coherence, academic essay writing

**UNIT II:** Definition and Characteristic Features of Effective Communication, Barriers to Communication: Types, Ways to overcome effective communication barriers, miscommunication, know what you want to say

**UNIT III:** Vocabulary Extension: Roots, Prefixes and Suffixes, Synonyms, Antonyms, Homophones, One Word Substitution, Learning words through Situations

Reading Comprehension: Problems, Types of Reading Skills, Strategies

**UNIT IV:** Listening Skills: listening for effective information, developing effective listening skills, Self-motivation, Aspiration and Ambitions, Discipline & Time Management, Confidence Building

**UNIT V:** Phonetics and Spoken English: Sounds of English, Word Accent and Weak Forms in English, Intonation, introducing students to the rules of Word Accent and Weak Forms in English, Art of Condensation: Steps Required, Strategies.

#### Syllabus (Practical)

- 1. Tips for inculcating effective communication skills (recorded video)
- 2. Development of listening skill by showing the real-life speech
- 3. Vocabulary building
- 4. Mastering Conversations Skills
- 5. Practice of different sounds of English language
- 6. Understanding the proper stress and intonation pattern in English Language
- 7. Role play and Information gap activities
- 8. Presentations to provide practice in spoken English
- 9. Techniques of paragraph development
- 10. Understanding different strategies of reading
- 11. Skim and scan a passage in search of specific details
- 12. Inculcating the skill of content prediction and inference

#### Textbook(s)

- 1. John Eastwood, Oxford Practice Grammar Intermediate, New Delhi: OUP, 2012.
- 2. Sanjay Kumar and PushpLata, Communication Skills, New Delhi: OUP, 2011.
- 3. Krishna Mohan and N.P.Singh, Speaking English Effectively, New Delhi: Macmillan, 1994
- 4. V. Sasikumar and P.V. Dhamija, Spoken English: A Self-Learning Guide to Conversation Practice, Tata-McGraw Hill, 2007.
- 5. Norman Lewis, Word Power Made Easy, Delhi: Goyal Saab Publishers and Distributors, 1994.
- 6. A. J. Thomson and A. V. Martinet, A Practical English Grammar, 4th Edition, New Delhi: OUP, 1999.
- 7. Asha Kaul, Business Communication, Second Edition, New Delhi: PHI, 2010.
- 8. Edgar Thorpe and Showick Thorpe, Objective English, 2nd Edition, New Delhi: Pearson Education, 2008.

#### Web Resource(s)

http://nptel.ac.in/courses/109104031/

|                            |         |      |                       |                                 |        |       |  | Tea                  | ching S | Schem | e               |  |
|----------------------------|---------|------|-----------------------|---------------------------------|--------|-------|--|----------------------|---------|-------|-----------------|--|
| Cour                       | se code |      | Course T              | itle                            |        |       | т  | т                    | р       | S     | Credit          |  |
|                            |         |      |                       |                                 |        |       | L  | I                    | I       | 6     | S               |  |
| M                          | A102    |      | Calculus and Line     | Calculus and Linear Algebra3100 |        |       |  |                      |         |       | 4               |  |
| Evaluation Scheme (Theory) |         |      |                       |                                 |        | Evalu | LIFSs31004Evaluation Scheme (Practical)CndClass Participation/<br>Additional Continuous<br>Evaluation*Total<br>Marks*<br>* |                      |         |       |                 |  |
| Mid                        | Mid     | End  | Class Participation/  | Total                           | Mid    | Fnd   | CI   | Class Particination/ |         |       |                 |  |
| Term                       | Term    | Ter  | Additional Continuous | Total<br>Mork                   | Torm   | Torm  | Additional Continuous  |                      |         |       | 10tai<br>Marke* |  |
| Test-                      | Test–   | m    | Fyaluation*           | •**                             | Test-I | Test  | Auu  | Evoluation*          |         |       | *               |  |
| Ι                          | II      | Test | Evaluation            | 3                               | 1050-1 | Itst  |  | Evalu                | ation   |       |                 |  |
| 20                         | 20      | 50   | 10                    | 100                             |        |       |  |                      |         |       |                 |  |

#### Syllabus (Theory)

#### **UNIT I:** CALCULUS OF SEVERAL VARIABLES:

Functions of two or more variables, Partial Derivatives, Total derivative, chain Rule, Euler's Theorem, Jacobian and transformation, Applications to errors

#### **UNIT II:** INTEGRAL CALCULUS

Solids of revolution: Surface and volume, Multiple Integrals - Double integral: Area, change of order of integration, changing to polar coordinates, Triple Integral

#### UNIT III: VECTOR FUNCTION AND ITS DERIVATIVES

Vector functions, their derivatives and integration, Arc length and UNIT tangent vector, Curvature and UNIT normal vector, Torsion and UNIT Bi-normal vector, Directional derivative and gradient vectors, Tangent plane, Divergence and curl of a vector field

#### **UNIT IV:** VECTOR INTEGRATION

Line integral, flux, work done, circulation, Path independence, potential function and conservative fields, Green's theorem in the plane, Stoke's theorem, Divergence theorem

#### **UNIT V:** LINEAR ALGEBRA

Matrices, Rank of a Matrix, System of Linear Algebraic Equations, Linear Independence and Dependence, Eigen Values and Eigen Vectors, Cayley Hamilton Theorem, Vector Spaces and Subspaces, Bases and Dimensions, Coordinates, Linear Transformations

#### Textbook(s)

- 1. Srimanta Pal and Subodh C. Bhunia, Engineering Mathematics, Oxford.
- 2. Babu Ram, Engineering Mathematics Part I, Pearson.
- 3. B. S. Grewal, Higher Engineering Mathematics, 41st Ed., Khanna Publishers, Delhi, 2011.
- 4. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Fourth Edition (Student Edition), Jones & Barlett, Viba, New Delhi, 2011
- Rober Wrede, Spiegel M. R., Schaum's outline of advanced calculus, 3<sup>rd</sup> edition, Tata Mc-GrawHill, New York, 2011
- 6. Peter V. O'Neil, Advanced Engineering Mathematics, Seventh Indian Reprint, Cengage Learning, New Delhi, 2011.
- 7. Kreyszig, E., Advanced Engineering Mathematics, John Willey, Delhi (2011).

#### Web Resource(s)

http://nptel.ac.in/courses/111106051/

|                            |         |      |                       |               |         |       |                              | Teaching Scheme      |                 |   |        |
|----------------------------|---------|------|-----------------------|---------------|---------|-------|------------------------------|----------------------|-----------------|---|--------|
| Cour                       | se code |      | Course T              | itle          |         |       | L                            | т                    | Р               | S | Credit |
|                            |         |      |                       |               |         |       | L                            | •                    | 1               | b | S      |
| P                          | H101    |      | Engineering           | Physics       |         |       | 3                            | 1                    | 5               |   |        |
| Evaluation Scheme (Theory) |         |      |                       |               |         | Evalu | valuation Scheme (Practical) |                      |                 |   |        |
| Mid                        | Mid     | End  | Class Participation/  | Total         | Mid     | Fnd   | CI                           | Class Particination/ |                 |   |        |
| Term                       | Term    | Ter  | Additional Continuous | 10tai<br>Mark | Term    | Term  |                              | itional              | 10tai<br>Marks* |   |        |
| Test-                      | Test-   | m    | Evaluation*           | s**           | Test-I  | Test  | nuu                          | Evalu                | *               |   |        |
| Ι                          | II      | Test | Livuluulion           | 5             | I COU I | Itst  | Evaluation.                  |                      |                 |   |        |
| 20                         | 20      | 50   | 10                    | 100           | 20      | 50    | 30                           |                      |                 |   | 100    |

\*\*The ratio of weightage between Theory and Practical content will be 60%: 40%

#### Syllabus (Theory)

#### UNIT I: COHERENCE, INTERFERENCE AND OPTICAL TECHNOLOGY

Introduction to optics, Spatial Coherence, Temporal coherence, Coherence length, Coherence time and 'Q' factor for light

Formation of Newton's rings, Measurement of wavelength of light, Diameter of Newton's rings Elementary idea of anti-reflection coating and interference filters

#### **UNIT II: DIFFRACTION**

Single slit diffraction, position of maxima / minima and width of central maximum, intensity variation. Construction and theory, Formation of spectra by plane transmission grating, Determination of wavelength of light by plane transmission grating.

#### **UNIT III: POLARIZATION**

Plane, circular and elliptically polarized light based on electric (light) vector, Malus law. Quarter and half wave plates, construction, working and use of these in production and detection of plane, circular and elliptically polarized light. Introduction and law of optical rotation, specific rotation and its measurement using the half-shade and bi-quartz device.

#### UNIT IV: LASER AND FIBRE OPTICS

Theory of Laser Action, Einstein's Coefficients, Threshold Conditions for Laser Action. Theory, Design, and Applications of He-Ne Laser. Theory of Semiconductor Lasers. Optical Fibre, Numerical Aperture, and Maximum Angle of Acceptance.

#### **UNIT V: QUANTUM MECHANICS**

Heisenberg's Uncertainty Principle, Wave and Particle Duality of Radiation, De-Broglie's Concept of Matter waves, Quantum Nature of Light, Concept of Compton Effect, Concept of Wave Function, Physical interpretation of wave function and its properties, Schrödinger's Wave Equation: Time dependent and time independent cases, Particle in one-dimensional box, Particle in three-dimensional boxes, Degeneracy.

#### Syllabus (Practical)

- 1. To determine the wavelength of sodium light by Newton's Ring
- 2. To determine the specific rotation of Glucose (Sugar) solution using a Polarimeter
- 3. To measure the Numerical Aperture of an Optical Fibre.
- 4. To determine coherent length and coherent time of laser using He-Ne Laser

- 5. To determine the height of object with the help of a Sextant.
- 6. To determine the dispersive power of material of a Prism for Violet Red and Yellow colours of Mercury light with the help of a spectrometer.
- 7. To study the Charge & Discharge of a condenser and hence determine time constant (Both current and voltage graphs are to be plotted).
- 8. To study characteristics of G.M. Counting System.
- 9. To convert a Galvanometer into an ammeter of range 1.5/3 amp and calibrate it.
- 10. To convert a Galvanometer into a Volt of range 1.5/3 volt and calibrate it.

#### Textbook(s)

- 1. Mahesh C. Jain, "Textbook of Engineering Physics", Part I, PHI
- 2. Mahesh C. Jain, "Textbook of Engineering Physics", Part II, PHI
- 3. Lab Manuals for Physics

#### **Reference Book(s)**

- 1. Arther Beiser, "Concept of Modern Physics" Tata McGrawHill, New Delhi, 5thedn. 1997.
- 2. Ajoy Ghatak, "Optics", Tata McGraw Hill, 4<sup>th</sup>edn
- 3. Eyvind H Wichman, "Quantum Physics" Tata McGraw Hill, Volume 4
- 4. Neeraj Mehta, "Applied Physics for Engineers", PHI, I edn. 2011
- 5. Dattu R Joshi, "Engineering Physics", Tata McGraw Hill Education Pvt. Ltd. New Delhi, I edn. 2010.

#### Web Resource(s)

http://nptel.ac.in/courses/122107035/

|                            |         |      |                       |               |         |                               |                       | Tea     | ching S  | Schem | e               |
|----------------------------|---------|------|-----------------------|---------------|---------|-------------------------------|-----------------------|---------|----------|-------|-----------------|
| Cour                       | se code |      | Course T              | itle          |         |                               | L                     | т       | р        | S     | Credit          |
|                            |         |      |                       |               |         |                               | Ľ                     | -       | 1        | 5     | S               |
| E                          | E101    |      | Electrical & Electron | ics Engir     | neering |                               | 3                     | 0       | 4        |       |                 |
| Evaluation Scheme (Theory) |         |      |                       |               |         | Evaluation Scheme (Practical) |                       |         |          |       |                 |
| Mid                        | Mid     | End  | Class Participation/  | Total         | Mid     | Fnd                           | CI                    | acc Par | ticinati | on/   | Total           |
| Term                       | Term    | Ter  | Additional Continuous | 10tai<br>Mark | Term    | Term                          | Additional Continuous |         |          |       | 10tai<br>Marks* |
| Test-                      | Test-   | m    | Fyaluation*           | s**           | Test-I  | Test                          | Auu                   | Fyalu   | *        |       |                 |
| Ι                          | II      | Test | Evaluation            | 5             | 1050-1  | 1050                          |                       |         |          |       |                 |
| 20                         | 20      | 50   | 10                    | 100           | 20      | 50                            | 30                    |         |          |       | 100             |

\*\*The ratio of weightage between Theory and Practical content will be 60%: 40%

#### Syllabus (Theory)

**UNIT I:** Basic physical laws, circuit elements, Source Transformation, KVL, KCL, Wye (Y) – Delta ( $\Delta$ ) and Delta ( $\Delta$ ) – Wye (Y) transformations.

UNIT II: Norton, Thevenin, Superposition, Max power transfer Theorem

**UNIT III:** AC NETWORKS: Fundamental aspects of single-phase ac supply, Sinusoidal Steady State, Real/Reactive Power, Phasor, three phase circuits, Start-delta, Two watt-meter Method, simple circuits, RMS Average value, Transients in R-L, R-C, R-L-C.

**UNIT IV:** TRANSFORMER & MACHINE: Basics of transformer Faraday and Lenz law, Mutual Inductance, construction, working Principles of Transformers, AC/DC machines.

**UNITV:** INTRODUCTION TO SEMICONDUCTORS: Defining Insulator, Semiconductor, Conductors. Band gap energy and band formation, elementary idea about semiconductor behavior, conductivity, types of semiconductor, p-type and n-type, working principle, characteristics and applications of Diode and Transistor, Transistor CE, CB, CC configuration.

#### Syllabus (Practical)

#### ELECTRICAL LAB

- 1. Single line diagram of a power system and a distribution sub-station and basic functional study of main components used in power systems.
- 2. Make house wiring including earthling for 1-phase energy meter, MCB, ceiling fan, tube light, three pin socket and a lamp operated from two different positions. Basic functional study of components used in house wiring
- 3. Study the construction and basic working of ceiling fan, single phase induction motor and three phase squirrel cage induction motor. Connect ceiling fan along with regulator and single-phase induction motor through autotransformer to run and vary speed.
- 4. (a) Basic functional study and connection of moving coil & moving iron ammeters and

Voltmeters, dynamometer, wattmeter and energy meter.

(b) Run a 3-phase squirrel cage induction motor at no load and measure its voltage, current, power and power factor. Reverse the direction of rotation.

- 5. Study the construction, circuit, working and application of the following lamps:
  (i) Fluorescent lamp, (ii) Sodium vapour lamp, (iii) Mercury vapour lamp, (iv) Halogen lamp and (v) Neon lamp
- 6. (a) Study the construction and connection of single-phase transformer and autotransformer. Measure input and output voltage and fin turn ratio.
  (b) Study the construction of a core type three phase transformer. Perform star and delta Connection on a 3-phase transformer and find relation between line and phase voltage.

#### ELECTRONICS LAB

- 1. Identification, testing and applications of resistors, inductors, capacitors, PN-diode, Zener diode, LED, LCD, BJT, FET, UJT, SCR, Photo diode and Photo transistor.
- (a) Functional study of CRO, analog & digital multi-meters and function / signal generator.

(b) Study the single-phase half wave and bridge rectifier and effects of filters on waveform.

- 3. Study the BJT amplifier in common emitter configuration. Measure voltage gain, plot gain frequency response and calculate its bandwidth.
- 4. (a) Study the construction and basic working of SCR.(b) Study the single-phase half wave and bridge controlled rectifier and observe the effect of firing angle on waveform.

#### Textbook(s)

- 1. S.N. Singh "Basic Electrical Engineering", Prentice-Hall of India Pvt. Ltd, 2011.
- 2. J. Millman and C. Halkias, Integrated Electronics, McGraw Hill,2th Edition, 6th Indian Reprint, 2011.
- 3. B. L. Theraja, "Electrical Technology", Vol.1, S. Chand Publication, New Delhi
- 4. V. K. Mehta, "Basic Electrical Engineering", S. Chand and Company Ltd., New Delhi

#### **Reference Book(s)**

- 1. T.K. Nagsarkar, M.S. Sukhija," Basic Electrical Engineering", Oxford University press, 2<sup>nd</sup> edition, 2011.
- 2. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College Publishing, 1991.

#### Web Resource(s)

http://nptel.ac.in/courses/108101038/

|                            |         |      |   |               |                               |      |     | Tea                  | ching S         | Schem | ie     |
|----------------------------|---------|------|---|---------------|-------------------------------|------|-----|----------------------|-----------------|-------|--------|
| Cour                       | se code |      | Course T                                | itle          |                               |      | т   |                      |                 |       | Credit |
|                            |         |      |   |               |                               |      | L   | Т                    | Р               | S     | s      |
| CN                         | M101    |      | Elements of En                          | gineering     | g                             |      | 2   | 0                    | 4               |       |        |
| Evaluation Scheme (Theory) |         |      |   |               | Evaluation Scheme (Practical) |      |     |                      |                 |       |        |
| Mid                        | Mid     | End  | Class Participation/                    | Total         | Mid                           | Fnd  | CI  | Class Particination/ |                 |       | Total  |
| Term                       | Term    | Ter  | Additional Continuous                   | 10tai<br>Mark | Term                          | Term |     | ass I al<br>litional | 10tai<br>Marks* |       |        |
| Test-                      | Test-   | m    | Fyaluation*                             | s**           | Test-I                        | Test | Auu | Evalu                | uous            | *     |        |
| Ι                          | II      | Test | Evaluation* S** Test-1 Test Evaluation* |               |                               |      |     |                      |                 |       |        |
| 20                         | 20      | 50   | 10                                      | 100           | 20                            | 50   | 30  |                      |                 |       | 100    |

\*\*The ratio of weightage between Theory and Practical content will be 60%: 40%

#### Syllabus (Theory)

**UNIT I:** Introduction: Prime movers and its types, Concept of Force, Pressure, Energy, Work, Power, System, Heat, Temperature, Specific heat capacity, Change of state, Path, Process, Cycle, Internal energy, Enthalpy, Statements of Zeroth Law and First law

**UNIT II: Power Transmission Methods and Devices:** Introduction to Power transmission, Belt drive, Rope drive, Chain drive, Pulley, Gear drive, Types of gears, Gear train, Clutches, Types and function of clutches, Types and function of brakes, Power measurement by dynamometer, Types of dynamometers.

**UNIT III: Internal Combustion Engines:** Classification, I.C. Engines parts, 2 Stroke and 4 stroke Petrol engines, 4- stroke diesel engines. P-V diagrams of Otto and Diesel cycles. Problems on indicated power, brake power, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency, and specific fuel consumption.

**UNIT IV:** Introduction: Branches of Civil Engineering, Scope of Civil Engineering, Role of Civil Engineer in Society. Impact of infrastructural development on economy of country.

Building Materials and Construction: Materials: Introduction to construction materials like Stone, Bricks, Lime, Cement, Timber, Sand, Aggregates, Mortar, Concrete and bitumen.

**Construction:** Classification of buildings, Types of loads acting on buildings, Building components and their functions and nominal dimensions

**UNITV:** Transportation Engineering: Role of transportation in national development, Modes of transportation, Introduction to road traffic and traffic control, Introduction to mass transportation system.

#### Syllabus (Practical)

#### **Mechanical Engineering**

- 1. Basics of manufacturing, types of production systems, ethics, safety in workshop.
- 2. Metrology, quality, Least Count of a measuring Instrument, measurement with Vernier Caliper or Micrometer.
- 3. Machining Demonstration of Turning, Step Turning, Facing, etc.
- 4. Casting Demonstration of sand-casting process
- 5. Forging Demonstration of forging operations

- 6. Sheet metal working applications.
- 7. Hands on practice of Sheet metal working operations using hand tools- Preparation of Funnel.
- 8. Gas Welding, Demonstration of Gas Welding
- 9. Hands on practice of Joining of metal parts by Arc Welding- Preparation of a Lap Joint model.
- 10. Mechanical joining processes, Arc Welding
- 11. Hands on practice of Joining of metal parts by Arc Welding- Preparation of a Butt Joint model.
- 12. Introduction to wood working, Wood working Tools, Types of wood, Types of joints.
- 13. Hands on practice of Wood working operations using hand tools- preparation of Lap Tee Joint, Mechanical joining processes, Soldering, Brazing.
- 14. Machining Demonstration of Shaping operations
- 15. Hands on practice of Fitting operations using hand tools- Prepare a job in fitting shop.

#### **Civil Engineering**

- 1. To measure the dimension of a given road, pathway, building and area by chain surveying.
- 2. Layout preparation on ground of a given drawing using compass and chain.
- 3. To determine compressive strength of a concrete cube using Compressive Testing Machine (CTM).
- 4. Measurement of offsets for a building in Chain Surveying.
- 5. Verification of conservation of energy in a duct based on Bernoulli's theorem
- 6. Determination of Turbidity, TDS, hardness of a water sample.

#### Textbook(s)

#### **Elements of Mechanical Engineering**

- 1. Fundamental of Mechanical Engineering by G.S. Sawhney, PHI Publication New Delhi.
- 2. Elements of Mechanical Engineering by Sadhu Singh S. Chand Publication.
- 3. Introduction to Engineering Materials by B.K. Agrawal Tata McgraHill Publication, New Delhi.

#### **Elements of Civil Engineering**

- 1. Elements of Civil Engineering Author: Dr. R.K. Jain and Dr. P.P. Lodha Publisher: McGraw Hill Education, India Pvt. Ltd.
- 2. Elements of Civil Engineering (IV Edition) by S.S. Bhavikatti, Vikas Publishing House Pvt. Ltd., New Delhi.

#### **Reference Book(s)**

- 1. H S Bawa, "Workshop Practice", TMH, New Delhi, 2<sup>nd</sup> Edition, 2011.
- 2. B S Nagendra Parashar and R K Mittal, "Elements of Manufacturing Process", Prentice Hall of India, New Delhi, 2010.
- 3. B S Raghuwanshi, "A Course in Workshop Technology", Dhanpat Rai & Co., New Delhi, Volume I & II, 2011.
- 4. SeropeKalpakjian and Steven R. Schmid, "Manufactuirng Engineering and Technology," Pearson Education (Low Cost Indian Edition), New Delhi, 4<sup>th</sup> Edition, 2005.
- K. Venkata Reddy, "Workshop Practice Manual", BS Publications, Hyderabad,6<sup>th</sup> Edition, 2011.
- 6. P. kannaiah and K. L. Narayana, "Engineering Practices Laboratory", SciTech Publications, Chennai, 2006.

### Web Resource(s)

http://nptel.ac.in/courses/112105124/

|                            |                              |      |                       |               |        |                               |         | <b>Teaching Scheme</b> |                 |   |        |
|----------------------------|------------------------------|------|-----------------------|---------------|--------|-------------------------------|---------|------------------------|-----------------|---|--------|
| Cour                       | se code                      |      | Course T              | itle          |        |                               | т       |                        |                 |   | Credit |
|                            |                              |      |                       |               |        |                               | L T P S |                        |                 |   | S      |
| Cl                         | CE102Engineering Drawing2020 |      |                       |               |        |                               | 3       |                        |                 |   |        |
| Evaluation Scheme (Theory) |                              |      |                       |               |        | Evaluation Scheme (Practical) |         |                        |                 |   |        |
| Mid                        | Mid                          | End  | Class Participation/  | Total         | Mid    | Fnd                           | CI      | Class Particination/   |                 |   |        |
| Term                       | Term                         | Ter  | Additional Continuous | 10tai<br>Mark | Torm   | Torm                          |         | ass I al               | 10tai<br>Marke* |   |        |
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| Ι                          | II                           | Test | Evaluation            | 5             | 1030-1 | 1050                          |         | Lvaiu                  |                 |   |        |
| 20                         | 20                           | 50   | 10                    | 100           | 20     | 50                            |         | 3                      | 100             |   |        |

\*\*The ratio of weightage between Theory and Practical content will be 60%: 40%

#### Syllabus (Theory)

UNIT I: Lines, Lettering & Dimension (Sketch Book)

Scales: Representative factor, plain scales, diagonal scales, scale of chords.

Conic sections: Construction of ellipse, parabola, & hyperbola by different methods; Engineering Curves: Cycloid, Epicycloid, Hypocycloid, Involutes, Archimedean and logarithmic spirals.

**UNIT II:** Projection: Types of projection, orthographic projection, first and third angle projection, (Sketch Book)

Projection of points and straight lines: Line inclined to one plane, inclined with both the plane, methods for determining True Length, true Inclinations, and Traces of straight lines.

**UNIT III:** Projection of planes and solids: Projection of Planes like circle and polygons in different positions; Projection of right and regular polyhedrons like prisms, pyramids and solids of revolutions like cylinder, cones in different positions.

**UNIT IV:** Section of Solids: Section of right solids (like Prism, Pyramid, Cylinder and Cone) by normal and inclined planes in different positions; Intersection of cylinders.

Development of Surfaces: Parallel line and radial-line method for right, regular solids.

**UNITV:** Isometric Projections: Isometric scale, Isometric axes, Isometric Projection of solids from orthographic drawing.

Computer Aided Drafting (CAD): Introduction, benefit, software's basic commands of drafting entities like line, circle, polygon, polyhedron, cylinders; transformations and editing commands like move, rotate, mirror, array; Draw Toolbar, Object & Modify toolbar; solution of projection problems on CAD.

#### Syllabus (Practical)

Sketching and drawing of geometries and projections on Sketch Book & on AutoCAD based on above syllabus

#### Textbook(s)

- 1. Kulkarni D M, Rastogi A P, Sarkar A K, Engineering Graphics with AutoCAD, PHI Learning Pvt. Ltd., New Delhi, India, Fourth Printing (Revised Edition), 2012.
- 2. Bhatt N D, Engineering Drawing, Charotar Book Stall, Anand, India.

#### **Reference Book(s)**

- 1. Jolhe D A, Engineering Drawing with an introduction to AutoCAD, TMH, New Delhi, India.
- 2. Gill P S, Engineering Drawing (Geometrical Drawing), S K Kataria& Sons, Delhi, India
- 3. Jeyopoovan T.; Engineering drawing & Graphics Using AutoCAD; Vikas publishers.
- 4. Engineering Drawing, Basant Agarwal & CM Agarwal, Tata McGraw Hill.
- 5. Shah MB and Rana BC; Engg.drawing; Pearson Education
- 6. Luzadder WJ and Duff JM; Fundamental of Engg Drawing; PHI
- 7. Dhananjay A Jolhe; Engg. Drawing an Introduction; Tata McGraw Hill.
- 8. Visvesvaraya Tech. University; A Premier on Computer Aided Engg drawing; VTU Belgaum
- 9. Venugopal K.; Engineering Graphics; New Age

#### Web Resource(s)

http://nptel.ac.in/courses/112103019/

| Course code:<br>Course Title: | LA203<br>Creativity and Design Thinking |   |   |   |  |  |  |  |  |
|-------------------------------|---|---|---|---|--|--|--|--|--|
| Teaching Scheme:              | L                                       | Т | Р | S |  |  |  |  |  |
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#### **Course Objective:**

It is often said that "Today, thinking is more important than knowing". Opportunities are what we all look for and their counterparts—the problems—are what we should solve in daily lives. Dynamic environment of twenty first century requires more creative skills from citizens than just analytical skills to manage in the ever-changing work environment.

The course is designed to provide an understanding of problem solving with a touch of creative focus in a systemic framework. The students will be introduced to concepts of creative thinking like convergent and divergent thinking, lateral thinking and brain storming. Structured techniques such as 6 thinking hats and mind maps will also be practiced. Students will be expected to work on live projects to come up with creative Jugaad solutions to problems that they see around them. Concepts around creativity such as the Medici Effect will also be discussed in class through book readings.

The sessions will focus on the following key topics:

- 1. Why do we need to be creative?
- 2. Fundamentals of Creative Thinking What is Creativity, Defining the Problem
- 3. Tools and Techniques of Creative Thinking
- 4. Creating Intersections for Creativity
- 5. Frugal Innovation
- 6. Disruptive Innovation

#### **Grading & Evaluation:**

- 1. Mid-Term Project 30%
- 2. Design Thinking Project 40%
- 3. Attendance, Class participation & Assignments-30%

#### **Recommended Books:**

| Arie Ruttenberg and Shlomo Maital | Cracking the Creativity Code |
|-----------------------------------|------------------------------|
| Frans Johnsson                    | The Medici Effect            |
| Navi and Jaideep                  | Jugaad Innovation            |
| Tom Kelly                         | Creative Confidence          |

#### **Teaching tools & methodology:**

TCS ION online discussion forum Hands-on activities Brain teasers and games Secondary research

#### Miscellany:

This course will require high level of self-motivation and class participation. Quality of group exercises, while not graded, will be considered for marks on class participation.

|                            |         |   |                       |               |        |       |   | Tea                  | ching S | Schem           | e      |  |  |
|----------------------------|---------|---|-----------------------|---------------|--------|-------|---|----------------------|---------|-----------------|--------|--|--|
| Cour                       | se code |   | Course T              | itle          |        |       | т   | т                    | р       | S               | Credit |  |  |
|                            |         |   |                       |               |        |       | L   | 1                    | L       | 5               | S      |  |  |
| М                          | A202    | 02Differential Equations and Complex Analysis3100 |                       |               |        |       |   |                      | 4       |                 |        |  |  |
| Evaluation Scheme (Theory) |         |   |                       |               |        | Evalu | 3     1     0     0     4       Cvaluation Scheme (Practical)       nd     Class Participation/     Total |                      |         |                 |        |  |  |
| Mid                        | Mid     | End   | Class Participation/  | Total         | Mid    | Fnd   | CI  | occ Dor              | Total   |                 |        |  |  |
| Term                       | Term    | Ter   | Additional Continuous | 10tai<br>Mark | Torm   | Term  |   | ass I al<br>litional | Contin  | 10tai<br>Marke* |        |  |  |
| Test-                      | Test–   | m   | Fyaluation*           | •**           | Test-I | Test  | Auu   | Evoluation*          |         |                 | *      |  |  |
| Ι                          | II      | Test  | Evaluation            | 3             | 1050-1 | Itst  |   | Evalu                | ation   |                 |        |  |  |
| 20                         | 20      | 50  | 10                    | 100           |        |       |   |                      |         |                 |        |  |  |

#### Syllabus (Theory)

**UNIT I:** ORDINARY DIFFERENTIAL EQUATION, Differential equation of first order, Differential equation of higher order with constant coefficients, Differential equation of second order with variable coefficients

**UNIT II:** PARTIAL DIFFERENTIAL EQUATION, Partial Differential Equations of First Order, Variable separable technique for solving PDE, Boundary value problems: Heat equation, wave equation, Laplace equation

**UNIT III:** LAPLACE TRANSFORMS Laplace Transform, Applications of Laplace transform in solving differential equations.

**UNIT IV:** FOURIER TRANSFORM, Fourier transform, Applications of Laplace transform in solving boundary value problems

UNITV: SEQUENCES AND SERIES Sequences, Series, Orthogonal function, Fourier series

#### **Reference Book(s)**

- 1. Srimanta Pal and Subodh C. Bhunia, Engineering Mathematics, Oxford.
- 2. Babu Ram, Engineering Mathematics Part II, Pearson.
- 3. B. S. Grewal, Higher Engineering Mathematics, 41st Ed., Khanna Publishers, Delhi, 2011.
- 4. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Fourth Edition (Student Edition), Jones & Barlett, Viba, New Delhi, 2011.
- 5. B.V.Ramana, Higher Engineering Mathematics, Tata Mc-graw Hill.
- 6. Peter V. O'Neil, Advanced Engineering Mathematics, Seventh Indian Reprint, Cengage Learning, New Delhi, 2011.
- 7. Kreyszig, E., Advanced Engineering Mathematics, John Willey, Delhi (2011).

#### Web Resource(s)

http://nptel.ac.in/courses/122107037/

|                             |          |      |                       |                            |                               |      |                          | Teaching Scheme |        |      |                 |  |  |
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| CH101 Engineering Chemistry |          |      |                       |                            |                               |      | 3                        | 1               | 2      | 0    | 5               |  |  |
| Evaluation Scheme (Theory)  |          |      |                       |                            | Evaluation Scheme (Practical) |      |                          |                 |        |      |                 |  |  |
| Mid                         | Mid      | End  | Class Participation/  | Class Participation/ Total |                               |      | Class Participation/ Tot |                 |        |      |                 |  |  |
| Term                        | Term     | Ter  | Additional Continuous | Mark                       | Term                          | Term | Additional Continuou     |                 |        |      | 10tai<br>Marks* |  |  |
| Test-                       | Test-    | m    | Evaluation*           | s**                        | Test-I                        | Test | Auu                      | Evalu           | ation* | uous | *               |  |  |
| Ι                           | Π        | Test |                       | 2                          | I COL I                       | LOU  |                          | Lvuiu           | anon   |      |                 |  |  |
| 20                          | 20       | 50   | 10                    | 100                        | 20                            | 50   |                          | 3               |        | 100  |                 |  |  |

\*\*The ratio of weightage between Theory and Practical content will be 60%: 40%

#### Syllabus (Theory)

**UNIT I:** Water Chemistry, Introduction, common Impurities in water, Hardness of water, Determination of hardness by Clark's test and complexometric (EDTA) method. Removal of hardness by Lime Soda, Zeolite and Ion exchange process.

Boiler feed water troubles their causes, disadvantages and prevention, Scale & Sludge Carry over (Priming and Foaming), Boiler Corrosion and Caustic embrittlement.

**UNIT II:** POLYMERS, Introduction to Polymer, Classification of polymers. Methods of Polymerization, Plastics: Thermosets and Thermoplastic. Preparation, properties and uses of Vinyl resins, Bakelite, Polyesters and Nylons. Rubbers: Natural rubber, vulcanization, synthetic rubbers e.g. Buna-S, Buna-N, Butyl, Thiokol and Neoprene rubbers.

**UNIT III:** Corrosion & Lubricants, Definition and its significance, Theories of corrosion: Dry corrosion theory, Wet (Electrochemical) theory, Passivity, Types of electrochemical corrosion. Factors influencing rate of corrosion. Introduction, classification, and uses of lubricants. Types of lubrication. Viscosity & viscosity index, Flash point Fire point, cloud and pour point, steam emulsification number, precipitation number and neutralization number.

**UNIT IV:** SOLID STATE CHEMISTRY, Solid State, Types of solids, Space Lattice and UNIT cell, Types of UNIT cell, Cubic System – Number of atoms per UNIT cell, Atomic Radius, Density Calculation of UNIT cell. Bragg's Law X-ray studies of Crystals.

Graphite – Structure, Properties and applications.

Liquid Crystal: Liquid Crystalline state, Classification of liquid crystal and their applications. **UNITV:** ENGINEERING MATERIALS, Cement: Definition, Composition basic constituents and their significance, manufacturing of Portland cement by Rotary Klin technology. Setting and hardening of cement and role of gypsum.

Nanotechnology and Nano materials: Fullerenes and Carbon Nano tubes - Introduction, Structural properties, preparation and their applications.

#### Syllabus (Practical)

- 1. To determine the hardness of water by complex metric method using EDTA.
- 2. To determine the strength of NaOH and Na<sub>2</sub>CO<sub>3</sub> in given alkali mixture.
- 3. To determine the strength of copper sulphate with the help of Hypo solution.
- 4. Measurement of conductivity of given sample by conductivity meter.

- 5. Measurement of pH of given sample by pH meter.
- 6. Determination of Barium as barium sulphate gravimetrically.
- 7. Measurement of Fluoride in water sample.
- 8. Determination of Na/K/Ca by Flame photometer in each sample.
- 9. To determine the amount of free chlorine in given sample.
- 10. To determine the viscosity of a given sample of lubricant oil at various temperature.
- 11. To determine flash and fire point of a given lubricant using Pensky-Martin's apparatus.
- 12. Measurement of Nitrate and Oxygen in water sample.
- 13. To determine cloud and pour point of a given sample of lubricating oil using Cloud and Pour point apparatus.

#### Textbook(s)

Engineering Chemistry by Jain & Jain (Dhanpat Rai publication)

#### **Reference Book(s)**

- 1. Engineering Chemistry by B Sivasankar, (Mc-Graw Hill publication).
- 2. Engineering Chemistry by O.G. Palanna, (Mc-Graw Hill publication).
- 3. Engineering Chemistry (Wiley India publication).
- 4. Introduction to Nanotechnology by Poole Owens (Wiley)
- 5. Nanotechnology by Shah & Shah (Wiley)
- 6. Chemistry in Engineering& Technology by J. C. Kuriacose and J. Rajaram, Vol. 1&2
- 7. The Physics and Chemistry of Solids by Elliott (Wiley)
- 8. Engineering Chemistry (Wiley India publication).
- 9. Polymer Chemistry by Stevens (Oxford)
- 10. Polymer Science and Technology by Ghosh (Tata Mc-Graw Hill publication)
- 11. Polymer Science and Technology by Fried (PHI publication)
- 12. Textbook of Polymer Science by Billmeyer (Wiley)

#### Web Resource(s)

http://www.nptel.ac.in/courses/122106028/

|                            |                            |                         |  |                      |                               |                     |            | Teaching Scheme      |   |   |             |  |  |  |
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| II                         | 0201                       |                         | Environmenta   | l Studies            | udies 2 0 0 0                 |                     |            |                      |   |   |             |  |  |  |
| Evaluation Scheme (Theory) |                            |                         |  |                      | Evaluation Scheme (Practical) |                     |            |                      |   |   |             |  |  |  |
| Mid<br>Term<br>Test–<br>I  | Mid<br>Term<br>Test–<br>II | End<br>Ter<br>m<br>Test | Class Participation/<br>Additional Continuous<br>Evaluation* | Total<br>Mark<br>s** | Mid<br>Term<br>Test-I         | End<br>Term<br>Test | Cla<br>Add | Total<br>Marks*<br>* |   |   |             |  |  |  |
| 20                         | 20                         | 50                      | 10   | 100                  |                               |                     |            |                      |   |   |             |  |  |  |

#### Syllabus (Theory)

**UNIT I:** Understanding environment, The global crisis, Basic Concepts, Forest and Grassland ecosystems, Desert Ecosystems, Aquatic Ecosystems

**UNIT II:** Introduction to Biodiversity, Biodiversity Conservation. Water Resources, Energy Resources, Forest Resources

**UNIT III:** Land, Food, and Mineral Resources, Air and Noise Pollution, Water, Soil, and Marine Pollution

**UNIT IV:** Solid Waste Management and Disaster Management, Population Growth, Environment and Human Health, Sustainable Development

**UNIT V:** Global Warming, Acid Rain, and Ozone Depletion, Different types of laws and regulations

#### Textbook(s)

1. Rajagopalan, R., "Environmental Studies: From Crisis to Cure", Oxford University Press, New Delhi, 2e, 2011

#### **Reference Book(s)**

- 1. Ranjit Daniels & J. Krishnaswamy "Environmental Studies", Wiley India
- 2. Davis & Cornwell "Environmental Engineering", Mc Graw Hill

#### Web Resource(s)

http://www.nptel.ac.in/courses/120108004/

|                             |         |      |                       |                 |                          |       |                                     | Teaching Scheme |         |        |                 |  |  |  |
|-----------------------------|---------|------|-----------------------|-----------------|--------------------------|-------|-------------------------------------|-----------------|---------|--------|-----------------|--|--|--|
| Cour                        | se code |      | Course 7              | Title           |                          |       | т                                   | т               | р       | S      | Credit          |  |  |  |
|                             |         |      |                       |                 |                          |       | L                                   | I               | I       | 5      | S               |  |  |  |
| ME201 Engineering Mechanics |         |      |                       |                 | 5                        |       | 3                                   | 1               | 0       | 0      | 4               |  |  |  |
| Evaluation Scheme (Theory)  |         |      |                       |                 |                          | Evalu | ation                               | Schem           | e (Prac | tical) | ·               |  |  |  |
| Mid                         | Mid     | End  | Class Participation/  | Total           | Mid                      | Fnd   | CL                                  | on/             | Total   |        |                 |  |  |  |
| Term                        | Term    | Ter  | Additional Continuous | Totai<br>Mombra | Torm                     | Torm  | Additional Continuous               |                 |         |        | Total<br>Morke* |  |  |  |
| Test-                       | Test-   | m    | Fyeluetion*           | **              | Term Term<br>Tost I Tost |       | Auditional Continuou<br>Evoluation* |                 |         | uous   | *               |  |  |  |
| Ι                           | Π       | Test | Evaluation            |                 | 1030-1                   | Itst  |                                     |                 |         |        |                 |  |  |  |
| 20                          | 20      | 50   | 10                    | 100             |                          |       |                                     |                 |         |        |                 |  |  |  |

#### Syllabus (Theory)

**UNIT I:** Fundamentals of engineering mechanics, Laws of Motion, Equilibrium, Conditions for equilibrium, and Equations of equilibrium. **Statics of Particles and Rigid Bodies:** System of forces, Resultant force, Resolution of force, Moment and Couples.

**UNIT II: Trusses:** Truss analysis, analysis of frames and machines. **Friction:** Types of Friction, Laws of friction, Angle of friction, Angle of repose, Applications of Friction. **Lifting Machines:** Mechanical advantage, Velocity Ratio, Efficiency of machine, Ideal machine, Ideal effort and ideal load, Reversibility of machine, Law of machine, Lifting machines; System of Pulleys, Simple wheel and axle, Wheel and differential axle, Weston's differential pulley block, Worm and worm wheel.

**UNIT III: Properties of Plane Surfaces:** Centroids & Centre of Mass, area of moments, principle moments of inertia, Second moment of mass. **Kinetics of Particles and Rigid Bodies**: Equation of motion in rectangular coordinate, radial and transverse components, Equation of motion in plane for a rigid body. **Impulse and Momentum:** Linear and angular momentum, Linear and angular impulse, Principle of momentum for a particle and rigid body, Principle of linear impulse and momentum for a particle and rigid body. Frinciple of angular momentum and Impulse, Conservation of angular momentum, Angular momentum of rigid body.

UNIT IV: Virtual work: Principle of Virtual Work, Active forces and active force diagram.

**Kinematics of Particles and Rigid Bodies:** Velocity, Acceleration, Types of Motion, Equations of Motion, Rectangular components of velocity and acceleration, Angular velocity and Angular acceleration, Radial and transverse velocities and accelerations, Projectiles motion on plane and Inclined Plane, Relative Motion.

**UNIT V: Work, Energy and Power:** Work of a force, weight, spring force and couple, Power, Efficiency, Energy, Kinetic energy of rigid body, Principle of work and energy, Conservative and Non-conservative Force, Conservation of energy.

#### Textbook(s)

- 1. Meriam and Kraige, "Engineering Mechanics-STATICS", John Wiley & Sons, Fifth Edition, 2010
- 2. Meriam and Kraige, "Engineering Mechanics-DYNAMICS", John Wiley & Sons, Fifth Edition, 2010

#### **Reference Book(s)**

1. Engineering Mechanics, Basudeb Bhattacharyya, Oxford University Press

- 2. Vector Mechanics for Engineers, Beer and Johnston, Tata McGraw-Hill., Ninth Edition, 2009.
- 3. Engineering Mechanics, Hibbeler, Pearson Education, Sixth Edition, 2010
- 4. Engineering Mechanics, Andrew Pytel & Kiusalas, Cengage Learning, Third Edition, 2010.
- 5. Engineering Mechanics, Timoshenko and Young, Tata McGraw-Hill, Fourth Edition, 2006.
- 6. Engineering Mechanics-Statics and Dynamics, Shames, Pearson Education.
- 7. Engineering Mechanics, Boresi and Schmidt, CL-Engineering, First Edition, 2008.

#### Web Resource(s)

http://nptel.ac.in/courses/122104015/

|                                    |               |            |                       |      |                               |                           |                      | Teaching Scheme |   |     |        |  |  |  |
|------------------------------------|---------------|------------|-----------------------|------|-------------------------------|---------------------------|----------------------|-----------------|---|-----|--------|--|--|--|
| Cour                               | se code       |            | Course Title          |      |                               |                           |                      | Т               | Р | S   | Credit |  |  |  |
|                                    |               |            |                       |      |                               |                           |                      |                 |   |     | S      |  |  |  |
| CSE202 Object Oriented Programming |               |            |                       |      |                               |                           | 3                    | 0               | 2 | 0   | 4      |  |  |  |
| Evaluation Scheme (Theory)         |               |            |                       |      | Evaluation Scheme (Practical) |                           |                      |                 |   |     |        |  |  |  |
| Mid<br>Term                        | Mid<br>Term   | End<br>Ter | Class Participation/  | Mid  | End                           | Class Participation/ Tota |                      |                 |   |     |        |  |  |  |
| Test_                              | Term<br>Test_ | m          | Additional Continuous | Mark | Term                          | Term                      | Additional Continuou |                 |   |     | Marks* |  |  |  |
| I                                  | II            | Test       | Evaluation*           | S**  | Test-I                        | Test                      |                      | *               |   |     |        |  |  |  |
| 20                                 | 20            | 50         | 10                    | 100  | 20                            | 40                        |                      | 4               |   | 100 |        |  |  |  |

\*\*The ratio of weightage between Theory and Practical content will be 60%: 40%

#### Syllabus (Theory)

**UNIT I:** Identifiers and constants (Literals), Keywords, Data Types, The Operators, New Casting Operators, Typeid and throw, The Conditional structures and Looping Constructs

**UNIT II:** Difference between Struct and class in C++, the difference between Union and Class, Static Data members of a class, Pointer to objects and pointer to members of class, The local classes, Assigning Objects

**UNIT III:** Introduction to Functions, The Inline function, Default Arguments to the function, Functions with object as parameters, call by reference and return by reference, Prototyping and Overloading, Friend functions, Const and Volatile functions, Static functions, Private and Public functions

**UNIT IV:** Introduction to constructors, the explicit constructors, Parameterized constructors, Multiple constructors, Constructors with default arguments, Dynamic Initialization, Constructor with dynamic allocation, copy constructors, The member initialization list, destructors

**UNIT V:** Overloading Operators, the need, defining derived class using single base class, Derivation using public, private and protected access modifiers

**UNIT VI:** The implementation of Inheritance in the C++ object model, multiple-inheritance, Abstract classes, Composite objects (container objects), Compile Time and Runtime Polymorphism Introduction, Need for Exception handling, Components of exception handling mechanism

#### Syllabus (Practical)

Programs using C++/Java which covers following concepts:

- 1. Declaration and Usage of Classes and Objects
- 2. Constructors and Destructors.
- 3. Overloaded Functions and Overloaded Operators.
- 4. Inheritance
- 5. Exception handling mechanism.

#### Textbook(s)

1. Object Oriented Programming with C++, E. Balagurusamy, McGraw Hill, 2013.

- 2. Object Oriented Programming with Java, RajkumarBuyya, McGraw Hill, 2014.
- 3. Object Oriented Programming in C++, Robert LaforeTechmedia Publication, 2005.
- 4. Mastering in C++, RajkumatBuyya, McGraw Hill, 2014.
- 5. Let us C++, Yashavant P. Kanetkar, BPB Publications, 2003

#### **Reference Book(s)**

- 1. Programming with ANSI C++ by Bhushan Trivedi, Oxford University Press, 2012.
- 2. An Introduction to Object Oriented Programming with Java, C Thomas WU, Fourth Edition, Tata McGraw Hill, 2005.
- 3. An Introduction to Object-Oriented Programming, 3rd Edition, Timothy Budd, Pearson, 2001.
- 4. C++: The Complete Reference, 4th Edition, Herbert Schildt, McGraw Hill Education, 2003.

#### Web Resources

http://nptel.ac.in/courses/106103115/36

| Course code | Course Title                      | Teaching Scheme |   |   |   |        |  |  |
|-------------|-----------------------------------|-----------------|---|---|---|--------|--|--|
|             |                                   | L               | Т | Р | S | Credit |  |  |
| LA204       | Introduction to Critical Thinking | 2               | 0 | 0 | 0 | 1      |  |  |

#### **Course Description**

This course is intended to introduce critical thinking.

Critical thinking provides the foundation for important skills such as rational decision-making and effective problem solving and is a key competency for success in the modern workplace. A domain general skill, critical thinking enhances verbal and written communication, presentation, and creativity, leading to success in academics and professional life.

The primary aim of the course is to enable students to analyze, reason and evaluate situations, text and information sources more carefully. The course will encourage them to read and think deeply, ask insightful questions and develop the ability to see how things connect and interact.

The course will introduce students to the concepts of bias, fallacies, fact, opinion, assertion and argument. It will enable them to differentiate one from another, and to train their minds to interpret information more efficiently and effectively. It will also introduce students to multiple disciplinary perspectives and show them how to engage critically with differing viewpoints.

Through group exercises, class discussions, word/logic games and film screenings, the course will use a variety of tools and frameworks that make critical thinking a habit, inside and outside the classroom.

The sessions will focus on the following key topics:

- 1. Introducing assertion and argument
- 2. Separating fact from opinion
- 3. Reconciling multiple sources
- 4. Understanding biases and assumptions
- 5. Recognizing multiple perspectives

#### Grading

The following is approximately how the final grade will be determined--changes will only occur in exceptional situations:

- 1. Response paper 1 ..... 40%
- 2. Response paper 2 ..... 40%
- 3. Class participation ......20%

#### **Recommended Online Courses**

- 1. Critical Thinking Skills for University Success Coursera
- 2. Reasoning Across the Disciplines Coursera

#### **Teaching tools & methodology:**

TCS ION online discussion forum Games and workshop activities Brain teasers and puzzles Peer reviews

#### Miscellany:

This course will require high level of self-motivation and class participation. Quality of group exercises, while not graded, will be considered for marks on class participation.

| Con                        | rso codo                             |      | Course Title          |       |        |      |     | Tea                      | aching | Schei  | ne      |  |
|----------------------------|--------------------------------------|------|-----------------------|-------|--------|------|-----|--------------------------|--------|--------|---------|--|
| Cou                        |                                      |      | Course 1              | lue   |        |      | L   | Т                        | P      | S      | Credits |  |
| CE305 Structure Analysis-I |                                      |      |                       |       |        |      | 3   | 1                        | 0      | 0      | 4       |  |
|                            | <b>Evaluation Scheme (Practical)</b> |      |                       |       |        |      |     |                          |        |        |         |  |
| Mid                        | Mid                                  | End  | Class Participation / |       | Mid    | End  | C   |                          |        |        |         |  |
| Term                       | Term                                 | Ter  | Additional Continuous | Total | Term   | Ter  |     | ass I al<br>ditional     | Conti  | 1011 / | Total   |  |
| Test -                     | Test -                               | m    | Fyaluation*           | Marks | Test - | m    | Aut | Additional Co<br>Evoluet |        | iuous  | Marks   |  |
| Ι                          | II                                   | Test | Evaluation            |       | Ι      | Test |     | Lvan                     |        |        |         |  |
| 20                         | 20                                   | 50   | 10                    | 100   | -      | -    |     | -                        |        |        |         |  |

#### Syllabus (Theory)

**Basics of Strength of Materials** - Types of stresses and strains, Definition of determinate and indeterminate structure, Degree of Freedom, Free Body Diagram, Concept of stress and strain, Mohr's circle of stress and strain, Principle stress and strain examples, Strain – strain relationship, Hook's law, Elastic constants & relation between them, Concept of Principle Axes, Moment of Inertia & Centre of Gravity, Compound and composite bars

**Bending Moment and Shear Force** – Introduction to bending moment and shear force diagram in beam, simply supported beams, overhanging beams, Beam with varying distributed load, Bending Moment and Shear Force for inclined loading

**Concept of Bending & Shear Stresses** – Flexural formula, Stress – Strain diagram for beam, Shear stress in beam, Shear stress in beam with different cross-section

**Concept of Torsion -** Torsion in circular shaft, Torsion Equation, Shear stress in shaft due to torsion, Combined Bending & Torsion

**Concept of Slope and Deflection** – Introduction to slope and deflection in beam by differential equation, Double Integration method, Moment area method (Mohr's Theorems), Conjugate beam method, Strain Energy Method, Macaulay's method, Maxwell's reciprocal deflection theorem, Betti's theorem of reciprocal deflections, Examples, **Combined Direct & Bending Stresses** 

#### **Textbooks:**

- 1. Pytel, A., and Jaan Kiusalaas, "Mechanics of Materials", CL Engineering, 2nd edition, 2011
- 2. Hibbeler, R.C., "Mechanics of Materials SI", 6th SI edition, Prentice Hall
- 3. Ryder, G.H., "Strength of Materials", Palgrave Macmillan, 1969

#### **Reference Books:**

- 1. Beer, F.P., Johnston, E.R., DeWolf, J.T., "Mechanics of Materials", McGraw Hill, 4th edition,
- 2. Craig, R.R., "Mechanics of Materials", John Wiley and Sons, 2nd edition, 1999
- 3. Singh, Sadhu, "Strength of Materials I", Khanna Book Publishing, Latest edition
- 4. Rattan, S.S., "Strength of Materials", McGraw Hill, New Delhi, 2nd edition

| Con                   | rso codo |                                      | Course Title          |                       |        |         |     | Teaching Scheme                  |                       |      |         |  |  |  |  |
|-----------------------|----------|--------------------------------------|-----------------------|-----------------------|--------|---------|-----|----------------------------------|-----------------------|------|---------|--|--|--|--|
| Cou                   |          |                                      | Course 1              | lue                   |        |         | L   | Т                                | P                     | S    | Credits |  |  |  |  |
| CE306 Fluid Mechanics |          |                                      |                       |                       |        | 3 1 2 0 |     |                                  |                       |      |         |  |  |  |  |
|                       | I        | <b>Evaluation Scheme (Practical)</b> |                       |                       |        |         |     |                                  |                       |      |         |  |  |  |  |
| Mid                   | Mid      | End                                  | Class Participation / | Class Participation / |        |         |     |                                  | Class Participation / |      |         |  |  |  |  |
| Term                  | Term     | Ter                                  | Additional Continuous | Total                 | Term   | Ter     |     | ass I al<br>litional             | 1 Juan<br>Marks       |      |         |  |  |  |  |
| Test -                | Test -   | m                                    | Fyaluation*           | Marks                 | Test - | m       | Aut | Additional Contin<br>Evoluation* |                       | iuou | **      |  |  |  |  |
| Ι                     | II       | Test                                 | Evaluation            |                       | Ι      | Test    |     | Evaluation*                      |                       |      |         |  |  |  |  |
| 20                    | 20       | 50                                   | 10                    | 100                   | 20     | 50      |     | 100                              |                       |      |         |  |  |  |  |

\*\*The ratio of weightage between Theory and Practical content will be 60%: 40%

#### Syllabus (Theory)

**Unit-I: Introduction:** Fluid and continuum, Physical properties of fluids, Rheology of fluids. **Kinematics of Fluid flow:** Types of fluid flows: Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, subcritical, critical and supercritical flows, one, two and three dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential, source, sink, doublet and half-body.

**Unit-II: Fluid Statics**: Pressure-density-height relationship, manometers, pressure transducers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis. **Dynamics of Fluid Flow:** Euler's Equation of motion along a streamline and its integration, Bernoulli's equation and its applications- Pitot tube, orifice meter, venturi meter and bend meter, , notches and weirs, momentum equation and its Application to pipe bends.

Unit-III: Dimensional Analysis and Hydraulic Similitude: Dimensional analysis,

Buckingham's Pi theorem, important dimensionless numbers and their significance, geometric, kinematics and dynamic similarity, model studies.

**Unit-IV:** Laminar and Turbulent Flow: Equation of motion for laminar flow through pipes, Stokes' law, transition from laminar to turbulent flow, turbulent flow, types of turbulence, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, resistance to flow, minor losses, pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and networks.

**Unit-V:** Boundary Layer Analysis: Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sub layer, separation and its control, Drag and lift, drag on a sphere, a two-dimensional cylinder.

#### Syllabus (Practical)

1. Determination of viscosity of oil

- 2. Establish relationship between pressure and height
- 3. Determination of metacentre of a floating body
- 4. Verification of conservation of energy in a duct based on Bernouli's theorem
- 5. Calibration of venturimeter, orificemeter, pitot tube and rotameter
- 6. Determination of coefficient of friction in close conduit as major losses
- 7. Determination of minor losses from bend, elbow, sudden contraction, enlargement
- 8. Lab exercises using Bentley WaterGEMS v8i.

#### **Reference Books:**

- 1. S Narasimhan: First Course in Fluid Mechanics, University Press
- 2. Som, S.K. & Biswas G.: Introduction of fluid mechanics & Fluid Machines, TMH, 2000, 2nd edition.
- 3. M M Das: Fluid Mechanics & Turbomachines, Oxford University Press
- 4. S.K.Agarwal: Fluid Mechanics & Machinery, TMH
- 5. Garde, R.J., "Fluid Mechanics through Problems", New Age International Pvt. Ltd, New Delhi, 2nd Edition.
- 6. Hunter Rouse, "Elementary Mechanics of Fluids", John Wiley & Sons. Omc. 1946
- 7. I.H.Shames, "Mechanics of Fluids", McGraw Hill, Int. Student, Education, 1988.
- 8. Vijay Gupta and S.K.Gupta, "Fluid Mechanics and its Applications", Wiley Eastern Ltd, 1984.

9. Modi, P.N., and Seth, S.H., "Hydraulics and Fluid Machines", Standard Book, House, 1989.

| Con             | ra ada                               |      | Course Title          |                       |        |     |     | Teaching Scheme      |                       |   |         |  |  |  |  |
|-----------------|--------------------------------------|------|-----------------------|-----------------------|--------|-----|-----|----------------------|-----------------------|---|---------|--|--|--|--|
| Cou             |                                      |      | Course 1              | lue                   |        |     | L   | Т                    | P                     | S | Credits |  |  |  |  |
| CE308 Surveying |                                      |      |                       |                       |        |     | 3   | 0                    | 2                     | 0 | 4       |  |  |  |  |
|                 | <b>Evaluation Scheme (Practical)</b> |      |                       |                       |        |     |     |                      |                       |   |         |  |  |  |  |
| Mid             | Mid                                  | End  | Class Participation / | Class Participation / |        |     |     |                      | Class Participation / |   |         |  |  |  |  |
| Term            | Term                                 | Ter  | Additional Continuous | Total                 | Term   | Ter |     | ass I al<br>litional | Total<br>Marks        |   |         |  |  |  |  |
| Test -          | Test -                               | m    | Fyaluation*           | Marks                 | Test - | m   | Aut | **                   |                       |   |         |  |  |  |  |
| Ι               | II                                   | Test | I Test                |                       |        |     |     |                      |                       |   |         |  |  |  |  |
| 20              | 20                                   | 50   | 10                    | 100                   | 20     | 50  |     | 100                  |                       |   |         |  |  |  |  |

\*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical

Records/Mock

Interviews/others

\*\*The ratio of weightage between Theory and Practical content will be 60%: 40%

#### Syllabus (Theory)

**Unit 1:** Basic principles, Maps, Topographic Sheets, their scales and uses; Classification of surveys; Linear measurements using chains and tapes, chaining and ranging, principles of chain surveying. Principles of compass survey, Measurement of bearing, whole circle bearings & quadrant bearings, fore bearing and back bearing, Computation of angles from bearings, Plane table survey.

**Unit 2**: Automatic levels, booking and reducing levels, simple and differential leveling, profile and cross-section leveling, reciprocal leveling, methods of leveling. Contouring: definition, contour interval, characteristics of contours, direct and indirect methods of contouring, interpolation of contours, uses of contour maps, Theodolite, temporary and permanent adjustments, measurement of horizontal and vertical angles.

**Unit-3:** Modern surveying electronic equipment: digital levels, digital theodolites, EDMs, Total stations; Principles, working and applications; Lasers in surveying.

Total Station: Components Used in Total Station Surveying, functioning and measurements, Slope Staking, Topographic surveys, Construction project layout: building corners, control and offset lines, Leveling, Traverse surveys and adjustments, Building Face Surveys, Resections, Road (Highway) Surveys.

**Unit 4:** Global Positioning System: Basic of GPS, Positioning using Satellites, GPS Principles, GPS receivers, GPS Errors and Accuracy, Error sources in GPS observations, References-Global Positioning System, Satellite geometry and Accuracy measures, GPS Measurements Techniques, GPS Algorithms/Navigational Solutions, Other Satellite navigation Systems and GPS Modernization.

#### **Syllabus (Practical)**

- 1. Measurement of offsets for a building
- 2. Tape and compass traverse survey for a boundary line
- 3. Simple leveling and measurement of gradients
- 4. Profile leveling and cross-section leveling for a road line
- 5. Preparation of a contour sheet for an area
- 6. Plane table surveying for a land area, traffic junction
- 7. Measurement of horizontal and vertical angles.
- 8. Quantity Surveying (Area and Volume Measurement),
- 9. Field project using total station

#### **Text and References Books:**

- 1. Plain Surveying, AM Chandra, New Age International Publishers
- 2. Surveying Vol-I, BC Punamia, AK Jain, AK Jain, Laxmi Publishing G.Strang, Linear algebra and its applications (4rh Ed.), Thomson (2006).
- 3. Surveying and leveling by Subramanian, Oxford Publication.

| Course code                |  |                     | Course   | Title          |                            |                     | Teaching Scheme   |   |         |                  |    |
|----------------------------|--|---------------------|--|----------------|----------------------------|---------------------|---|---|---------|------------------|----|
| Cou                        |  |                     |  |                | L                          | Т                   | Р   | S | Credits |                  |    |
| M                          | MA302 Computer Based Numerical and Statistical 3 0 2 0 |                     |  |                |                            | 4                   |   |   |         |                  |    |
|                            | Ev   | aluation            | Scheme (Theory)  |                |                            | Evalı               | valuation Scheme (Practical)                                    |   |         |                  | l) |
| Mid<br>Term<br>Test<br>- I | Mid<br>Term<br>Test<br>- II                            | End<br>Term<br>Test | Class<br>Participation/<br>Additional<br>Continuous<br>Evaluation* | Total<br>Marks | Mid<br>Term<br>Test<br>- I | End<br>Term<br>Test | Class Participation/<br>Additional<br>Continuous<br>Evaluation* |   |         | Total<br>Marks** |    |
| 20                         | 20   | 50                  | 10   | 100            | 20                         | 50                  | 30  |   | 100     |                  |    |

\*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

\*\*The ratio of weightage between Theory and Practical content will be 60%: 40%

#### Syllabus (Theory)

**UNIT – I: Numerical Methods – I:** Modeling and Error Analysis, Solutions to transcendental and polynomial equations, Solutions to system of linear simultaneous equations

**UNIT – II: Numerical Methods – II:** Interpolation and approximation, Numerical Differentiation and Integration, Solutions to Ordinary Differential Equations

**UNIT – III: Basic Statistics:** Introduction to probability, Discrete and continuous random variables, Probability Distributions: Binomial, Possion and Normal distributions, Mathematical expectation, Correlation and Regression

**UNIT – IV: Sampling Distributions and Estimation:** Sampling, Types of sampling, sampling errors, sampling distribution of means, variance and proportions for normal population, The Central Limit Theorem, Chi-Square, t and F distributions, Estimators, Point and interval estimation

**UNIT** – **V: Test of Hypothesis:** Null and alternative hypotheses, the critical and acceptance regions, two types of error, Parametric Tests, Chi-square goodness of fit test, Contingency tables

## Syllabus (Practical)

Numerical Methods using MATLAB and Statistical Analysis using SPSS in Computer Labs that includes:

- 1. Numerical solution of algebraic and transcendental equations.
- 2. Numerical solution of system of linear equations.
- 3. Interpolation.
- 4. Numerical differentiation.
- 5. Numerical integration.
- 6. Numerical solution of differential equations.
- 7. Data Analysis using Correlation and Regression
- 8. Test of Hypothesis

#### **Textbooks and Reference books**

- 1. Srimanta Pal, Numerical Methods: Principles, Analyses and Algorithms, Oxford University Press, New Delhi.
- 2. Rishard A. Johnson, Miller and Freund's probability and Statistics for Engineers, PHI, 8th Ed.
- 3. K. E. Atkinson, Introduction to Numerical Analysis, John Wiley and Sons.
- 4. M.K. Jain, S. R. K. Iyengar, R. K. Jain, Numerical Methods for Scientific And Engineering Computation, New age International publishers, New Delhi.
- 5. Steven C Chapra, Raymond P Canale, Applied Numerical Methods with MATLAB for Engineers and Scientists, 3<sup>rd</sup> Editions, Tata Mc Graw Hill, New Delhi, 2012.
- 6. Cheney and Kincaid, Numerical Methods and Applications, Cengage Publications, New Delhi.
- 7. Cleve B. Moler, Numerical Computing with MATLAB, Prentice Hall of India, New Delhi.
- 8. Ravichandran J., Probaility and statistics for Engineers, Wiley India, New Delhi.
- 9. Douglas C. Montgomery and George C. Runger, Applied Statistics and Probability for Engineers, John Wiley & Sons, Inc., 3rd Edition (2004).
- 10. Prem S. Mann, Introductory Statistics, Wiley publication, 7th edition.

Course Title and Code: Effective Communication Design: CCT306

**Course Description:** The course deals with written and verbal communication skills. Students will learn structuring their pieces of communication using various principles of effective communications. By the end of this course, the students will be able to articulate and present effective pieces of communication in the form of e-mails, monologues, presentations (small and long)

| Course learn  | ning outcomes  |               |  |  |  |  |  |
|---|--|---------------|--|--|--|--|--|
| CCT306.   | Explain the principles of Effective Communication Design   |               |  |  |  |  |  |
| CCT306.   | 2 Apply the principles for structuring and designing wri   | tten and oral |  |  |  |  |  |
|   | communication.   |               |  |  |  |  |  |
| CCT306.3 Reason and Prioritize the content of presentation and emails |  |               |  |  |  |  |  |
| CCT306  | CCT306.4 Demonstrate improvement in speak-listen- feedback |               |  |  |  |  |  |
| Hours per Week L-T-P: 3-0-0   |  |               |  |  |  |  |  |
| Planned hours 30  |  |               |  |  |  |  |  |
| Actual hours  |  |               |  |  |  |  |  |
| Credits   |  | 3             |  |  |  |  |  |
| Sr. No  | Specifications   | Marks         |  |  |  |  |  |
| 01  | Attendance   | 10            |  |  |  |  |  |
| 02  | Assignment   | 70            |  |  |  |  |  |
| 03  | Class Participation 2                                      |               |  |  |  |  |  |
|   | Total (100)  | 100           |  |  |  |  |  |

# **Syllabus of the Course**

| Topics                  | Content  |  |  |  |  |
|-------------------------|--|--|--|--|--|
| Introduction to         | Beginning-Middle-End                                     |  |  |  |  |
| principles of effective | Pyramid Principle-Governing Thought                      |  |  |  |  |
| communication design    | KISS Principle   |  |  |  |  |
|                         | • Power of Three   |  |  |  |  |
| E-mail writing          | • E-mail etiquette                                       |  |  |  |  |
|                         | • Analyzing good and bad examples of e-mails             |  |  |  |  |
| Written                 | Practicing structure and summary                         |  |  |  |  |
| Communication           | • Applying principles of effective communication through |  |  |  |  |
|                         | various assignments                                      |  |  |  |  |
| Flowchart and Mind      | Practicing putting thoughts in sequence                  |  |  |  |  |
| Mapping                 | • Speak-Listen-Feedback                                  |  |  |  |  |
| Verbal                  | Important parameters to make oral presentation effective |  |  |  |  |
| Communication           | oral presentation.                                       |  |  |  |  |
|                         | a. Delivery and Body Language                            |  |  |  |  |
|                         | b. Delivery-Voice  |  |  |  |  |
|                         | c. Content   |  |  |  |  |
|                         | Audience analysis  |  |  |  |  |
|                         | Applying the principles of effective communication       |  |  |  |  |
| Planning for            | • Essential elements of power point presentation         |  |  |  |  |
| presentation            | Common mistakes made in Power point presentation         |  |  |  |  |

| Course Ti   | tle and Code   |                   |  |  |  |  |
|-------------|--|-------------------|--|--|--|--|
| Intelligent | Machines (AI, Robotics, IoT): ID303  |                   |  |  |  |  |
| Course Do   | escription   |                   |  |  |  |  |
| This cours  | This course introduces an understanding of the fundamental concepts of Artificial Intelligence |                   |  |  |  |  |
| and Machi   | and Machine Learning, Internet of Things and Robotics. Focus of this course would be on        |                   |  |  |  |  |
| discussion  | discussion of case studies on various aspects.   |                   |  |  |  |  |
| Prerequisit | tes  | Basic Programming |  |  |  |  |
|             |  | Course            |  |  |  |  |
| Hours per   | Week   | L-T-P: 2-0-0      |  |  |  |  |
| Credits     |  | 2                 |  |  |  |  |
| Sr. No      | Specifications   | Marks             |  |  |  |  |
| 01          | Attendance   | Nil               |  |  |  |  |
| 02          | Assignment   | 40                |  |  |  |  |
| 03          | Class Participation  | 20                |  |  |  |  |
| 04          | Quiz   | 40                |  |  |  |  |
| 05          | Theory Exam  | Nil               |  |  |  |  |
| 06          | Theory Exam  | Nil               |  |  |  |  |
| 07          | Theory Exam (Final)  | Nil               |  |  |  |  |
| 08          | Report-1   | Nil               |  |  |  |  |
| 09          | Report-2   | Nil               |  |  |  |  |
| 10          | Report-3   | Nil               |  |  |  |  |
| 11          | Project -1   | Nil               |  |  |  |  |
| 12          | Project -2   | Nil               |  |  |  |  |
| 13          | Project -3   | Nil               |  |  |  |  |
| 14          | Lab Evaluation1  | Nil               |  |  |  |  |
| 15          | Lab Evaluation2(Final)   | Nil               |  |  |  |  |
| 16          | Course portfolio   | Nil               |  |  |  |  |
|             | Total (100)  | 100               |  |  |  |  |

#### **Syllabus**

IoT: Introduction to Embedded IOT System: Interfacing sensors and motor, Controlling Devices and Reading input Status from sensors using webpage, Introduction to API and web services, Designing SMS API and security OTP app, Camera Interfacing using sensors, Basic SMTP protocol and Mail server and Sending Mail (Security application) mail based, Creating applications with weather updates.

Artificial Intelligence and Machine Learning: Understanding what we mean when we say machines think, how does AI relate to the rest of predictive analytics, How AI works and its inherent limitations., AI till date, Expectations from the field of AI, Introduction to Machine Learning, Preprocessing your data, Regression model, Classification model, Clustering Model, Case-study-Water Jug Problem, Titanic Data Set

Robotics: Elements of robots: joints, links, actuators, and sensors. Position and orientation of a rigid body, Representation of joints, different kinds of actuators – stepper, DC servo and brushless motors, model of a DC servo motor, purpose of sensors, internal and external sensors, common sensors, Kinematics of serial robots, Degrees-of-freedom of parallel mechanisms and manipulators.

#### **Reference / Textbooks**

1. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)

- 2. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti (Universities Press)
- 3. Russel and P. Norvig, "Artificial Intelligence A Modern Approach", Second Edition, Pearson Education, 2003.
- 4. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education, 2002.
- 5. David Poole, Alan Mackworth, Randy Goebel," Computational Intelligence: a logical approach", Oxford University Press, 2004.

| Course code Course Title   |                             |                     |  | Teaching Scheme |                            |                     |  | ieme |   |                  |         |
|----------------------------|-----------------------------|---------------------|--|-----------------|----------------------------|---------------------|--|------|---|------------------|---------|
| Cou                        |                             |                     | Course   | 11110           |                            |                     | L T P S Credits  |      |   |                  | Credits |
| C                          | E405                        |                     | Structure Analysis - II     3     1     0     0                  |                 |                            |                     |  | 4    |   |                  |         |
|                            | E                           | valuatio            | n Scheme (Theory)  |                 |                            | Eval                | Evaluation Scheme (Practical)                                    |      |   |                  | cal)    |
| Mid<br>Term<br>Test<br>- I | Mid<br>Term<br>Test<br>- II | End<br>Term<br>Test | Class Participation /<br>Additional<br>Continuous<br>Evaluation* | Total<br>Marks  | Mid<br>Term<br>Test<br>- I | End<br>Term<br>Test | Class Participation /<br>Additional<br>Continuous<br>Evaluation* |      |   | Total<br>Marks** |         |
| 20                         | 20                          | 50                  | 10   | 100             | -                          | -                   | -  |      | - |                  |         |

\*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

#### Syllabus (Theory)

**Unit 1:** Analysis of indeterminate beams & frames: Static determinacy and indeterminacy, strain energy and energy theorems – theorem of minimum potential energy, principle of virtual work, castigliano theorem, betti's law, clerk maxwell's reciprocal theorem, Force Method, displacement method, Three Moment Theorem, Column Analogy Method, moment distribution method.

Unit 2; Analysis of trusses: indeterminate truss by force method, displacement method

Unit 3: Analysis of arches: three hinged arches (determinate) and two hinged arches (indeterminate)

**Unit 4: Columns and Struts -** Definitions, Classifications, Assumptions made in the Euler's Column Theory, Expressions for crippling load of different cases like both the ends are hinged or pinned, one end is fixed and other is free, both ends are fixed, one end is fixed other is hinged, Effective length of column, Slenderness ratio, Crippling stress in terms of Effective length and radius of gyration, limitations of Euler's Formula, Rankine's Formula, Eccentric loading, Johnson's Formula for Columns, both straight line and parabolic formula for columns, Examples

## **Reference Books:**

- 1. Yuan Yu Hsieh (1987) Elementry Theory of Structures, 3rd edition, Prentrice Hall.
- 2. Ghali, A., Neville, A. M., Structural Analysis (Unified Classical and Matrix Approach), Chapman and Hall Ltd.
- 3. Menon, Devdas (2008) Structural Analysis Structural Analysis, Narosa Publishing House Narosa Publishing House Pvt. Ltd., New Delhi.
- 4. Menon, Devdas (2009) Advanced Structural Analysis, Narosa Publishing House, New Delhi. House, New Delhi.
- 5. R. C. Hibbeller (2002), Structural Analysis, 5th ed, Pearson Education.
- 6. J. Mc Carmac and R.E.Elling, Structural Analysis: A classical and Matrix Aapproach, Harper and Row Publishers.

# **Course Code and Name: CE402** Engineering Geology and Building Construction **Teaching Scheme: 3 0 2 0**

## Credit: 4

## **Course Outcomes:**

On successful completion of this course students will be able to:

- CE402.1 Apply the geological concepts for the Civil Engineering applications.
- CE402.2 Identify and classify common minerals, rocks and soils, and understand their significance to different types of engineering projects.
- CE402.3 Analyze the possible geological problems to evaluate sites for the construction of Dam, Tunnel and Bridges.
- CE402.4 Analyze the effect of weathering phenomenon on civil engineering works.
- CE402.5 Plan precautions against faulting, folding, bedding planes, joints, cracks, fissures etc. and permeability and ground water conditions
- CE402.6 Understand the components of a building and their functions,
- CE402.7 Select appropriate building materials required for building construction as per IS Code.
- CE402.8 Incorporate principles of sustainability in making building construction decisions that conserve natural resources.

## Syllabus (Theory)

Part 1: Engineering Geology

Unit I-Earth Sciences: Introduction,

**Basics of Engineering Geology:** Scope of Engineering Geology for a Civil Engineer **Types of Geology:** Physical geology and mineralogy

Unit II- Petrology: Classification of rocks and their uses as building and road materials

**Failures in Earth crust:** Historical geology; Structural geology: Folds, faults, unconformity etc. **Unit III-Investigation in Geology:** Engineering geology: Geological investigations at dam, tunnel and bridge sites and influence of various structures

**Precautions in different earth planes:** Precautions against faulting, folding, bedding planes, joints, cracks, fissures, permeability and ground water condition.

## Part 2: Building Construction and Materials

**Unit IV** Components of a building and their functions, foundation, shallow and deep foundation, grillage, raft, inverted arches, causes of failure of foundations and remedial measures, Masonry: types- Bricks and stone masonry, functions, material requirements, different bonds, damp proofing course

**Unit V** Shoring, under pining, scaffolding, horizontal and vertical shores, purpose and methods of under pinning, different types of scaffolding, floors and roofs: types, details of construction and materials

Unit VI Doors: paneled, glazed, flushed doors, collapsible steel doors, Windows: Casement, Sash, and Skylight windows, Staircase: Requirement of a good staircase, different types of staircases

**Unit VII** Physical and chemical characteristic of commonly used building materials in Civil Engineering construction – Clay, Sand, Stone, Lime, Cement, Concrete, Bricks, Silica, Aluminum and Timber with reference to its specifications. Plywood, asbestos, plastics and polymer-based materials.

## Syllabus (Practical)

- 1. Megascopic study of minerals
- 2. Megascopic study: Igneous, Sedimentary, Metamorphic
- 3. Understand fold and faults within a rock mass
- 4. Study geological features of rocks such as strike and dip
- 5. Soil erosion and physical weathering in the rocks
- 6. Structural analysis using stereo nets or Wulff's net
- 7. Geological maps representing the geological structure of some segment
- 8. Use of GPS instrument for geological data generation.

#### **Evaluation Scheme:**

| Prerequisites |                             | A Basic Civil Engineering Materials Course |  |  |  |
|---------------|-----------------------------|--|--|--|--|
| Teaching      | Scheme (Hours per Week)     | L T P: 3 0 2                               |  |  |  |
| Credits       |                             | 4  |  |  |  |
| Sr. No.       | <b>Evaluation Component</b> | Marks                                      |  |  |  |
| 1             | Attendance                  | 5  |  |  |  |
| 2             | Assignment                  | 10   |  |  |  |
| 3             | Class Participation         | 5  |  |  |  |
| 4             | Quiz                        | 5  |  |  |  |
| 5             | Theory Exam-I               | 10   |  |  |  |
| 6             | Theory Exam-II              | NIL  |  |  |  |
| 7             | Theory Exam-III             | 20   |  |  |  |
| 8             | Report-I                    | 5  |  |  |  |
| 9             | Report-II                   | NIL  |  |  |  |
| 10            | Report-III                  | NIL  |  |  |  |
| 11            | Project-I                   | 10   |  |  |  |
| 12            | Project-II                  | NIL  |  |  |  |
| 13            | Project-III                 | NIL  |  |  |  |
| 14            | Lab Evaluation-I            | 10   |  |  |  |
| 15            | Lab Evaluation-II           | 20   |  |  |  |
| 16            | Course Portfolio            | NIL  |  |  |  |
|               | Total (100)                 | 100  |  |  |  |

#### Textbook(s)

- Prof. Prabin Singh, 'Engineering & General Geology" S K Kataria & Sons, 8th edition, 2008
- 2. Principles of Engineering Geology, Bangar
- 3. B.C. Punmia, "Building Construction", Laxmi Publications Pvt. Ltd.
- 4. Sushil Kumar, Building Construction, Standard Publishers, Delhi.

#### **Reference Book(s)**

- 1. Structural Geology by Billings
- 2. Petrology by Tyrll

- 3. Surendra Singh, Engineering Materials, Konark Publishers Pvt. Ltd.
- 4. D.S. Arora, 'Text Book of Engineering Materials', Kalyani Publishers
- 5. Building Planning and Drawing by Dr. N. Kumara Swamy, A. Kameshwara Rao, Charotar Publishing House Pvt. Ltd.

## Video Links:

https://nptel.ac.in/courses/105105106/

https://youtube.com/results?search\_query=engineering+geology++lectures+for+civil+engineering

| Con    | Course code Course Title |      |                       |         |        | Tea  | aching S  | Schen | ne    |       |         |
|--------|--------------------------|------|-----------------------|---------|--------|------|---|-------|-------|-------|---------|
| Cou    | rse coue                 |      | Course 1              | ine     |        |      | L   | Т     | Р     | S     | Credits |
| C      | E409                     |      | Concrete Tech         | nnology |        |      | 3 0 2 0   |       |       |       | 4       |
|        |                          |      |                       |         |        |      |   |       |       |       |         |
| Mid    | Mid                      | End  | Class Participation / |         | Mid    | End  | Class Participation /<br>Additional Continuous<br>Evaluation* |       |       | Total |         |
| Term   | Term                     | Ter  | Additional Continuous | Total   | Term   | Ter  |   |       |       | Marks |         |
| Test - | Test -                   | m    | Evaluation*           | Marks   | Test - | m    |   |       |       | **    |         |
| Ι      | II                       | Test | Lvaluation            |         | Ι      | Test |   | Lvan  | ation |       |         |
| 20     | 20                       | 50   | 10                    | 100     | 20     | 50   | 30  |       | 100   |       |         |

\*\*The ratio of weightage between Theory and Practical content will be 60%: 40%

#### Course Syllabi (Theory):

Review of constituent materials – Cement, Aggregates and mix design, admixtures, Properties of concrete in fresh and hardened state, special concretes, durability of concrete subjected to extreme environment,

Deterioration mechanisms, assessment and control of corrosion in concrete structures, In-situ assessment of concrete structures,

Various NDT techniques and their applications, Repair of concrete structures

## Syllabus (Practical)

- 1. Tests on cement specific gravity, fineness, soundness, normal consistency, setting time, compressive strength on cement mortar cubes
- 2. Tests on fine aggregate specific gravity, bulking, sieve analysis, fineness modules, moisture content, bulk density and deleterious materials.
- 3. Tests on coarse aggregate specific gravity, sieve analysis, fineness modulus, bulk density.
- 4. Tests on Fresh Concrete: Workability: Slump, Compaction factor tests, Flow table test.
- 5. Indian standard method of test for permeability of cement mortar and concrete.
- 6. Hardened Concrete: Compressive strength on Cubes, Static modulus of elasticity, Flexure tests, Nondestructive testing
- 7. Mix Design of Concrete.

## Textbook(s)/ Reference Book(s)

- 1. Neville, A.M. and Brooks, J.J.," CONCRETE TECHNOLOGY", ELBS .1990.
- 2. Mehta, P.K., "CONCRETE Structure, Material and Properties" Prantice Hall Inc.1986.
- 3. Newman, K., "CONCRETE SYSTEMS in COMPOSITE MATERIALS". EDT BY L.Holliday. Elsevier Publishing Company. 1966.

Powers, T.C., "THE PROPERTIES OF FRESH CONCRETE". JOHN WILEY & SONS, INC. 1968.

# Course Code and Name: CE 403 Hydraulic Engineering Teaching Scheme: 3 0 2 0

## Credit: 4

## **Course Outcomes**

## After course completion, the student will be able to:

- CE1107.1 Explain the principles governing the open channel flow.
- CE1107.2 Classify the various types of flow in open channels.
- CE1107.3 Design the most efficient cross section of channel for uniform flow.
- CE1107.4 Compute the gradually varied flow profiles in prismatic and non-prismatic channels.
- CE1107.5 Analyze the flow in channels by open source software HEC RAS.
- CE1107.6 Compute the rapidly varied flow profile (hydraulic jump) in open channels.
- CE1107.7 Explain the basic equations and principles of unsteady flow in open channel.
- CE1107.8 Explain the principles governing the flow in rivers and canals with sediments.
- CE1107.9 Explain the various forms of river.
- CE1107.10 Explain the various sources of water in rivers.
- CE1107.11 Design the canals with and without sediments with IS standards.

## Syllabus (Theory)

**Unit 1:** Basic Principles: open channel flow and its classifications, and properties, energy and momentum principles, Critical flow computation and its applications, transitions with sub critical and super critical flows.

**Unit 2:** Uniform flow, roughness coefficient, computation of uniform flow in prismatic channel, design of non- erodible channels for uniform flow, Most efficient channel section, compound sections

**Unit 3:** Gradually varied flow: Theory and analysis, gradually varied flow computations in prismatic channels, gradually varied flow in non-prismatic channels. Rapidly varied flow: Theory of hydraulic jump, evaluation of jump elements in rectangular and non-rectangular channel, location of jump on horizontal floor, channel controls and transitions, free over fall, thin plate weirs, broad crested weirs, and sluice gates.

**Unit 4**: Unsteady flow in open channels, surge movement in open channels, Numerical methods to solve Saint-Venant Equation

**Unit 5** River regions and their characteristics - classification of rivers on alluvial plains - meandering of rivers, design of canals with sediments

## Syllabus (Practical)

- 1. Calibration of triangular notch for field installation
- 2. Study on velocity distribution in an open channel
- 3. Study phenomena of hydraulic jump
- 4. Study on critical depth of flow
- 5. To perform the Reynolds experiment for determination of different regimes of flow.
- 6. To study the movement of surge in open channel
- 7. To study the sediment movement in channels

| Prerequisi | ites                    | Fluid Mechanics |
|------------|-------------------------|-----------------|
| Teaching   | Scheme (Hours per Week) | 302             |
| Credits    |                         | 4               |
| Sr. No.    | Evaluation Component    | Marks           |
| 1          | Attendance              | NIL             |
| 2          | Assignment              | 5               |
| 3          | Class Participation     | 5               |
| 4          | Quiz                    | NIL             |
| 5          | Theory Exam-I           | 10              |
| 6          | Theory Exam-II          | 10              |
| 7          | Theory Exam-III         | 40              |
| 8          | Report-I                | NIL             |
| 9          | Report-II               | NIL             |
| 10         | Report-III              | NIL             |
| 11         | Project-I               | NIL             |
| 12         | Project-II              | NIL             |
| 13         | Project-III             | NIL             |
| 14         | Lab Evaluation-I        | 10              |
| 15         | Lab Evaluation-II       | 20              |
| 16         | Course Portfolio        | NIL             |
|            | Total (100)             | 100             |

#### **Course Evaluation for Hydraulic Engineering**

#### **Text /References Books:**

- 1. V.L. Streeter, "Fluid Mechanics", Mc Graw-Hill, N.Y, USA.
- 2. 2.R.J. Garde "Fluid Mechanics" RPH, Roorkee.
- 3. Shames, "Mechanics of fluids", Mc Graw-Hill (Int. St. ed.) Auckland, NZ
- 4. A.K. Jain "Mechanics of fluids", Khanna Publisher., Delhi
- 5. Subramanya, "Flow in Open channels"
- 6. K G Ranga Raju, "Flow through open channel"
- 7. V.T Chow "Open channel Hydraulics"
- 8. Bakhmeteff, "Hydraulics of open channel"
- 9. Henderson, "Open channel flow"

Course Title and Code - Advanced Communication & Interpersonal Dynamics | CCT401

#### **Course Description**

In this course student will be able to prepare for various group settings, manage difficult conversations, identify individual differences and opinions. This course will enable students to resolve interpersonal conflict by identifying possible sources of conflict and by using a range of techniques to bring about a solution.

#### **Course Outcomes**

The students will be able to:

- CCT401.1 Formulate effective questions, differentiate facts from opinions.
- CCT401.2 Identify reasons for individual differences and their impact on the group dynamics.
- CCT401.3 Use inquiry and advocacy to engage with groups.
- CCT401.4 Identify possible sources of conflict and by using a range of techniques to bring about a solution.
- CCT401.5 Use and compare different problem-solving techniques to produce the best possible outcome from the group.

| Prerequisit | es                  | N/A            |
|-------------|---------------------|----------------|
| Hours per   | Week                | L-T-P: 2-0-0-0 |
| Credits     | 2                   |                |
| Sr. No      | Specifications      | Marks          |
|             | Attendance          | 10             |
|             | Assignment(s)       | 30             |
|             | Class Participation | 10             |
|             | Theory Exam         | 25             |
|             | Project -1          | 10             |
|             | Project -2          | 15             |
|             | Total               | 100            |

## **Syllabus**

- I. **Introduction to Critical Thinking** Critical thinking is the ability to think for one's self and reliably and responsibly make those decisions that affect one's life. Students will practice the formulating open-ended, inquiring questions, using available information differentiating facts from opinions, backing their claims with reasons, and thinking from many perspectives
- II. **Introduction to Personality, Perception and Learning as source of differences in individual and groups -**Students will be able to understand the relevance of personality, perceptions and learning in a group and their impact on the group dynamics. Introduction to the stages of group development (forming, norming, storming and performing).
- III. Emotional Intelligence and Conflict Resolution Techniques Four quadrants of EI-Self-aware, manage their reaction, understand social dynamics and manage Relationships will be discussed. Through the Thomas Killman Conflict Mode Instrument, students will learn about the process of conflict resolution. Techniques for managing conflict. Deep listening will be covered in this module for effective use of the

techniques.

- IV. Difficult Conversation using Inquiry & Advocacy Concept of silence (Masking, Avoiding, Withdrawing) and violence (Controlling, Labeling, Attacking). Students will be able to use techniques of inquiry and advocacy to engage with groups. They will be able to gain leverage for improving conversations by paying attention to advocacy and inquiry. They will be exposed to effects of high-low advocacy and inquiry.
- V. **Empathy & Feedback-** Concept of empathy will be discussed. The requirements/prerequisites for Empathy ((Open-mindedness, imagination, Knowing and accepting yourself). Introduction to the concept of Giving & Receiving Feedback.
- VI. **Problem solving techniques in a Group-** Concept of brainstorming, nominal group technique, interacting group and how it can be used to generate solution to conflict. Active & deep listening as a tool for problem solving.

Reading Material will be provided by the facilitator to the students. Students can refer the following links for better understanding of the concepts.

#### WEBLINKS:

- 1. http://apppm.man.dtu.dk/index.php/Group\_Dynamics\_and\_Personality\_Typ
- 2. https://www.managementstudyguide.com/types-of-personality.htm
- 3. https://www.hrpersonality.com/resources/conflict-management-techniques
- 4. https://thesystemsthinker.com/productive-conversations-using-advocacy-and-inquiry-effectively/

#### **Articulation and Elocution**

## Course Code: CCT202 Credit: Audit Course Total Number of Contact Hours: 6 Hrs.

#### **Course Outcomes:**

On successful completion of this course, the students should be able to:

- CCT202.1 Use richer vocabulary in their communication appropriate to the context.
- CCT202.2 Use appropriate grammar, vocabulary and style which are essential to professional-level reading, writing, speaking, listening, and editing.
- CCT202.3 Apply various strategies to make the speeches/ conversation interesting and captivating.
- CCT202.4 Using the sentence structure effectively and connect ideas logically within a paragraph.
- CCT202.5 Write descriptions on various objects and topics.

| Sessions | Content                                    | Activities   |
|----------|--|--|
| 1        | Listening                                  | <ul> <li>To inculcate the skills of content prediction, inference<br/>and discourse coherence.</li> <li>Acquire proficiency in Prosodic Features<br/>(Pronunciation, enunciation, pitch, intonation/voice<br/>modulation)</li> </ul>   |
| 2        | Ideation and<br>Expression                 | <ul> <li>Proving situation/context to trigger thinking process</li> <li>Just Minutes</li> <li>Role Play/ Situational Dialogues</li> <li>(Oral Narration) Describing people, places, events and things</li> </ul>   |
| 3        | Reading                                    | <ul> <li>Distinguishing the main idea and supporting ideas</li> <li>Transcoding information to diagrammatic display, recognizing indicators in discourse, understanding conceptual meaning and summarizing.</li> <li>Reading and writing skills will be targeted simultaneously.</li> </ul>  |
| 4.       | Writing                                    | <ul> <li>To throw some light on the features of the connected speech/ composition such as use transitional words, connectives, etc.</li> <li>To explain various strategies for the organization of ideas such as introduction, development, transition, conclusion, emphasis, explanation and anticipation.</li> </ul>   |
| 5        | Vocabulary<br>Building                     | <ul> <li>Introducing Idioms, Proverbs, Phrasal verbs and asking them to use the same.</li> <li>Connotative and denotative meaning of the words.</li> <li>To familiarize the students with the ways in which words are actually used in a particular context, especially with regard to their meanings, roots, prefixes suffixes, antonym &amp; synonym.</li> </ul> |
| 6        | Collecting and<br>Analyzing<br>Information | <ul> <li>Assigning students to read books, newspapers, magazines and stories to learn from, assess and improve analytical ability.</li> <li>Allotment will be done before the class.</li> </ul>  |

#### **Course Outline (Tentative Session Plan):**

# **Reading Materials:**

- Sanjay Kumar & Pushpa Lata "Communication Skills". New Delhi: Oxford University Press, 2011.
- M Ashraf Rizvi "Effective Technical Communication". Chennai, McGraw Hill Education, 2018

Note: Latest edition of the readings will be used.

| Eval | ustion | Scheme:  |
|------|--------|----------|
| Lya  | uauvii | Schulle. |

| Evaluation Component | Weightage (%) |
|----------------------|---------------|
| Attendance           | 10            |
| Assignment(s)        | 30            |
| Class Participation  | 10            |
| Quiz                 | 10            |
| Project-I            | 15            |
| Lab Evaluation-I     | 25            |
| Total                | 100           |

| Course code |  | Course Title        |                           | Teaching Scheme |   |         |
|-------------|--|---------------------|---------------------------|-----------------|---|---------|
|             |  | Course Thie         | L                         | Т               | Р | Credits |
| PS1101      |  | Practice School – I |                           |                 |   | 4       |
| Evaluati    | on Scheme                                      |                     |                           |                 |   |         |
| S. No.      | Evaluation Component                           |                     | Marks (100) (Weightage %) |                 |   |         |
| 1           | External Day to Day task Record                |                     | 30                        |                 |   |         |
|             | Supervisor Report Content and Presentation     |                     | 20                        |                 |   |         |
| 2           | Faculty         Reporting Activity Fortnightly |                     | 20                        |                 |   |         |
|             | Supervisor Presentation, Viv, Report           |                     | 30                        |                 |   |         |

#### Syllabus:

This course is for 6 weeks at the end of 4th semester during summer term of 4 year full time B. Tech. and 5 year Integrated Dual degree (B.Tech + M.Tech, B.Tech + MBA) programs in all the engineering disciplines. The objective of this programme is to provide the students an understanding of working of corporate world in various functions associated with an Industry/Organization. During this programme, they will observe and learn various real world applications of their curricula and develop an understanding of vast engineering operations and its various facets such as inventory, productivity, management, information systems, human resource development, data analysis etc. The general nature of PS-1 assignments is of study and orientation.

| <b>Course Title and Code:</b> Design of RCC and Steel Structures CE1107        |   |  |  |  |
|--|---|--|--|--|
|  |   |  |  |  |
| Hours per Week L-T-P: 3-0-2  |   |  |  |  |
| Credits  | 4   |  |  |  |
| Students who can take  | B. Tech Semester-V  |  |  |  |
| Course Objective:  |   |  |  |  |
| This course aims to develop understanding abo                                  | ut design of RCC and steel structure  |  |  |  |
| components for structural design.  |   |  |  |  |
| Course outcomes:   |   |  |  |  |
| On successful completion of this course, students will be able to:             |   |  |  |  |
| CE1107.1 Understand material properties and de<br>structures                   | E1107.1 Understand material properties and design methodologies for Concrete and Steel structures |  |  |  |
| CE1107.2 Analyse and design reinforced concret                                 | E1107.2 Analyse and design reinforced concrete elements like beam and slab                        |  |  |  |
| CE1107.3 Analyse and design steel elements like tension member and compression |   |  |  |  |
| member   |   |  |  |  |
| CE1107.4 Design different type of connections for steel members                |   |  |  |  |
| Prerequisites  | Structural Analysis   |  |  |  |

# Course Syllabi (Theory):

**Reinforced Concrete Materials: Concrete**- Grade of concrete, Characteristic strength, Compressive strength, Flexural tensile strength, modulus of elasticity and Poisson's Ratio, creep & shrinkage, Stress-strain behavior, Design stress-strain curve of concrete, Nominal mix and design mix of concrete. **Reinforcing steel**-Types, sizes and grades, Stress-strain behavior, Design stress-strain curve. Sustainable concrete by using Recycled Concrete Aggregates (RCA) & other waste materials.

**Basic concepts of Reinforced Concrete Design:** Working Stress Method (WSM), Ultimate Load Method (ULM) and Limit State Method (LSM), Characteristic strength of materials, Characteristic loads, Partial safety factors for materials and loads.

**Reinforced Concrete Beams:** Design of singly & doubly reinforced rectangular sections in flexure, Design for shear, Design for bond and anchorage of reinforcement.

Slabs: Analysis and design of one way and two way slabs by LSM.

**Introduction and Design Philosophies:** Types of Structural Steel, structural steel sections, Working Stress Method (WSM) and Limit State Method (LSM).

**Introduction to Connections:** Types of Bolts, Bolted and Welded Connections under axial loadings.

Tension Members: Design of axially loaded tension members.

**Compression Members:** Design of axially loaded compression members, Design of Built-up Columns.

# Syllabus (Practical)

Design problems based on theory syllabus

# **References:**

# Textbooks

1. Pillai, S.U. and Menon, D., "Reinforced Concrete Design", McGraw Hill Education (India) Pvt. Ltd (2003).

2. Sinha, S. N., "Reinforced Concrete Design", Tata McGraw Hill Education Pvt. Ltd. (Second Edition).

3. Jain, A.K., "Reinforced Concrete Limit State Design", Nem Chand & Brothers, Roorkee (2012)

4. Subramanian, N., "Steel Structures-Design and Practice", Oxford University Press (2008).

5. Arya, A.S. and Ajmani, J.L., "Design of Steel Structures", Nem Chand & Brothers (2000).

6. Duggal SK, "Limit State Design of Steel Structures", Tata McGraw Hill (Third edition)

# IS Codes:

- 1. IS 456-2000 Plain and Reinforced Concrete Code of Practice
- 2. IS: 800-2007 General Construction in Steel-Code of Practice
- 3. SP 6-1: ISI Handbook for Structural Engineers -Part-1 Structural Steel Sections

# NPTEL – SWAYAM MOOC Courses:

- 1) Design of Reinforced Concrete Structures. Course url: <u>https://swayam.gov.in/nd1\_noc19\_ce22/preview</u>
- 2) Design of Steel Structures Course url: <u>https://swayam.gov.in/nd1\_noc19\_ce25/preview</u>

| Course Title and Course Code | <b>GEOTECHNICAL ENGINEERING (CE 1108)</b> |
|------------------------------|---|
| Hours per week               | L T P: 3 0 2                              |
| Credits                      | 4   |
| Students who can take        | B.Tech, Semester-V                        |

## **Course Objective:**

To introduce students to the fundamental concepts of soil mechanics dealing with historical development, water-capillary phenomena, vertical stress distribution, compaction behaviour, shear strength, compressibility and consolidation behaviours of soil.

## **Course Outcomes:**

On successful completion of this course, the students should be able to:

- CE1108.1 assess index properties of different soil types.
- CE1108.2 evaluate the effect of pore water and seepage on the soil strength.
- CE1108.3 estimate vertical stress distribution beneath the foundation on account of superstructure load, up to certain depth.
- CE1108.4 calculate the shear strength of soil under different configurations of principal and shear stresses.
- CE1108.5 determine the compaction characteristics, optimum water content and maximum dry density of soil.
- CE1108.6 determine the consolidation characteristics of different type of soils and estimate the settlement under superstructure loads.

|           | Prerequisites  | Engineering Mechanics and<br>Solid Mechanics |
|-----------|--|--|
| Sr.<br>No | Specifications   | Marks  |
| 1.        | Attendance   | Nil  |
| 2.        | Assignment   | Nil  |
| 3.        | Class Participation                                      | 5  |
| 4.        | Quiz   | 15   |
| 5.        | Theory Exam-I  | 20   |
| 6.        | Theory Exam-II   | Nil  |
| 7.        | Theory Exam-III  | 30   |
| 8.        | Report-I   | Nil  |
| 9.        | Report-II  | Nil  |
| 10.       | Report-III   | Nil  |
| 11.       | Project-I  | 10   |
| 12.       | Project-II   | Nil  |
| 13.       | Project-III  | Nil  |
| 14.       | Lab Evaluation-I [Report (2.5) + Exam (10) + Viva (7.5)] | 20   |
| 15.       | Lab Evaluation-II  | Nil  |
| 16.       | Course Portfolio   | Nil  |
|           | Total  | 100  |

## **COURSE SYLLABUS (Theory):**

## **UNIT I Historical Development of Soil Engineering**

Origin and general types of soils, Soil structure, Clay minerals, Three-phase system, Identification and Classification of soils.

## **UNIT II Soil Water-Capillary Phenomena**

Concept of effective and neutral stresses, Permeability, Determination of coefficient of permeability in the laboratory, Seepage flow, Head, Gradient, Pressure, Steady-state flow, Two-dimensional flow net.

## **UNIT III Vertical Stress Distribution in Soil**

Boussinesq and Westergaard's equation, Newmark's influence chart, Principle, Construction and Use, Equivalent point load and Other approximate methods, Pressure bulb.

## **UNIT IV Compaction and Shear Strength**

Mohr-Coulomb failure criterion, Shear strength tests, Different drainage conditions, Shear properties of cohesionless and cohesive soils, Use of Mohr's circle, Relationship between principal stresses and shear parameters.

## **UNIT V Compressibility and Consolidation**

Terzaghi's one-dimensional consolidation theory, Pressure void ratio relationship, Preconsolidation pressure, Total settlement and time rate of settlement, Coefficient of consolidation, Curve fitting methods, Correction with construction time.

## **UNIT VI Sustainability in Geotechnical Engineering**

Indian Standard Codes for Geotechnical Engineering (IS 2720, Part 1-41, IS 6403, etc.).

## **COURSE SYLLABUS (Practical):**

- 1. Collection of Soil Sample and Determination of Moisture Content
- 2. Determination of Specific Gravity by (a) *Density bottle* and (b) *Pycnometer*
- 3. Grain Size Distribution of Soil Using Dry Sieve Analysis
- 4. Grain Size Distribution of Soil Using Wet Sieve Analysis
- 5. Particle Size Distribution Using Hydrometer
- 6. Determination of Liquid Limit Test by Casagrande Apparatus
- 7. Determination of Liquid Limit Test by Cone Penetrometer
- 8. Plastic Limit Test
- 9. Shrinkage Limit Test
- 10. Field Density Test by Core Cutter Method
- 11. Field Density Test by Sand Replacement Method
- 12. Standard Proctor Compaction Test
- 13. Modified Proctor Compaction Test
- 14. Consolidation Test

#### **Text Books:**

- 1. Arora, K. R. (1992). *Soil Mechanics and Foundation Engineering in SI Units*. Standard Publishers Distributors.
- 2. Coduto, D. P. (1999). *Geotechnical Engineering: Principles and Practices*, Pearson.
- 3. Lambe, T. W., & Whitman, R. V. (2008). *Soil mechanics SI version*. John Wiley & Sons.
- 4. Murthy, V. N. S. (2002). *Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering*. CRC press.
- 5. Punmia, B., & Jain, A. K. (2005). Soil Mechanics and Foundations. Firewall Media.
- 6. Ranjan, G., & Rao, A. S. R. (2007). *Basic and Applied Soil Mechanics*. New Age International.
- 7. Singh, A., & Chowdhary, G. R. (1967). *Soil Engineering in Theory and Practice*. Asia Publishing House.
- 8. Venkatramaiah, C. (1995). Geotechnical Engineering. New Age International.

#### **Other Important Links:**

- 1. Online Lecture Notes on Geotechnical Engineering: (<u>https://nptel.ac.in/courses/Webcourse-contents/IIT-</u>%20Guwahati/soil\_mech/index.htm)
- 2. Video Lecture on Geotechnical Engineering: (<u>https://www.youtube.com/</u>watch?v=DuZllNDex6s)

| Course Title and Code:                     |               |  |  |  |
|--|---------------|--|--|--|
| Mechanical and Electrical Machines: ES1108 |               |  |  |  |
| Hours per Week                             | L-T-P-S: 3020 |  |  |  |
| Credits                                    | 4             |  |  |  |

#### Syllabus (Theory)

## <u>UNIT – I</u>

**Transformer:** 1-Phase transformer: Working principle, Construction, EMF equation, Equivalent circuit and phasor diagram, losses and Efficiency, O.C. /S.C. Test, Polarity Test, 3-Phase transformer: Construction, Connections and phasor groups. *Standards: IEC60616* 

**D. C. Machines:** D.C. Generator: Construction, Armature Winding, EMF Equation, Armature reaction, characteristics of dc generators, applications.

**D. C. Motor:** Construction, Operation of a DC Motor, performance characteristics of DC Motors, Losses in a DC Motors, Methods of Speed Control, applications.

## <u>UNIT – II</u>

**Boilers:** Purpose, Classification of boilers, Fire tube and water tube boilers, Mountings and accessories, construction and working of Cornish, Cochran, Lancashire, Locomotive, Babcock and Wilcox boilers, boiler performance. Construction and working of Loeffler, Velox, Benson, Lamont boiler. Efficiency of boiler.

**Turbines:** Introduction to steam turbines, Working of Impulse and Reaction turbines, compounding of steam turbines, losses in steam turbines, need of governing, throttle governing, nozzle governing and bypass governing.

#### <u>UNIT – III</u>

#### **Synchronous Machines:**

Synchronous Generator: Basic concepts, types and construction, generated emf, distribution &Pitch factor, armature reaction, phasor diagram.

Synchronous Motor: Working principle and construction, phasor diagrams, speed torque characteristics, starting methods, applications.

## UNIT - IV

**Induction Motor:** Theory and construction of squirrel-cage and wound-rotor motors; equivalent circuit; measurement of equivalent circuit parameters, speed and slip, starting & running torque, speed/torque curves. *standards: EEMUA132*.

**Pumps:** Types of pumps, positive displacement pumps, rotary type positive displacement pumps like gear pump, screw pump, rotary vane pumps; reciprocating type positive displacement pumps like piston pumps, plunger pumps. Centrifugal pumps working principle, pressure head, velocity head.

#### <u>UNIT –V</u>

Stepping Motors: Construction, working and application.

#### **List of Experiments:**

- 1. Open circuit characteristics of D.C. generator
- 2. Measurement of torque and speed of D.C motor operating in the workshop for lathe operation.

- 3. Speed control of D.C. shunt motor by (a) Field current control method & plot the curve for speed vs. field current. (b) Armature voltage control method & plot the curve for speed vs armature voltage.
- 4. To perform O.C. and S.C. test on a 1-phase transformer and to determine the parameters of its equivalent circuit its voltage regulation and efficiency.
- 5. To perform no load and blocked rotor test on a 3-phase induction motor and to determine the parameters of its equivalent circuits. Draw the circle diagram and compute the following (a) Max. Torque (b) Current (c) slip (d) p.f. (f) Efficiency.
- 6. To plot OCC & SCC of an Alternator and to determine its regulation by synchronous impedance method.
- 7. To find efficiency of a given boiler.
- 8. To find power output & efficiency of a steam turbine.
- 9. To find efficiency of a reciprocating pump.
- 10. To find efficiency of a Gear pump.

## **Textbooks:**

- 1. Nagrath I.J.and Kothari D.P, "Basic Electrical Engineering" TMH, Third Edition 2011.
- 2. B. L. Theraja, "A Text Book on Electrical Technology" S.Chand, VolumeII. 2012.
- 3. Electric Machinery and Transformers-Bhag S. Guru, Huseyin R. Hiziroglu-Oxford Publication.
- 4. J B Gupta, "Theory and Performance of Electrical Machines"4th Edition, S.K.Kataria and Sons
- 5. Power plant Engineering, P.K. Nag, Tata McGraw-Hill, 2008.
- 6. Steam and Gas turbines and power plant engineering- Dr. R Yadav, Central Publishing House, Allahabad, 2011.
- 7. Introduction to Fluid Mechanics and fluid machines- Author: S K som, Gautam Biswas, Mc Graw Hill.

## **Reference Book(s)**

- 1. Electrical Engineering Principles and Applications, Allan R. Hambley, PHI, fourth edition-2007.
- 2. Electrical Machines by P S Bhimbra- Khanna Publishers.
- 3. Ashfaq Hussain, "Electrical Machines" 2<sup>nd</sup> Edition, Dhanpatrai and Sons.
- 4. A. E. Fitzerald, Charles Kingsley, Stephen. D. Umans, "Electric Machinery" 6th Edition, Tata McgrawHill.

## Course Title and Code: Communication and Identity |CC1104 Course Objective:

This course enables students to explore their personal and professional identities, to create their distinctive presence. It intends to help them gain an understanding of the basic purpose, benefits, and responsibilities of self-presence, and to begin the process of defining their values, strengths, and goals, which also helps them enhancing their professional readiness.

## **Course Outcomes**

| CC1104.1 | Analyse their personal identities, both private and social |
|----------|--|
| CC1104.2 | Identify their different values, strengths and areas of    |
|          | professional interest                                      |
| CC1104.3 | Articulate their personal statement and use it to craft an |
|          | influential pitch  |
| CC1104.4 | Express themselves through various communication formats   |
|          | on different platforms                                     |
|          |  |

| Prerequisites  |                     | N/A          |  |
|----------------|---------------------|--------------|--|
| Hours per Week |                     | L-T-P: 2-0-0 |  |
| Credits        |                     | 2            |  |
| Sr. No         | Specifications      | Weightage    |  |
| 1.             | Assignment          | 40           |  |
| 2.             | Class Participation | 10           |  |
| 3.             | Theory Exam III     | 30           |  |
| 4.             | Presentation        | 20           |  |
|                | Total               | 100          |  |

## Syllabus:

| Module   | Topics   |  |
|--|--|--|
| Identifying  | Factor that shape our identity                           | The 3 Types of Diversity that shape our identities. Three things: demographic diversity (our gender, race, sexual orientation, and so on), experiential diversity (our affinities, hobbies, and abilities), and cognitive diversity (how we approach problems and think about things). |
| Self   | Internal confidence<br>or "principle-<br>centred living" | Living a principle-centred life is the key to<br>excelling in all other areas of our living. A<br>principle is based on the fundamental idea<br>that there is learned behavior that governs<br>human effectiveness.  |
|  | Personal Statement                                       | Use of story map to create a personal statement.   |
| PersuasiveSteps to build aCommunicationPersonal Identity |  | Personal Identity through brand building exercise: meaning, importance and how to  |

|   | create and use it; the three Cs of personal branding   |
|---|--|
| Online presence   | Creating an online presence for<br>professional and personal branding<br>through social media.(LinkedIn,<br>Facebook etc.)   |
| Elevator Pitch,<br>Cover Letter                               | Elevator Pitch: Meaning and use of an<br>elevator pitch in interview and workplace;<br>techniques to craft and improve their pitch<br>Purpose of a cover letter, types of the<br>cover letter, the structure of a cover letter<br>and tips on the cover letter, to craft their<br>cover letter to be used for placements |
| Presence in Group<br>Discussion and<br>Personal<br>Interviews | Practice different types of group<br>discussions, dos and don'ts of group<br>discussions and use of techniques to<br>perform well in GDs   |

#### **References for Reading:**

- 1. O'Brien, T. (2019). When your job is your identity, professional failure hurts more. *Harvard Business Review*.
- 2. Anca, C., & Aragón, S. (2018). The 3 types of diversity that shape our identities. *Harvard Business Review*.
- 3. Craig, N., & Snook, S. (2014). From purpose to impact. *Harvard business review*, 92(5), 104-111.
- 4. Detert, J. R. (2018). Cultivating everyday courage. *Harvard Business Review*, *96*(6), 128-135.
- 5. Dutta, S. (2010). What's your personal social media strategy? *Harvard business review*, 88(11), 127-30.

#### MANAGEMENT PERSPECTIVES (IL1101) COURSE CREDITS: 2

SESSION DURATION: 60 MINUTES

# **COURSE DESCRIPTION:**

The present course is an introductory and integrative action encapsulated course designed for the engineering students to introduce them to management discipline and the core functional areas contributing to it. This course adopts the integrated problem oriented approach via the use of cases and simulation. It implies that complex business problems, in the form of cases and simulations require students to understand different dimensions of the problem and come up with holistic solutions. The course will help students to be familiar with trending management issues and at the same time apply the knowledge gained.

# **COURSE OUTCOMES**

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

- IL1101.1 Comprehend the importance of management and its functional areas in businesses and also its interaction with technology.
- IL1101.2 Highlight specific external and internal issues impacting businesses.
- IL1101.3 Integrate and analyze multiple dimensions of management aspects to solve business problems.
- IL1101.4 Evaluate the aspects that management might consider when evaluating technical and engineering projects such as planning and scheduling, personnel management, cost control etc. from a management perspective

# **TOPICS TO BE COVERED:**

# HR

- 1. Business organization- Current challenges
- 2. HR and its growing importance.
- 3. Overview of people management systems
- 4. Recent trends shaping HR.

# **Economics:**

- 1. Introduction of important concepts of Micro and Macro Economics
- 2. Key Features of Indian Economy
- 3. Understanding of economic environment of business

# Marketing:

1. Marketing Process

- 2. Elements of Marketing Mix
- 3. Segmentation, Targeting and Positioning

## Finance and Accounts:

- 1. Understanding Accounting Terms
- 2. Overview of Financial Reports, viz., Balance Sheet, Income Statement, Cash Flow Statement
- 3. Interface of Balance Sheet and Income Statements
- 4. Types of Costs and assessing and ascertaining Costs

# BOOKS FOR REFERENCE

- Aswathappa, K. (2008) Human Resource Management Text and Cases, Tata McGraw Hill New Delhi.
- Rao VSP (2002)– Human Resource Management, Text and Cases,Excel Book, New Delhi
- Armstrong, G. and Kotler, P. (2017). Marketing: An Introduction. New Delhi: Pearson Education.
- Ramaswamy, V. S., & Namakumari, S. (2013). Marketing Management: Global Perspective, Indian Context. New Delhi: Macmillan (India) Limited.
- T. R. Jain (Latest Edition). Economics for Engineers. New Delhi: V K Publications.
- Ramachandran N & Kakani K.Ram.(2017). How to Read a Balance Sheet,2/e. New Dehi: Mc Graw Hill Publications.
- Mott Graham. (2008). Accounting for Non-Accountants: A Manual for Managers and Students. Kogan Publication.
- Goyal, V.K. & Goyal, Ruchi. (2016). Financial Accounting, 4/e, New Delhi: PHI Learning Pvt. Ltd.[ ISBN.-978-81-203-4626-0]

# ASSESSMENT MATRIX

The criteria for assess the learning outcomes of this course are as follows:

| S.No. | Specification       | Marks |
|-------|---------------------|-------|
| 1     | Attendance          | 10    |
| 2     | Assignment          | Nil   |
| 3     | Class Participation | 10    |
| 4     | Quiz                | Nil   |
| 5     | Theory Exam-I       | Nil   |
| 6     | Theory Exam-II      | Nil   |

| 7  | Theory Exam-III   | 40  |
|----|-------------------|-----|
| 8  | Report-I          | Nil |
| 9  | Report-II         | Nil |
| 10 | Report-III        | Nil |
| 11 | Project-I         | 40  |
| 12 | Project-II        | Nil |
| 13 | Project-III       | Nil |
| 14 | Lab Evaluation-I  | Nil |
| 15 | Lab Evaluation-II | Nil |
| 16 | Course Portfolio  | Nil |
|    | Total             | 100 |

| Course Ti                     | Course Title and Code: Transportation Engineering CE1109 |                           |   |  |  |  |
|-------------------------------|--|---------------------------|---|--|--|--|
| Hours per                     | Week   |                           | L-T-P: 3-0-2                            |  |  |  |
| Credits                       |  |                           | 4                                       |  |  |  |
| Students w                    | ho can take  |                           | B.Tech Semester-VI (Batch: 2017-2021)   |  |  |  |
| Course Ob                     | ojective:  |                           | · · · · · · · · · · · · · · · · · · ·   |  |  |  |
| This course                   | e aims to develop und                                    | erstanding about con      | cepts of highway planning, design and   |  |  |  |
| constructio                   | n to ensure safe and ef                                  | fective transportation    | of people and goods through roads.      |  |  |  |
| On succes                     | sful completion of the                                   | is course, students w     | vill be able to:                        |  |  |  |
| CE11                          | 09.1 Plan and design t                                   | he alignment of high      | way.                                    |  |  |  |
| CE11                          | 09.2 Characterize high                                   | way construction ma       | aterials and application of sustainable |  |  |  |
| CE11                          | highway materia  | ls.                       | fficatudios                             |  |  |  |
| CEII<br>CEII                  | 09.5 Flair and conduct                                   | r features of highway     | as per IRC .86                          |  |  |  |
| CE11<br>CE11                  | 09.5 Design of flexibl                                   | e and rigid pavement      | s as per IRC:37 & IRC:58                |  |  |  |
|                               | respectively.  | 0 1                       | L                                       |  |  |  |
| Duono quigi                   | - ·  | NTA                       |   |  |  |  |
| Prerequisi                    | ltes   | INA                       |   |  |  |  |
| Sr. No.                       | Evaluation   |                           | Marks                                   |  |  |  |
|                               | Component  |                           |   |  |  |  |
| 1                             | Attendance   | NIL<br>10 (02 Assignment) |   |  |  |  |
| 2                             | Assignment   |                           |   |  |  |  |
| 3                             | Class<br>Participation                                   | 10                        |   |  |  |  |
| 4                             | Quiz (02 Nos.)   | 10                        |   |  |  |  |
| 5                             | Theory Exam-I  | 10                        |   |  |  |  |
| 6                             | Theory Exam-II   | -                         |   |  |  |  |
| 7                             | Theory Exam-III  | 20                        |   |  |  |  |
| 8                             | Report-I   | 10 (Report)               |   |  |  |  |
| 9                             | Report-II  | 10 (Presentation)         |   |  |  |  |
| 10                            | Report-III   |                           |   |  |  |  |
| 11                            | Project-I  | NIL                       |   |  |  |  |
| 12                            | Project-II   | -                         |   |  |  |  |
| 13 Project-III                |  | -                         |   |  |  |  |
| 14                            | Lab Evaluation-I   | 10 (Dh                    | rical Lab and Vintual Lab               |  |  |  |
| 17                            | (Continuous<br>Evaluation)                               | 10 (Phys                  | sical Lab and virtual Lab)              |  |  |  |
| 15                            | Lab Evaluation-II  |                           | 10                                      |  |  |  |
| (Examination)                 |  |                           | 10                                      |  |  |  |
| 16Course PortfolioTotal (100) |  | NIL                       |   |  |  |  |
|                               |  | 100                       |   |  |  |  |
|                               | Theory Exam  |                           | 30                                      |  |  |  |

#### **Course Syllabus (Theory):**

**Highway Development & Planning:** Importance of transportation in economic activity and social effects, characteristics of road transport. Current road development plans in India, Classification of roads, road patterns. Highway alignment and preparation of highway Detailed Project Report (DPR).

**Highway Materials:** Desirable properties, laboratory test and MORTH specifications on materials: sub-grade soil; aggregate and bitumen Grading systems for bitumen: penetration grading, viscosity grading and super-pave performance grading. Modified bitumen: PMB & CRMB, cutback bitumen and bitumen emulsions. Green highways: Importance and application of sustainable materials in highway construction RAP (Recycled Asphalt Pavement) and RCA (Recycled Concrete Aggregates).

**Highway Geometric Design:** Cross sectional elements, camber, sight distance (SSD, OSD and ISD). Design of horizontal alignment: super elevation, extra widening, transition curves, grade compensation. Design of vertical alignment: gradients, vertical curves. Recommendations for highway geometric design parameters as per IRC code of practice (IRC: 73, IRC: 86).

**Traffic Studies:** Objects, methods and data presentation of various traffic studies such as classified traffic volume studies; spot speed studies; travel time and delay studies; origin & destination studies. Parking studies: Investigations and determination of parking demand; Accident studies: Objectives & causes of accidents; 3Es measures used for the reduction of accident rate.

Highway Flexible Pavement: Factors affecting design & performance of flexible pavements, component layers, structural design of highway flexible pavement as per IRC:37guidelines.
Highway Rigid Pavements: Component layers, factors affecting design & performance of rigid pavements. Types of joints in rigid pavements: longitudinal, contraction, expansion & construction joints. Temperature stresses: warping and frictional stresses, Wheel load stresses, Design of rigid pavements as per IRC:58 guidelines.

#### Text and reference books:

- 1. Highway Engineering by S.K. Khanna, C.E.G. Justo & A. Veeraragavan, Nem Chand and Bros., Roorkee.
- 2. Bituminous Road Construction in India by Prithvi Singh Kandal, PHI Learning Private Limited, Delhi.
- 3. Traffic Engineering & Transport Planning by L R Kadiyali, Khanna Publishers, New Delhi.
- 4. Principles of Transportation Engineering by Partha Chakroborty & Animesh Das, PHI, New Delhi.
- 5. Highway and Traffic Engineering by Subhash C. Saxena, CBS Publishers and Distributors Pvt. Ltd.
- 6. Specifications for Road and Bridge Works, Fifth Revision, Ministry of Road Transport and Highways (MORTH)I, ndian Roads Congress, New Delhi.
- 7. Indian Road Congress standards (IRC: 73, IRC: 86, IRC: 37, IRC:58).

## Syllabus (Practical)

- 1. CBR test for subgrade soil (Virtual Lab)
- 2. To determine the flakiness index & elongation Index of given sample of aggregate (Physical Test)
- 3. Aggregate Impact test (Physical & Virtual Lab)
- 4. Los angles abrasion test (Virtual Lab)
- 5. Aggregate crushing value test (Virtual Lab)
- 6. Ductility of bitumen (Physical & Virtual Lab)
- 7. Softening point of bitumen (Physical & Virtual Lab)
- 8. Flash and fire point of bitumen (Physical Test)

Ref: Virtual Lab by NIT Karnataka

http://vlabs.iitb.ac.in/vlabs-dev/labs/nitk\_labs/Transportation\_Engineering\_Lab/labs/index.html

| Course Title and Code                    |                                |  |  |  |
|--|--------------------------------|--|--|--|
| Construction Project Management: CE 1112 |                                |  |  |  |
| Hours per Week                           | L-T-P: 3-0-2                   |  |  |  |
| 20Credits                                | 4                              |  |  |  |
| Students who can take                    | B. Tech Sem VI sem (2017-2021) |  |  |  |
|  | (CE)                           |  |  |  |

**Course Objective:** This course aims to develop understanding for importance of estimation, costing and evaluation, construction project management, project planning, cash flow and time management and safety measures at the project site. Topics include estimation, costing, evaluation, management, role of civil engineer, project scheduling with PERT, methods to reduce the project cost, contract management and safety measures at excavation, demolition, roads and other construction sites.

#### **Course Outcomes**

#### On completion of the course, the student should be able to:

- CE 1112.1 Calculate the estimated cost of the project
- CE 1112.2 Compute the Benefit cost ratio of various type of projects.
- CE 1112.3 Asses the risks in various Civil Engineering projects.
- CE 1112.4 Analyze the project schedule by CPM and PERT.
- CE 1112.5 Evaluate various types of contracts.
- CE 1112.6 Develop various methods of safety in various construction projects.
- CE 1112.7 Incorporate sustainability in project planning and execution.
- CE 1112.8 Develop project scheduling using M S project.

| Prereq                           | uisites              |                         |  |
|----------------------------------|----------------------|-------------------------|--|
| Teaching Scheme (Hours per Week) |                      | 302                     |  |
| Credits                          |                      | 4                       |  |
| Sr.<br>No.                       | Evaluation Component | Marks<br>(Pre COVID 19) | Marks<br>(Post COVID 19<br>situation)      |
| 1                                | Attendance           | Nil                     | Nil  |
| 2                                | Assignment           | Nil                     | 10 (5 Nos)                                 |
| 3                                | Class Participation  | 5                       | 10   |
| 4                                | Quiz (3)             | 5                       | 0  |
| 5                                | Theory Exam-I        | 10                      | 10   |
| 6                                | Theory Exam-II       | 10                      | NIL  |
| 7                                | Theory Exam-III      | 25                      | 25   |
| 8                                | Report-I             | 5                       | 5  |
| 9                                | Report-II            | Nil                     | 0  |
| 10                               | Report-III           | Nil                     | 0  |
| 11                               | Project-I            | 10                      | 10   |
| 12                               | Project-II           | 10                      | 0  |
| 13                               | Project-III          | 10                      | 20   |
| 14                               | Lab Evaluation-I     | 5                       | 5 (Physical Lab<br>and Online<br>Sessions) |

| 15 | Lab Evaluation-II            | 5   | 5   |
|----|------------------------------|-----|-----|
| 16 | Course Portfolio             | Nil | Nil |
|    | Total (100)                  |     |     |
|    | Evaluation scheme for retest |     |     |
|    | Theory Exam III              | 25  | 25  |
|    | Lab Evaluation II            | 5   | 5   |

#### Syllabus (Theory)

**CONSTRUCTION AND PROJECT MANAGEMENT:** Construction Project, Importance of Construction and Construction Industry, Indian Construction Industry, Project Management and Its relevance, Stake holder of a construction Project, Role of Civil Engineer in Project Management, Stages in Construction, Project Organization: Construction Company, Structure of construction Organization, Management levels, Construction Economics: Benefit cost ratio, Average Annual rate of return, Major cause of project failure, Role of arbitrator in project management

**PROJECT PLANNING:** Importance of project planning, Types of Project Plans, determining activities involved, work breakdown structure, assessing activity duration, duration Estimate procedure, Project work scheduling, Project management techniques – CPM and PERT networks analysis, concept of precedence network analysis.

**PROJECT COST AND TIME CONTROL:** Monitoring the time progress and cost controlling measures in a construction project, Time cost trade-off process: direct and indirect project costs, Cost slope, Process of crashing of activities, determination of the optimum duration of a project, Updating of project networks, resources allocation.

**CONTRACT MANAGEMENT:** Elements of tender operation, Types of tenders and contracts, Contract document, Legal aspects of contracts, Contract negotiation & award of work, breach of contract, determination of a contract, arbitration.

**SAFETY AND OTHER ASPECTS OF CONSTRUCTION MANAGEMENT:** Causes and prevention of accidents at construction sites, Safety measures to be followed in various construction works like excavation, demolition of structures, explosive handling, hot bitumen work. Project Management Information System – Concept, framework, benefits of computerized information system. Environmental and social aspects of various types of construction projects.

#### Syllabus (Practical)

Various modes of measurements, measurement sheet and abstract sheet;

Types of estimate, plinth area rate, cubical content rate, preliminary, original, revised and supplementary estimates

Basic schedule of rates. (C.S.R.)

Preparing detailed estimates of various types of buildings, R.C.C. works, earth work calculations for roads and estimating of culverts, Services for building such as water supply, drainage and electrification.

Various percentages of overhead charges, Contingencies and work charge establishment different services in building.

## **Text /Reference Books:**

- 1. Dutta B. N. Estimating & Costing in Civil Engineering, UBS Publishers, 2016
- 2. Jha N K. Construction project Management Pearson, 2015.
- 3. Chitkara K K. Construction Project Management, Mc Graw Hill 2014.
- 4. Punmia B C and Khandelwal K K. Project Planning and Control with PERT and CPM. Laxmi Publication 2014.
### Course Title and Code: Critical Thinking for Decisions at Workplace |CC1106

**Course Description:** In today's world, the idea of right and wrong is being challenged by businesses, use of technology, economic conditions, and norms of societies. The relevance of a well-reasoned decision is crucial. This course intends to make students take better decisions keeping in mind purpose, context, and ethics.

### **Course Outcomes**

The students will be able to:

- CC1106.1 Apply techniques of critical thinking to analyse organisational problems through positive inquiry
- CC1106.2 Describe and analyse appropriate problem-solving and ethical decisionmaking processes
- CC1106.3 Choose the most effective and logical decision among multiple alternatives
- CC1106.4 Evaluate solutions and anticipate likely risks based on purpose, context and ethics

| Prerequisites         |                            | N/A          |                     |  |  |
|-----------------------|----------------------------|--------------|---------------------|--|--|
| Hours per Week        |                            | L-T-P: 2-0-0 |                     |  |  |
| Credits               |                            | 2            |                     |  |  |
| Sr. No Specifications |                            |              | Weightage           |  |  |
|                       |                            | Original     | Revised             |  |  |
| 1                     | Attendance                 | Nil          | 10                  |  |  |
| 2                     | Assignment                 | 20           | 30                  |  |  |
| 3                     | <b>Class Participation</b> | 20           | 10                  |  |  |
| 4                     | Quiz                       | Nil          | -                   |  |  |
| 5                     | Theory Exam-II             | 20           | 15(Individual viva) |  |  |
| 6                     | Theory Exam-III            | 30           | 15 (online mode)    |  |  |
|                       | Presentation               | 20           | 20                  |  |  |
|                       | Total (100)                | 100          | 100                 |  |  |

#### **References for Readings:**

- 1. Lehrer, J. (2010). How we decide. Houghton Mifflin Harcourt.
- 2. Heath, C., & Heath, D. (2013). *Decisive: How to make better choices in life and work*. Random House.
- 3. Hammond, J. S., Keeney, R. L., & Raiffa, H. (2015). *Smart choices: A practical guide to making better decisions*. Harvard Business Review Press.
- 4. Cases and scenario will be shared in the class.

| Course ande  |                       | Course Title                     | Teaching Scheme                           |   |                              |   |          |
|--|-----------------------|----------------------------------|---|---|------------------------------|---|----------|
| Course code  | e                     | Course 11tie                     | L   | Т                                       | Р                            | S   | Credits  |
| EE1111   |                       | Introduction to IoT              | 1   | 0                                       | 2                            | 0   | 2        |
| <b>Course Objectives:</b><br>The course aims to develop understanding of Internet of Things conc<br>development boards to interface sensors and actuators. The course w<br>upload data from sensors on a web server and to use this data for a<br>actuate some transducers.  |                       |                                  |   | epts an<br>ill enal<br>analytic         | d work<br>ole the<br>cal pur | cing on IoT<br>students to<br>poses or to |          |
| Course Outed   | mes                   |                                  | 4 1                                       |   | -1-1-4                       |   |          |
| <ul> <li>On successful completion of this course, the students should be able to:</li> <li>EE1111.1 Interface the Analog and Digital sensors to Node-MCU</li> <li>EE1111.2 Develop Embedded C programs to read sensor data and uplot cloud platform.</li> <li>EE1111.3 Use Python-based IDE (integrated development environmet Raspberry Pi</li> <li>EE1111.4 Interface Raspberry Pi with I/O devices.</li> <li>EE1111.5 Visualize sensor data uploaded on public cloud.</li> <li>EE1111.6 Apply standard protocol(s) for implementation of IoT Systems</li> </ul> |                       |                                  | o:<br>upload<br>onment<br>stems.<br>ative | d to public<br>ts) for the<br>IoT based |                              |   |          |
|  | app                   | roaches.                         |   |   |                              |   |          |
| Assessment S   | chei                  | ne:                              |   |   |                              |   |          |
| Prerequisites  |                       |                                  |   |   | Basi                         | c Prog                                    | gramming |
| Teaching Sch   | eme                   | e (Hours per Week)               |   |   |                              | LTP                                       | 102      |
| Credits  |                       | -                                |   |   |                              | 2   | 2        |
| Sr. No.  |                       | <b>Evaluation Component</b>      |   |   |                              | Ma  | arks     |
| 1  | Attendance            |                                  |   |   | N                            | JA  |          |
| 2  | As                    | signment                         |   |   |                              | N   | JA       |
| 3  | 3 Class Participation |                                  |   |   | N                            | JA  |          |
| 4  | Qu                    | iz                               |   |   |                              | 1   | 0        |
| 5  | The                   | eory Exam-I                      |   |   |                              | 1   | 0        |
| 6  | The                   | eory Exam-II                     |   |   |                              | N   | JA       |
| 7  | The                   | eory Exam-III                    |   |   |                              | 2   | 20       |
| 8  | Re                    | port-I (Case Study on Raspberry  | Pi, Io                                    | T)                                      |                              | 2   | 20       |
| 9  | Re                    | port-II                          |   |   |                              | N   | JA       |
| 10   | Re                    | port-III                         |   |   |                              | N   | JA       |
| 11   | Pro                   | oject-I                          |   |   | NA                           |   | JA       |
| 12   | Pro                   | oject-II                         |   |   | NA                           |   | JA       |
| 13   | Pro                   | oject-III                        |   |   | NA                           |   | JA       |
| 14   | Lal                   | o Evaluation-I (Continuous)      |   |   | 30                           |   | 30       |
| 15   | Lal                   | o Evaluation-II                  |   |   | NA                           |   | JA       |
| 16   | Co                    | urse Portfolio (MOOC certificate | )   |   | 10                           |   |          |
|  | To                    | tal (100)                        |   |   |                              | 1   | 00       |
|  |                       | <b>Evaluation Scheme for</b>     | Rete                                      | st                                      | 1                            |   |          |
| 1  | The                   | eory Exam-III                    |   |   |                              | 2   | 20       |

|   | 2   | Lab Evaluation-II  | 0  |
|---|---|--|--|
|   |   | Total (40)   | 20   |
|   | Course Sy   | llabi (Theory):  |  |
|   | UNIT 1:<br>Application  | Introduction to IoT Fundamentals: Definitions, Connectivity Layers, Addressing, Networking   | ion, Characteristics,  |
|   | UNIT 2: Se<br>Types, Act  | ensors and Actuators: Sensors and Transducers, Se<br>uator Basics, Actuator Types,   | ensor Classes, Sensor  |
|   | UNIT 3:<br>dependence<br>MQTT, Co   | Basics of IoT Networking & Protocol: IoT<br>es, SoA, Wireless Networks, Protocol Classifica<br>AP, XMPP, AMQP (Advanced Message Queuing  | Components, Inter-<br>tion, MQTT, Secure<br>g Protocol)                              |
|   | UNIT 4 <b>:</b> C<br>HART, NF   | onnectivity Technologies: IEEE 802.15.4, ZigBee<br>C, Bluetooth, Zwave.  | e, 6LoWPAN, RFID,  |
| UNIT 5: Introduction to NodeMCU and Server: Basic Concepts of Arduino Platform, Examples of Arduino Programming, Interfacing different sensors with NodeMCU. Introductio to Blynk App, Uploading and downloading data from server using Blynk App. Intoduction to ThingSpeak Server, Uploading and downloading data from ThingSpeak server. |   |  |  |
|   | UNIT-6 Ra<br>and Config<br>Python fun<br>online serv  | aspberry Pi: Basic functionality of the Raspberry<br>uring Raspberry Pi, programming on the Raspbe<br>ctions to access the Raspberry Pins, how Raspb<br>ices through the use of public APIs and SDKs, ca | Pi B+ board, Setup<br>erry Pi using Python,<br>perry Pi interact with<br>se studies. |
|   | References  | s:   |  |
|   | <ol> <li>"The Independent of the second second</li></ol> | nternet of Things: Enabling Technologies, Platfor<br>Raj and Anupama C. Raman (CRC Press)<br>et of Things: A Hands-on Approach", by Arshdo   | rms, and Use Cases",<br>eep Bahga and Vijay  |
|   | Madisetti (<br>3. Rajkan<br>Hill Educat   | Universities Press)<br>nal, Internet of Things, Architecture and Design I<br>tion (India) Pvt Ltd.   | Principles, Mc. Graw   |
| 5.  | 4. IoT fun<br>internet of<br>Barton, Ro<br>IOT (Intern  | ndamentals: networking technologies, protocols,<br>things : Hanes, David   Salgueiro, Gonzalo  <br>bert Henry, Jerome, Pearson, 2018, ISBN: 97893<br>net of Things) Programming: A Simple and Fa         | and use cases for the<br>Grossetete, Patrick  <br>86873743.<br>Ist Way of Learning   |
| 5.  | IOT (Inter<br>IOT by Da   | vid Etter,<br>vid Etter,   | st way of Learning   |
| 1.  | Introductio<br>https://sway   | n to internet of things By Prof. Sudip Misra, IIT I am.gov.in/nd1_noc20_cs66/preview   | <pre>snaragpur</pre>   |
| 2   | https://www   | coursera org/specializations/iot#courses   |  |

nups://www.coursera.org/specializations/lot#courses

3. https://www.coursera.org/specializations/embedding-sensors-motors

MOOC course The Arduino Platform and C Programming https://www.coursera.org/learn/arduino-platform?specialization=iot#syllabus

| Course<br>code |   | Course Title                                   |             | Teaching Scheme        |   |  |
|----------------|---|--|-------------|------------------------|---|--|
|                |   |  |             | NA                     | Credits   |  |
| <b>PR1</b>     | 101   | Automation Project                             |             |                        | 2   |  |
| Cour           | <b>Course Objectives:</b> The course aims to train students for designing and implementing  |  |             |                        |   |  |
| soluti         | solutions for Automation using Internet of Things.  |  |             |                        |   |  |
| Cour           | se Ou   | itcomes:                                       |             | 1 111 11 /             |   |  |
| On st          |   | tul completion of this course, the stude       | nts s       | should be able to:     | MCU and   |  |
| PI             | K1101   | sensors using Embedded C program               | proje<br>ns | ect in 101 using Node- | MCU and   |  |
|                |   | Or   |             |                        |   |  |
| P<br>P         | <ul> <li>Design and implement a complete project in IoT using Raspberry pi and sensors using Python programs</li> <li>PR1101.2 Apply one/more standard protocol(s) during project implementation</li> <li>PR1101.3 Demonstrate sensitivity to sustainability issues for power consumption / Bandwidth utilization/economic solutions during implementation of projects</li> </ul> |  |             |                        | berry pi and<br>ntation<br>nsumption /<br>entation of |  |
| Λεερ           | semor   | nt Scheme.                                     |             |                        |   |  |
| Sr.            |   | it Scheme.                                     |             |                        |   |  |
| No.            | Eva   | luation Component                              | Ma          | arks                   |   |  |
| 1              | Atte  | ndance   |             | Nil                    |   |  |
| 2              | Assignment  |  |             | Nil                    |   |  |
| 3              | Clas  | s Participation                                |             | Nil                    |   |  |
| 4              | Quiz  | <br>Z  |             | Nil                    |   |  |
| 5              | The   | ory Exam-I                                     |             | Nil                    |   |  |
| 6              | The   | ory Exam-II                                    |             | Nil                    |   |  |
| 7              | The   | ory Exam-III                                   |             | Nil                    |   |  |
| 8              | Rep   | ort I (Synopsis)                               |             | 30                     |   |  |
| 9              | Rep<br>and  | ort II (Midterm Progress Presentation<br>Viva) |             | 30                     |   |  |
| 10             | Rep   | ort III  |             | Nil                    |   |  |
| 11             | Proj  | ect I (with Report)                            |             | Nil                    |   |  |
| 121            | Proj  | ect II   |             | Nil                    |   |  |
| 13             | Proj  | ect III (With working model)                   |             | 40                     |   |  |
| 14             | Lab   | Evaluation I                                   |             | Nil                    |   |  |
| 15             | Lab   | Evaluation II                                  |             | Nil                    |   |  |
| 16             | Cou   | rse Portfolio                                  | Nil         |                        |   |  |
|                | Tota  | al (100)                                       | 100         |                        |   |  |
|                |   | Evaluation scheme f                            | or re       | etest.                 |   |  |
|                | Proj  | ect III (with Report)                          |             | 40                     |   |  |
|                | Tota  | 1 (100)  |             | 40                     |   |  |

| Course Title and Code: Minor Project PR1103 |                      |
|---|----------------------|
| Prerequisites                               | Nil                  |
| Hours per Week                              | L-T-P:               |
| Credits                                     | 04                   |
| Students who can take                       | B.tech. Semester VII |
|   |                      |

# **Course Objective:**

In Minor Project, Students are expected to work towards the goals and milestones set in Minor Project. The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format. At the end there would be a demonstration of the solution and possible future work on the same problem. The student will have to present the progress of the work through seminars and progress reports. (in continue contact with Faculty Supervisor Assigned)

**Operation Procedure** 

- Student has to devote full semester for Minor Project.
- Student has to report to the Supervisor regularly.
- Seminars s evaluation has to be carried out in the presence of atleast twomember Committee comprising.
- Experts in the relevant area constituted by the Supervisor.
- Final Seminar Report to be submitted has to be in formal hard bound cover bearing of the Institute emblem.

| Assessment Scheme: |                                    |       |  |
|--------------------|------------------------------------|-------|--|
|                    |                                    |       |  |
| Sr. No             | Specifications                     | Marks |  |
| 01                 | Attendance                         | NIL   |  |
| 02                 | Assignment                         | NIL   |  |
| 03                 | Class Participation                | NIL   |  |
| 04                 | Quiz                               | NIL   |  |
| 05                 | Theory Exam(Mid Term)              | NIL   |  |
| 06                 | Theory Exam                        | NIL   |  |
| 07                 | Theory Exam(Final)                 | NIL   |  |
| 08                 | Report-1 (Synopsis) (Panel)        | 15    |  |
| 09                 | Report-2                           | NIL   |  |
| 10                 | Report-3                           | NIL   |  |
| 11                 | Project -1 (Mid Term ) (Panel)     | 20    |  |
| 12                 | Project -2 (Day to Day work)       | 25    |  |
|                    | (Demo, Presentation, Viva, Report) |       |  |
| 13                 | Project -3 (End Term) (Panel)      | 40    |  |
|                    | (Demo, Presentation, Viva, Report) |       |  |
| 14                 | Lab Evaluation – I                 | NIL   |  |
| 15                 | Lab Evaluation – II                | NIL   |  |
| 16                 | Course portfolio                   | NIL   |  |
|                    | Total (100)                        | 100   |  |

#### PR 1104 – Practice School II

#### **Course Syllabi:**

This course is for five four and half months (summer and one semester) in VII or VIII Semester. The objective of this programme is to provide the students, an opportunity to work on live projects of corporate world in various fields. During this programme, they will work on real world applications of their curricula through organizational function of their choice. The students are expected to be involved directly in problem solving efforts of specific interest to the host organization. The learning of PS-I will help them in completing PS-II successfully. PS-II duration of internship is 4 - 4.5 months. PS -II Winter internship Dec to May.

| Course Title and Code: Public Health Engineering CE1201 |  |  |  |
|---|--|--|--|
| Hours per week  | L-T-P: 3-0-2                             |  |  |
| Credits   | 4  |  |  |
| Students who can take                                   | B.Tech Semester-V (Batch: 2017-2021)/ DE |  |  |

### **Course Objective:**

This course aims to develop critical thinking and engineering problem solving skills by exploring and proposing sustainable solutions for current water and waste water problems.

### On successful completion of this course students will be able to:

- CE1201.1 Identify current public health problems within a broader framework of sustainable development.
- CE1201.2 Use research tools and analytical methods to critically monitor and assess the water and wastewater management problems.
- CE1201.3 Develop treatment plant layout and analyse main physical, chemical and biological processes for water and wastewater treatment.
- CE1201.4 Design water treatment and wastewater treatment units to meet the drinking water and discharge/reuse standards.

| Prerequisites |  | Basic science and mathematical |  |
|---------------|--|--------------------------------|--|
|               | 1  | SKIIIS                         |  |
| Sr. No.       | Evaluation Component                     | Marks                          |  |
| 1.            | Attendance                               | NIL                            |  |
| 2.            | Assignment                               | 10                             |  |
| 3.            | Class Participation                      | 10                             |  |
| 4.            | Quiz                                     | 10                             |  |
| 5.            | Theory Exam-I                            | NIL                            |  |
| 6.            | Theory Exam-II                           | 10                             |  |
| 7.            | Theory Exam-III                          | 20                             |  |
| 8.            | Report-I                                 | NIL                            |  |
| 9.            | Report-II                                | NIL                            |  |
| 10.           | Report-III                               | NIL                            |  |
| 11.           | Project-I                                | 20                             |  |
| 12.           | Project-II                               | NIL                            |  |
| 13.           | Project-III                              | NIL                            |  |
| 14.           | Lab Evaluation-I (Continuous Evaluation) | 10                             |  |
| 15.           | Lab Evaluation-II (Lab Examination)      | 10                             |  |
| 16.           | Course Portfolio                         | NIL                            |  |
|               | Total                                    | 100                            |  |

### Course Syllabi (Theory):

**UNIT-1**: General requirement for sustainable water supply, Quality and quantity of water, Domestic water quality standards; Water analysis (CPCB, ISO, WHO standards).

**UNIT-2:** Physical, chemical and biological characteristics of water and their significance, water quality criteria, Process of treatment: mixing, aeration, sedimentation, coagulation, disinfection, softening.

**UNIT-3:** Distribution systems pump, pumping systems, distribution systems- analysis and distribution of network, layout of distribution system, methods of water supply, distribution reservoir, and capacity of reservoirs.

**UNIT-4:** Waste water treatment: sewage and effluent, sources of wastewater, classification of wastewater, characteristics and testing of sewage, composition, sampling, physical and chemical analysis. Waste water discharge standards.

**UNIT-5**: Waste treatment process: objectives, significance of treatment, and classification of treatment processes, Activated sludge process, wastewater treatment operations, screenings, skimming, sedimentation, biological treatment, aerobic and anaerobic treatment, Design of STP

# **Syllabus (Practical):**

- 1. Determination of PH of given in water /waste water sample
- 2. Determination of Alkalinity in water sample
- 3. To determine the Total Dissolved Solids of the given water/sewage sample
- 4. Determination of Hardness in water sample
- 5. Determination of CO<sub>2</sub> in water sample
- 6. Determination of turbidity of water supply system
- 7. Determination of chlorine demand and chloride residuals in water supply system
- 8. To determine Total Suspended Solids (TSS) of the given sewage sample.

9. To find out the Quantity of Dissolved Oxygen present in the given waste water /water sample

- 10. Determination of Biochemical Oxygen Demand exerted by given wastewater sample
- 11. To find out Chemical Oxygen Demand of the waste water

### **References:**

# Textbooks

- 1. Environmental engineering, HS Paevy, DR Rowe, G Tchobanoglous, McGraw Hill
- 2. Environmental engineering: Wastewater engineering, SK Garg, Khanna Publishers
- 3. Water supply and sanitation engineering, GS Birdie, JS Birdie, Galgotia Publishing Ltd.
- 4. Water Supply Engineering, Dr. B.C. Punmia Laxmi Publications Pvt. Ltd.
- 5. Water and wastewater engineering, Metcalf and Eddy, McGraw Hill

- 6. Standard Handbook of Environmental Engineering, by Robert A. Corbitt, McGraw-Hill Professional publication.
- 7. Industrial waste treatment by Nelson Leonard Nemarow

### E-books

- 1) Textbook Of Environmental Engineering by by P. Venugopala Rao
- 2) Environmental Engineering by D. Srinivasan.

#### Video Lectures

- 1) NPTEL >> Civil Engineering >> Water and Waste Water Engineering (Video) >>
- 2) https://www.youtube.com

### Websites (related to the course)

- 1) http://www.cpcb.nic.in/
- 2) http://www.rpcb.rajasthan.gov.in
- 3) http://www.bis.org.in/
- 4) http://www.who.int/en/
- 5) 3. http://www.moef.gov.in/
- 6) http://www.greentribunal.gov.in/

### BASIC COURSE IN ENTREPRENEURSHIP IM311 SEMESTER V (All Branches B.Tech.)

#### L-T-P: 3-0-0 COURSE CREDITS: 3 SESSION DURATION: 60 MINUTES

#### **1. COURSE DESCRIPTION**

This is an open course for all the II<sup>nd</sup> Year management students (BBA & B.Com) and III<sup>rd</sup> Year Engineering Students. It is one of the fastest growing subjects in colleges and Universities across the world. It has been identified as one of the major trends shaping business, economy and even society. This course is about creating, managing and leading an entrepreneurial organisation. It would enable students to start dreaming big, visualizing and working towards the realization of their dreams. The programme imparts essential knowledge of how to start one's own business venture and the various facets that influence successful set up and operations. The teaching/ learning of entrepreneurship require greater focus on experiential learning. Engagements such as interactive sessions, cases, games, exercise, role plays, films, projects, assignments, simulation and group activities play a vital role in teaching this course. This course is supported by Wadhwani Foundation and facilitated through Learnwise.

### 2. COURSE OBJECTIVES

To encourage students to nurture their entrepreneurial traits and think creatively to develop innovative ideas/products for commercial exploitation.

### 3. COURSE LEARNING OUTCOMES

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

- IM311.1 Identify problem worth solving through design thinking.
- IM311.2 Identify customer segment and niche for specific markets.
- IM311.3 Craft Value Preposition Canvas.
- IM311.4 Create business model using Lean Canvas Template
- IM311.5 Build 'A' team for new start-ups.
- IM311.6 Design and validate solution demo and MVP.
- IM311.7 Analyse cost, revenue, key channels and pricing model for the venture.

#### 4. TOPICS

- > Overview of Entrepreneur and Entrepreneurship
- Self-Discovery
- Opportunity Discovery
- Identify Customer and Craft Value Preposition
- Business Model
- > Validation
- Money (Revenue, Costs, Pricing and Financing)
- > Team Building
- Marketing and Sales
- Support (Business Regulation)
- > Project

# 5. EVALUATION COMPONENT

| Sr. No | Specifications           | Marks |
|--------|--------------------------|-------|
| 01     | Attendance               | Nil   |
| 02     | Assignment               | 20    |
| 03     | Class Participation      | Nil   |
| 04     | Quiz                     | 10    |
| 05     | Theory Exam              | Nil   |
| 06     | MID TERM -2, Theory Exam | Nil   |
| 07     | END TERM Theory Exam     | 30    |
| 08     | Report-1                 | 20    |
| 09     | Report-2                 | Nil   |
| 10     | Report-3                 | Nil   |
| 11     | Project -1               | 20    |
| 12     | Project -2               | Nil   |
| 13     | Project -3               | Nil   |
| 14     | Lab Evaluation           | Nil   |
| 15     | Lab Evaluation           | Nil   |
| 16     | Course portfolio         | Nil   |
|        | Total (100)              | 100   |

| Course Title and Code: Municipal and Urban Engineering CE1202  |  |  |  |
|--|--|--|--|
| Hours per Week L-T-P: 3-0-2  |  | L-T-P: 3-0-2   |  |
| Credits 4  |  | 4  |  |
| Students who can takeB. Tech all branches (Open Elective)  |  |  |  |
| Prerequ  | isites   | Basic science  |  |
| Course   | Objective:   |  |  |
| To deve  | elop understanding a   | bout the engineering related urban planning and  |  |
| managen  | nent especially focussi  | ng on transportation, water and waste management.  |  |
| On succe   | 02.1 Apply the various   | is course students will be able to:  |  |
| CE12<br>CE12   | 02.1 Apply the vario   | king of various transport systems in different   |  |
|  | scenarios.   |  |  |
| CE12   | 202.3 Plan a solid was   | te management system for a given urban area.   |  |
| CE12   | 202.4 Select appropria   | te SWM options in a specific local context.  |  |
| CE12<br>CE12   | 202.5 Characterize wa  | ter and wastewater effluents.  |  |
| CE12<br>CE12   | 202.0 Design water su  | process water wastewater treatment and sludge  |  |
| CLIZ   | handling.  | socoss when, wastewater treatment and studge   |  |
| Evaluati   | ion Scheme   |  |  |
| Sr. No   | Specifications   | Marks  |  |
| 1  | Attendance   | NIL  |  |
| 2  | Assignment (03)  | 15   |  |
|  | ~  | -  |  |
| 3  | Class Participation  | 10   |  |
| 3<br>4   | Class Participation<br>Quiz (02)   | 10 10  |  |
| 3<br>4<br>5  | Class Participation<br>Quiz (02)<br>Theory Exam-I  | 10<br>10<br>NIL  |  |
| 3<br>4<br>5<br>6   | Class Participation<br>Quiz (02)<br>Theory Exam-I<br>Theory Exam-II  | 10<br>10<br>NIL<br>NIL   |  |
| 3<br>4<br>5<br>6<br>7  | Class Participation<br>Quiz (02)<br>Theory Exam-I<br>Theory Exam-III<br>Theory Exam-III  | 10<br>10<br>NIL<br>NIL<br>25   |  |
| 3<br>4<br>5<br>6<br>7<br>8   | Class Participation<br>Quiz (02)<br>Theory Exam-I<br>Theory Exam-II<br>Theory Exam-III<br>Report-I   | 10<br>10<br>NIL<br>NIL<br>25<br>15   |  |
| 3<br>4<br>5<br>6<br>7<br>8<br>9  | Class Participation<br>Quiz (02)<br>Theory Exam-I<br>Theory Exam-II<br>Theory Exam-III<br>Report-I<br>Report-II  | 10<br>10<br>NIL<br>NIL<br>25<br>15<br>15   |  |
| 3<br>4<br>5<br>6<br>7<br>8<br>9<br>10  | Class Participation<br>Quiz (02)<br>Theory Exam-I<br>Theory Exam-II<br>Theory Exam-III<br>Report-I<br>Report-II<br>Report-III  | 10<br>10<br>NIL<br>NIL<br>25<br>15<br>15<br>NIL  |  |
| 3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11  | Class Participation<br>Quiz (02)<br>Theory Exam-I<br>Theory Exam-II<br>Theory Exam-III<br>Report-I<br>Report-II<br>Report-III<br>Project-I   | 10         10         NIL         NIL         25         15         15         NIL         NIL         NIL         15         NIL         NIL         NIL  |  |
| 3         4         5         6         7         8         9         10         11         12   | Class Participation<br>Quiz (02)<br>Theory Exam-I<br>Theory Exam-II<br>Theory Exam-III<br>Report-I<br>Report-II<br>Report-III<br>Project-I<br>Project-II   | 10       10       NIL       NIL       25       15       15       NIL       NIL       NIL   |  |
| 3         4         5         6         7         8         9         10         11         12         13  | Class Participation<br>Quiz (02)<br>Theory Exam-I<br>Theory Exam-II<br>Theory Exam-III<br>Report-I<br>Report-II<br>Report-III<br>Project-I<br>Project-III<br>Project-III   | 10       10       NIL       NIL       25       15       15       NIL       NIL       NIL       NIL       NIL       NIL   |  |
| $ \begin{array}{r} 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ \end{array} $  | Class Participation<br>Quiz (02)<br>Theory Exam-I<br>Theory Exam-II<br>Theory Exam-III<br>Report-I<br>Report-I<br>Report-II<br>Project-I<br>Project-II<br>Project-III<br>Lab Evaluation-I  | 10         10         NIL         NIL         25         15         15         NIL   |  |
| $ \begin{array}{r} 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ \end{array} $  | Class Participation<br>Quiz (02)<br>Theory Exam-I<br>Theory Exam-II<br>Theory Exam-III<br>Report-I<br>Report-II<br>Report-II<br>Project-II<br>Project-II<br>Project-III<br>Lab Evaluation-I<br>(Continuous Evaluation)   | 10       10       NIL       NIL       25       15       15       NIL       NIL       NIL       NIL       NIL       NIL       NIL       NIL   |  |
| $ \begin{array}{r} 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ \end{array} $  | Class Participation<br>Quiz (02)<br>Theory Exam-I<br>Theory Exam-II<br>Theory Exam-III<br>Report-I<br>Report-II<br>Report-III<br>Project-II<br>Project-II<br>Project-III<br>Lab Evaluation-I<br>(Continuous Evaluation-II)<br>Lab Evaluation-II (L                 | 10         10         NIL         NIL         25         15         15         NIL         NIL         NIL         NIL         NIL         NIL         NIL         NIL         NIL         10  |  |
| $     \begin{array}{r}       3 \\       4 \\       5 \\       6 \\       7 \\       8 \\       9 \\       10 \\       11 \\       12 \\       13 \\       14 \\       15 \\       14     $                             | Class Participation<br>Quiz (02)<br>Theory Exam-I<br>Theory Exam-II<br>Theory Exam-III<br>Report-I<br>Report-I<br>Report-II<br>Project-II<br>Project-II<br>Project-III<br>Lab Evaluation-I<br>(Continuous Evaluati<br>Lab Evaluation-II (L<br>Examination)         | 10       10       NIL       NIL       25       15       15       NIL       NIL       NIL       NIL       NIL       NIL       10  |  |
| $     \begin{array}{r}       3 \\       4 \\       5 \\       6 \\       7 \\       8 \\       9 \\       10 \\       11 \\       12 \\       13 \\       14 \\       15 \\       16 \\       16 \\       \hline     $ | Class Participation<br>Quiz (02)<br>Theory Exam-I<br>Theory Exam-II<br>Theory Exam-III<br>Report-I<br>Report-II<br>Report-III<br>Project-II<br>Project-III<br>Lab Evaluation-I<br>(Continuous Evaluati<br>Lab Evaluation-II (L<br>Examination)<br>Course Portfolio | 10           10           NIL           NIL           25           15           15           NIL           NIL |  |

| Evaluation Scheme for Retest |                 |       |  |
|------------------------------|-----------------|-------|--|
| Sr. No                       | Specifications  | Marks |  |
| 1                            | Theory Exam-III | 25    |  |

# Course Syllabi (Theory):

**Urban Traffic Planning & Management:** Modes of transportation, Characteristics of various modes, Socioeconomic effect of transportation, objectives of transport planning, urban traffic & transport problems, steps in urban transport planning process, traffic system management measures, pedestrian & cyclist management measures, Intelligent Transportation System (ITS) and its advantages, Use of ITS in India, alternative urban transportation systems such as BRT, Metro & mono rail.

**Water Supply Engineering:** General requirement for water supply, Quality and quantity of water, Domestic water quality standards; Water analysis (ISO, WHO standards), Sources of water and their yield, Water supply forecast, population forecast, variation in demand pattern, design period; pumping and transportation of water. Water treatment and distribution systems. Methods of water supply.

**Waste Water Treatment:** Waste water treatment, sewage and effluent, sources of wastewater, classification of wastewater, characteristics and testing of sewage, composition of waste water, sampling, significance of treatment, classification of treatment processes, wastewater treatment operations, screenings, skimming, sedimentation, biological treatment, CNG production at Sewage treatment Plants, Sludge treatment, Use of manure for sustainable agriculture.

**Solid Waste Management:** Generation and characterization of solid waste, challenges in waste collection, methods of solid waste disposal, energy recovery from solid wastes, 3 R (reduce, reuse, recycle) principal for sustainable development.

### **Syllabus (Practical)**

- 1) Determination of PH of given in water /waste water sample
- 2) Determination of Alkalinity in water sample.
- 3) To determine the Total Dissolved Solids of the given water/sewage sample
- 4) Determination of Hardness in water sample
- 5) Determination of turbidity of water supply system
- 6) Determination of chlorine demand and chloride residuals in water supply system
- 7) To determine Total Suspended Solids (TSS) of the given sewage sample.
- 8) To find out the Quantity of Dissolved Oxygen present in the given waste water /water sample
- 9) Determination of Biochemical Oxygen Demand (BOD) exerted by given wastewater sample.
- 10) Determination of Chemical Oxygen Demand (COD) exerted by given wastewater sample

# **Reference:**

### Books

- 1) Kadiyali L. R. Traffic Engineering and Transport Planning, Khanna Publishers, New Delhi, India, 1997.
- 2) Khanna, S. K. and C.E.G. Justo Highway Engineering Nem Chand and Bros, Roorkee, India, 2001.
- Ministry of Road Transport and Highways. Specifications for Road and Bridge Works,
- Papacostas C. S. and P D Prevedouros Transportation Engineering and Planning, Third Edition. Prentice Hall of India Pvt. Ltd, New Delhi, India, 2002.
- 5) Environmental engineering: Wastewater engineering, SK Garg, Khanna Publishers
- 6) Water supply and sanitation engineering, GS Birdie, JS Birdie, Galgotia Publishing Ltd.
- 7) Water Supply Engineering by Dr. B.C. Punmia, Laxmi Publications Pvt. Ltd
- 8) Environmental engineering, HS Paevy, DR Rowe, G Tchobanoglous, McGraw Hill

# MOOC Courses:

- NPTEL >> Civil Engineering >> Water and Waste Water Engineering (Video) >>
- 2) <u>https://nptel.ac.in/courses/120108005/</u>
- 3) <u>https://nptel.ac.in/courses/105/107/105107067/</u>
- 4) https://nptel.ac.in/courses/105/101/105101008/
- 5) https://nptel.ac.in/courses/120/108/120108005/
- 6) https://nptel.ac.in/courses/105/103/105103205/
- 7) <u>https://swayam.gov.in/nd1\_noc20\_ce23/preview</u>
- 8) <u>https://swayam.gov.in/nd1\_noc19\_ce32/preview</u>

# Websites (related to the course)

- 1) http://www.cpcb.nic.in/
- 2) http://www.rpcb.rajasthan.gov.in
- 3) http://www.bis.org.in/
- 4) http://www.who.int/en/
- 5) <u>http://www.moef.gov.in/</u>
- 6) <u>https://nhai.gov.in/</u>
- 7) <u>http://mohua.gov.in/</u>
- 8) <u>http://smartcities.gov.in/content/</u>

# Economics and Finance for Engineers Course Code: IL1203

### COURSE CREDITS: 4 SESSION DURATION: 60 MINUTES

### **COURSE DESCRIPTION:**

This course aims to develop the management and business perspective among the students and its interaction with technology. The course has been divided in two parts Economics and Finance. Economics is the study of the way people and societies use limited resources in decision making. The world economies are becoming increasing market oriented and has faced many financial crises in the last decades. Thus, understanding about the truths of economics has become even vital in the affairs of people and nations. This part helps the students in understanding the regular uptrend and downturn in the economy and enables them to do appropriate business decision. Finance is also considered as life blood of any organization. Understanding the basics behind financial decision making is necessary for any individual irrespective of his/her profession. Therefore, it is imperative for every individual to understand the basic financial terms and concepts to grasp the nuances of the financial world. This part offers more analytical input than the knowledge of accounting process and finance, which is just a means to achieve the major objective of developing analytical and interpretation skills.

### **COURSE OUTCOMES**

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

- IL1203.1 Apply the different concepts, theories of macroeconomic in understanding economic environment.
- IL1203.2 Outline the money market dynamics in economy and role in determination of interest rate.
- IL1203.3 Analyze and evaluate the basic problems of an economy which have been faced by the countries and policy makers over time like achieving high rate of growth, controlling inflation, preventing business cycles and solving problems of unemployment and poverty.
- IL1203.4 Explain the ripple impact of open economy.
- IL1203.5 Recognize elements of financial statements
- IL1203.6 Critically analyze financial statements for decision making and assess financial performance & position of organizations.
- IL1203.7 Evaluate viability of projects and proposals of capital nature.

# **TOPICS TO BE COVERED:**

# **Economics:**

In Introduction of Major Macro Economic Variables

Demand and Supply of Money

Business cycles

Inflation and unemployment

Monetary and Fiscal policy

Open Economy Macro Economics: Basic Concepts

**Case Studies** 

### **Finance:**

Building Blocks of Accounting & Finance

Financial Accounting: Reading and Interpretation of Financial Statements

**Basic Principles of Financial Valuations** 

Corporate Financing Decision- Appraisal of a Project (Investment Decision)

### **BOOKS FOR REFERENCE**

- Dwivedi, D. N. (2018). Macroeconomics: Theory and policy. New Delhi: Vikas Publishing House Pvt. Ltd.
- T. R. Jain (2017). Macroeconomics. New Delhi: V K Publications
- Edward Shapiro (2017). Macroeconomic Analysis. New Delhi: Galgotia Publications
- Batra, K.J. (2019). Accounting and Finance for Non-Finance Managers. Sage Publications.
- Chandra, P. (2017). Finance Sense: Finance for Non-Finance Executives. Mc-Graw Hill Education.
- Narayanaswamy, R. (2014). Financial Accounting A managerial perspective (6th edition) by PHI Learning Private Limited.
- Gupta, A. (2008). Financial Accounting for Management An Analytical Perspective (3<sup>rd</sup> edition) by Pearson Education.

# ASSESSMENT MATRIX

| S.No. | Specification       | Marks |
|-------|---------------------|-------|
| 1     | Attendance          | Nil   |
| 2     | Assignment          | Nil   |
| 3     | Class Participation | Nil   |
| 4     | Quiz                | 20    |
| 5     | Theory Exam-I       | Nil   |
| 6     | Theory Exam-II      | Nil   |
| 7     | Theory Exam-III     | 40    |
| 8     | Report-I            | Nil   |
| 9     | Report-II           | Nil   |
| 10    | Report-III          | Nil   |
| 11    | Project-I           | 40    |
| 12    | Project-II          | Nil   |
| 13    | Project-III         | Nil   |
| 14    | Lab Evaluation-I    | Nil   |
| 15    | Lab Evaluation-II   | Nil   |
| 16    | Course Portfolio    | Nil   |
|       | Total               | 100   |

The criteria for assess the learning outcomes of this course are as follows:

| Course Title and Code       |                                |
|-----------------------------|--------------------------------|
| Disaster Management: CE1206 |                                |
| Hours per Week              | L-T-P: 3-1-0                   |
| Credits                     | 4                              |
| Students who can take       | B. Tech Sem VI sem (2017-2021) |
|                             | (OE)                           |

**Course Objective:** This course aims to develop understanding of various natural and manmade disasters. Natural disasters include earthquake, Tsunami, Flood, forest fires and Land Slides. Manmade disasters include fire, Industrial Pollution, embankment failure, structural failure and due to electric supply. Topics includes the causes for these disasters and remedial measures which can minimize the losses to the life and property. The course also includes the identification and description of electric supply resilience and restoration.

#### **Course Outcomes**

#### On completion of the course, the student should be able to:

| CE1206.1 | Asses the types of disasters, causes and their impacts.                |    |
|----------|--|----|
| CE1206.2 | Assess vulnerability and various methods of risk reduction measures an | ıd |

- mitigation.
- CE1206.3 Draw the hazard and vulnerability profile of a given region.
- CE1206.4 Analyze a power grid collapse.
- CE1206.5 Plan and execute framework to black start and restoration procedure with considering security criteria and power system reliability.

| Prerequisites |                             |                         |                                       |
|---------------|-----------------------------|-------------------------|---------------------------------------|
| Teach         | ing Scheme (Hours per Week) | 302                     |                                       |
| Credit        | ts                          | 4                       |                                       |
| Sr.<br>No.    | Evaluation Component        | Marks<br>(Pre COVID 19) | Marks<br>(Post COVID 19<br>situation) |
| 1             | Attendance                  | Nil                     | Nil                                   |
| 2             | Assignment (5 Nos)          | 10                      | 15                                    |
| 3             | Class Participation         | Nil                     | Nil                                   |
| 4             | Quiz                        | Nil                     | 10 (1 Quiz)                           |
| 5             | Theory Exam-I               | 15                      | 15                                    |
| 6             | Theory Exam-II              | 15                      | Nil                                   |
| 7             | Theory Exam-III             | 30                      | 30                                    |
| 8             | Report-I/ Case Study        | 10                      | 10                                    |
| 9             | Report-II/Case Study        | 10                      | 10                                    |
| 10            | Report-III/Case Study       | 10                      | 10                                    |
| 11            | Project-I                   | Nil                     | Nil                                   |
| 12            | Project-II                  | Nil                     | Nil                                   |
| 13            | Project-III                 | Nil                     | Nil                                   |
| 14            | Lab Evaluation-I            | Nil                     | Nil                                   |
| 15            | Lab Evaluation-II           | Nil                     | Nil                                   |
| 16            | Course Portfolio            | Nil                     | Nil                                   |
|               | Total                       | 100                     | 100                                   |

| Evaluation scheme for retest |    |    |
|------------------------------|----|----|
| Theory Exam III              | 30 | 30 |

### Syllabus (Theory)

**Unit-1** Introduction to Disasters, Various types of disaster, Natural: Flood, Earthquake, cyclone, Land slide, Manmade: Fire, Industrial Pollution, embankment failure, structural failure and due to electric supply. Loss of resources.

### Unit-2

### **Risk and Vulnerability:**

Risk: Its concept and analysis, Risk reduction, Vulnerability: Its concept and analysis, strategic development for vulnerability reduction

### Unit 3

### Disaster Management in Power Utilities and Power grid collapse:

Sectoral impacts, System Impact of the Loss of Major Components, Vulnerability Program, Options to reduce impacts of disaster, Power system operation security, Security criteria, System security function, Power System Reliability, Black start and restoration Procedure, Black start facilities, Impact of Blackout in day to day life, Role of Utility staff, Speeding recovery

# Unit – 4

Management- Objectives, Processes, Events, analysis, base-line data, forecasting and Warnings. Disaster preparedness plan concept and nature, Emergency operation center and IT aids- physical environment, Applications. Public-private agency co-ordination- federal, state and local disaster response organization and network, Citizen and community role in disaster response and recovery.

#### Syllabus (Practical)

- 1. A Case study on flood Hazard
- 2. A case study on Tsunami Hazard
- 3. A case study on Earthquake
- 4. A case study on Forest fire
- 5. A case study on structural failure
- 6. A case study on grid challenges for Indian grid system on blackout plan (05 April 2020)
- 7. A case study on Indian blackout on July 30-31, 2012

#### **Text /Reference Books:**

- 1. M. Pandey, "Disaster Management" Wiley India Pvt. Ltd.
- 2. Tushar Bhattacharya, "Disaster Science and Management" McGraw Hill Education (India) Pvt. Ltd.
- 3. <u>Crisis and disaster management plan for power sector by central electricity authority of India</u>
- 4. N. Malla, S. Poudel, N. R. Karki and N. Gyawali, "Resilience of electrical power delivery system in response to natural disasters," 2017 7th International Conference on Power Systems (ICPS), Pune, 2017, pp. 806-811.doi: 10.1109 /ICPES.2017.8387400
- **5.** Sahni, Pardeep et. al. (Eds.)," Disaster Mitigation Experiences and Reflections", Prentice Hall of India, New Delhi.

| Course ande | Course Nome                    |   | Tea | aching <b>S</b> | Scheme  |
|-------------|--------------------------------|---|-----|-----------------|---------|
| Course code | Course Name                    |   | Т   | Р               | Credits |
| AS1203      | <b>Optimization Techniques</b> | 3 | 0   | 2               | 4       |

#### **Course Objectives:**

This course aims to give knowledge about algorithms and methods developed for solving various types of optimization problems that arise in engineering and industries.

In this course, each student will explore how to formulate mathematical models of optimization problems, and how to solve them effectively using various software.

### **Course Outcomes:**

On successful completion of this course, the students will be able to

- AS1203.1 formulate linear programming models with respect to industrial or societal issues such as production, transportation, job assignment, health care etc.
- AS1203.2 solve and analyze linear and non-linear programming problems using simplex method, MODI method, Hungarian method, Lagrange's method, etc.
- AS1203.3 find optimized solutions for industry and service sector related problems using queueing theory, game theory and sequencing theory.
- AS1203.4 solve optimization problems using various software support like Windows-based TORA, Excel spreadsheet templates and MATLAB.

### Syllabus (Theory):

**Unit – I: Introduction**: Introduction to Optimization and its scope, formulating a Mathematical Model, Deriving Solutions from the Model.

**Unit – II: Linear Programming Problems:** Revised Simplex Method, Duality Theory and Sensitivity Analysis, Dual Simplex Method, Transportation Problem, Assignment Problem.

### **Unit – III: Non-Linear Programming Problems**

Introduction, Single variable and Multi-variable Optimization, Constrained and Unconstrained Problems, Kuhn-Tucker conditions, Dynamic Programming.

#### Unit - IV: Queuing and Inventory Theory

Basic structure of Queuing models, Role of the exponential distribution, Birth and Death processes, Queuing models based on birth and death processes (M/M/1 Model).

### Unit – V: Game and Sequencing Theory:

Game Theory, Johnsons Algorithm for n Jobs and two Machines, n Jobs and three Machines, Two Jobs and m Machines Problems.

#### **Syllabus (Practical):**

Problem solving using various software packages for the following

- Linear Programming problems
- Non-linear Programming problems
- Case Study

#### **Evaluation Scheme:**

| Sr. No | Specifications         | Evaluation Scheme<br>(Pre-Covid) | Evaluation Scheme<br>(Post-Covid) |
|--------|------------------------|----------------------------------|-----------------------------------|
| 1      | Attendance             | -                                | -                                 |
| 2      | Assignment             | 5                                | 20                                |
| 3      | Class Participation    | 5                                | 10                                |
| 4      | Quiz                   | 20                               | 20                                |
| 5      | Theory Exam-1          | 10                               | 10                                |
| 6      | Theory Exam-2          | 10                               | -                                 |
| 7      | Theory Exam-3          | 30                               | 30                                |
| 8      | Report-1               | -                                | -                                 |
| 9      | Report-2               | -                                | -                                 |
| 10     | Report-3               | -                                | -                                 |
| 11     | Case Study - 1         | 10                               | -                                 |
| 12     | Case Study - 2         | -                                | -                                 |
| 13     | Project -3             | -                                | -                                 |
| 14     | Lab Evaluation-1       | 10                               | 10                                |
| 15     | Lab Evaluation-2       | -                                |                                   |
| 16     | Course portfolio       | -                                |                                   |
|        | Total (100)            | 100                              | 100                               |
| 17     | Retest - Theory Exam-3 | 30                               | 30                                |

#### **Text/Reference books:**

- 1. Hillier F.S. and Lieberman G.J., *Introduction to Operations Research: Concepts and Cases*, Tata McGraw Hill, 8th Ed., (Indian Adapted Edition), 2005.
- 2. Taha H. A, *Operations Research: An Introduction*, Prentice-Hall of India, 7th ed., 2003.
- 3. Ronald L. Rardin, *Optimization in Operations Research*. Pearson Education, First Indian Reprint 2002.
- 4. PantJ.C., *Introduction to Optimization: Operations Research*, Jain Brothers, 5th Ed., 2000.

| Cour<br>Code          | rse Title and Course      | Green E                                   | cnergy (ES1109)              |                              |  |
|-----------------------|---------------------------|---|------------------------------|------------------------------|--|
| Hour                  | rs per Week               | per Week LTP: 302                         |                              |                              |  |
| Cred                  | its                       | 4   |                              |                              |  |
| Stude                 | ents who can take         | vho can take <b>B. Tech (Semester-VI)</b> |                              |                              |  |
| C                     |                           |   |                              |                              |  |
| Coul                  | rse Objective:            |   |                              |                              |  |
| I ne i                | main objective of the cou | rse 1s:-                                  |                              |                              |  |
| I                     | 1. To expose the studen   | ts to diffe                               | rent energy sources, solar   | energy, solar photovoltaic,  |  |
| ~                     | DIOINASS, WING, SINAIL    | nyaro ana                                 | other renewable energy res   | ources                       |  |
| 4                     | 2. To develop understan   | aing of co                                | nversion technologies, pro-  | cesses, systems and devices  |  |
|                       | and equip the student     | to take up                                | projects in those areas.     |                              |  |
| Cou                   | rse Outcomes:             |   |                              |                              |  |
| On s                  | uccessful completion of t | his course,                               | the students should be able  | e to:                        |  |
| E                     | S1109.1 Identify suital   | ole renewa                                | ble source and technology    | for a given requirement      |  |
| E                     | S1109.2 Use interdisci    | plinary ap                                | proach for designing solar   | energy systems, predicting   |  |
|                       | performance               | with differ                               | ent systems                  |                              |  |
| E                     | S1109.3 Design sola       | r energy                                  | systems for making           | the process economical,      |  |
|                       | environmenta              | lly safe an                               | d sustainable.               |                              |  |
| ł                     | ES1109.4 Identify the m   | ajor source                               | es of biomass energy and ap  | ply the various technologies |  |
| _                     | to generate bi            | omass ene                                 | rgy.                         |                              |  |
| ł                     | ES1109.5 Assessing the    | hydro pov                                 | wer potential of a basin and | design the various types of  |  |
|                       | turbines to ge            | nerate hyd                                | ro power.                    |                              |  |
|                       | Prerequisites             |   | N                            | NIL                          |  |
| Sr.                   | Specifications            |   | Marks                        | Marks (Post COVID)           |  |
| INU                   |                           |   |                              |                              |  |
| 1                     | Attendance                |   | NIL                          |                              |  |
|                       |                           |   |                              | 10                           |  |
| 2                     | 2 Assignment              |   | NIL                          |                              |  |
| 2                     | 2 Class Dartisingtion NII |   |                              |                              |  |
| 3 Class Participation |                           | NIL                                       | 10                           |                              |  |
| 4 Ouiz                |                           | 10  | 10                           |                              |  |
| т<br>                 | XWILL                     |   | 10                           | 10                           |  |
| 5                     | Theory Exam-I             |   | 10                           | 10                           |  |
|                       |                           |   | 10                           |                              |  |
| 6                     | Theory Errore H           |   | 10                           |                              |  |

| 5  | Class I articipation | INIL  |    |
|----|----------------------|-------|----|
| 4  | 0.                   | 10    | 10 |
| 4  | Quiz                 | 10    | 10 |
| 5  | Theory Exem I        | 10    | 10 |
| 5  |                      | 10    |    |
| 6  | Theory Exam-II       | 10    |    |
|    |                      |       | 30 |
| 7  | Theory Exam-III      | 30    |    |
| 8  | Report I             | NII   |    |
| 0  | Keport-I             | NIL   |    |
| 9  | Report-II            | NIL   |    |
| 10 | Demonst III          | NUL   |    |
| 10 | Report-III           | NIL   | 20 |
| 11 | Project-I            | 30    | 30 |
|    | 2                    |       |    |
| 12 | Project-II           | NIL   |    |
|    |                      |       |    |
| 13 | Project-III          | NIL   |    |
| 14 | Lab Evaluation-I     | NIL   |    |
|    |                      | 1,111 |    |

| 15                           | Lab Evaluation-II   | 10  | 10  |
|------------------------------|---------------------|-----|-----|
| 16                           | Course Portfolio    | NIL |     |
| Total (100)                  |                     | 100 | 100 |
| Evaluation Scheme for Retest |                     | 3   | 0   |
| 1                            | Theory Exam Re-test | 30  |     |
|                              | <b>Total (30)</b>   | 30  |     |

#### UNIT-I Energy Sources and Sustainability

Energy chain and common forms of usable energy - Present energy scenario - World energy status - Energy scenario in India - Introduction to renewable energy resources – Sustainability, Triple bottom line, sustainable smart city.

### UNIT-II Biomass Energy Hours)

Biomass as energy resources; Bio energy potential and challenges-Classification and estimation of biomass; Source and characteristics of biofuels: Biodiesel, Bioethanol, Bio petrol, Biogas; Types of biomass energy conversion technologies; waste to energy conversions; Biomass resource development in India; Future of Biomass energy in India & Global Scene; Environmental benefits.

#### **UNIT-III Solar Energy**

Solar Energy, Solar cell, I-V characteristic, cell efficiency, Current status and Future potential of P.V. cells, Solar Thermal systems, Application of solar energy, Design and installation of solar panels for residential and industrial applications, solar power generation systems (a) off-grid systems (b) grid connected systems (c) power control and management systems, Energy Storage devices, Environmental impact, economics of solar energy systems.

#### UNIT-IV Hydro Power Energy Hours)

Hydro power energy, types of hydropower plants and schemes, runoff studies, assessment of hydropower potential of a basin, storage and pondage, load studies, elements of hydropower plants, types of power houses, low head turbines

#### **Textbooks:**

- 1. S. P. Sukhatme, J. K. Nayak, "Solar Energy" McGraw Hill Education, 2017
- 2. G. D. Rai, Non-conventional Sources of Energy, Khanna Publishers, Delhi, 2012.
- 3. D. P. Kothari, K. C. Singal, and Rakesh Ranjan, "Renewable Energy Sources and Emerging Technologies" PHI, 2011.
- 4. John Andrews, Nick Jelley (2013), Energy Science: Principles, technologies and impacts, Oxford Universities press.
- 5. 1- Renewable energy technologies: A practical guide for beginners by Chetan S Solanki; PHI ; ISBN: 978-81-203-3434-2

(10 Hours)

(10)

(10

- 6. 2- Renewable energy Engineering and Technologies: by VVN Kishore; Teri Press; ISBN:978-81-7993-221-6
- 7. Water Power Engineering, M.M. Dandekar& K.N. Sharma, Dhanpat Rai & Sons

#### **Reference Books:**

- 1. Fang Lin You, Hong ye (2012), Renewable Energy Systems, Advanced conversion technologies and applications, CRC Press.
- 2. John.A.Duffie, William A.Beckman (2013), Solar Engineering of Thermal processes, Wiley
- 3. A.R.Jha (2010), Wind Turbine technology, CRC Press.
- 4. Godfrey Boyle (2012), Renewable Energy, power for a sustainable future, Oxford University Press.
- 5. Recovering Energy from Waste Various Aspects Editors: Velma I. Grover and Vaneeta Grover, ISBN 978-1-57808-200-1; 2002

| Course Title and      | Machatronics and Polatics (II 1201) |  |
|-----------------------|-------------------------------------|--|
| Course Code           | Mechatronics and Robotics (1L1201)  |  |
| Hours per Week        | L T P: 3 0 2                        |  |
| Credits               | 4                                   |  |
| Students who can take | B. Tech Semester-VI                 |  |

### **Course Objective:**

To provide understanding of robots & manipulators in different fields of application, also to synthesis planar & spatial manipulator and its control strategy.

### **Course Outcomes:**

On successful completion of this course, the students will be able to:

IL1201.1 identify the use of robots and its application in industry and everyday life.

IL1201.2 analyze kinematic parameters for different robots.

IL1201.3 analyze dynamic parameters for robots and method to improve its performance including energy requirements.

IL1201.4 develop open and close loop control system for a manipulator.

IL1201.5 perform trajectory planning for a manipulator.

|           | Prerequisites                 | Basics of Physics |                   |            |
|-----------|-------------------------------|-------------------|-------------------|------------|
| Sr.<br>No | Specifications                | Marks             | Marks (I<br>COVII | Post<br>D) |
| 1         | Attendance                    |                   |                   |            |
| 2         | Assignment                    | 10                | 10                |            |
| 3         | Class Participation           |                   |                   |            |
| 4         | Quiz                          |                   | 10                |            |
| 5         | Theory Exam-I                 |                   | 10                |            |
| 6         | Theory Exam-II                |                   |                   |            |
| 7         | Theory Exam-III               | 30                | 30                |            |
| 8         | Report-I                      |                   | 20                |            |
| 9         | Report-II                     |                   |                   |            |
| 10        | Report-III                    |                   |                   |            |
| 11        | Project-I                     | 40                |                   |            |
| 12        | Project-II                    |                   |                   |            |
| 13        | Project-III                   |                   |                   |            |
| 14        | Lab Evaluation-I (Continuous) | 10                | 10                |            |
| 15        | Lab Evaluation-II (End Term)  | 10                | 10                |            |
| 16        | Course Portfolio              |                   |                   |            |
|           | Total (100)                   | 100               | 100               |            |
|           | Evaluation scheme for Retest  | Marks             |                   |            |
| 1         | Theory Exam-Retest            | 30                | 50                | 50         |
|           | Total                         | 30                | 50                | 50         |

**COURSE SYLLABUS (Theory):** 

# UNIT - I

#### Introduction:

Robotics trends and the future, robot anatomy – links, joints and joint notation scheme, Degrees of Freedom (DOF), required DOF in a manipulator, arm configuration, wrist configuration; end-effector, human arm characteristics, design & control issues, manipulation & Control, robotics sensors, robot specification, different robot programming platform.

### UNIT - II

### **Robot Motion Analysis:**

Introduction to co-ordinate frames mapping, mapping between rotated frames, mapping between translated frames, description of objects in space, transformation of vectors - rotation & translation of vectors, composite transformations, inverting a homogeneous transform, fundamental rotation matrices – principle axes rotation fixed, euler and equivalent angle axis representations.

#### **Kinematics Manipulators:**

The kinematic modeling of manipulator, direct kinematics, Denavit – Hartenberg notation, kinematic relationship between links, manipulator transformation matrix, the inverse kinematics manipulator: workspace, solvability of inverse kinematic model, singularities of manipulators.

### UNIT – III

### **Differential Motion, Statics:**

Linear and angular velocity of a rigid body, relationship between transformation matrix and angular velocity, mapping velocity vectors, velocity propagation along links. manipulator Jacobian, Jacobian inverse, Jacobian singularities, static analysis. Jacobian in statics.

#### **Dynamics:**

Introduction, Lagrangian mechanics, Lagrange – Euler formulation, velocity of a point on the manipulator, the inertia tensor, the kinetic energy, the potential energy. equations of motions, the Lagrangian-Euler (LE) dynamic model algorithm.

### $\mathbf{UNIT} - \mathbf{IV}$

#### **Robot Control:**

Open loop, close loop system, and differential equation, control of movements of mechanical joints, control sequence, n-joints manipulator control system, system performance, control system with damping, control strategy, architecture of control systems.

### $\mathbf{UNIT} - \mathbf{V}$

#### **Trajectory Planning**

Definition and planning tasks, joint space techniques, cartesian space techniques, joint space versus cartesian space tp.

## Machine Vision:

Introduction to machine vision, industrial application of vision controlled robotic systems, image processing and analysis, description of other components of vision system.

#### **COURSE SYLLABUS (Practical):**

- 1. To determine the forward kinematic of a 1-DOF robot using RoboAnalyzer
- 2. To determine the forward kinematic of a 3-DOF robot using RoboAnalyzer
- 3. To determine the forward kinematic of a 6-DOF robot using RoboAnalyzer
- 4. To determine the inverse kinematic of a 1-DOF robot using RoboAnalyzer
- 5. To determine the inverse kinematic of a 3-DOF robot using RoboAnalyzer
- 6. To determine the forward dynamic of a 3-DOF robot using RoboAnalyzer
- 7. To determine the inverse dynamics of a 3-DOF robot using RoboAnalyzer
- 8. To determine the trajectory control of a 3-DOF robot using RoboAnalyzer
- 9. To determine the trajectory control of a 6-DOF robot using RoboAnalyzer

- 10. To write a MATLAB program to interface camera for data acquisition.
- 11. To write a MATLAB program to determine pattern in an image.

### **Textbooks:**

- 1. Saha, Subir Kumar. Introduction to robotics. Tata McGraw-Hill Education, 2014.
- 2. Mittal, R. K., and I. J. Nagrath. Robotics and control. Tata McGraw-Hill, 2003.
- 3. Fu, King Sun, Ralph Gonzalez, and CS George Lee. Robotics: Control Sensing. Vis. Tata McGraw-Hill Education, 1987.
- 4. Waldron, Kenneth J., Gary L. Kinzel, and Sunil K. Agrawal. Kinematics, dynamics, and design of machinery. John Wiley & Sons, 2016.
- 5. Groover, Mikell P., Mitchell Weiss, and Roger N. Nagel. Industrial robotics: technology, programming and application. McGraw-Hill Higher Education, 1986.
- 6. Schilling, Robert J. Fundamentals of robotics: analysis and control. Vol. 629. New Jersey:

Prentice Hall, 1990.

| Course Title e   | nd Coder Duilding Dianning & Design  | CE1205                                  |  |
|--|--|---|--|
| Course The and Coue: Building Planning & Design CE1205 |  |   |  |
| TT 337   | 1  |   |  |
| Hours per Wee  | K  | L-1-P: 3-0-2                            |  |
| Credits  |  | 4                                       |  |
| Students who c   | an take  | B.Tech Semester-VI (Batch: 2017-        |  |
|  |  | 2021)                                   |  |
| <b>Course Object</b>                                   | tive: This course aim to develop underst                                     | anding of the fundamental principle and |  |
| concepts of bu   | uilding planning & drawing as per bu   | uilding by-laws and standard national   |  |
| building code  |  |   |  |
| ounding code.  |  |   |  |
| On successful  | completion of this course students wi  | ll be able to:                          |  |
| CE1205.1   | Interpret conventional sign, symbols and working drawings of buildings.      |   |  |
| CE1205.2   | Prepare line plans of residential, commercial and public buildings using     |   |  |
|  | principle of planning.   |   |  |
|  |  |   |  |
| CE1205.3   | Plan and design earthquake resistant buildings. Comply with the building by- |   |  |
|  | laws as per provision of local bodies and NBC technical specification.       |   |  |
| Prerequisites  | NA   |   |  |
|  |  |   |  |

#### Syllabus (Theory)

**Unit 1:** Introduction to buildings, Type of buildings, Principles of building planning, Principles of architecture composition building by–laws as per National Building Code, Standards for residential buildings, Building by–laws of local authority, standards for industrial, public, commercial and institutional buildings.

**Unit 2:** Planning of earthquake resistant building considering symmetry, simplicity, continuity, consideration of locating staircase and overhead water tank, most sensitive to earthquake.

**Unit 3:** Introduction of Building Services like water supply, sewerage and drainage systems, sanitary fittings and fixtures, plumbing systems, principles of internal & external drainage systems, principles of electrification of buildings, intelligent buildings, elevators & escalators their standards and uses ,air-conditioning systems, firefighting systems, building safety and security systems, ventilation and lightening and staircases, fire safety, thermal insulation

**Unit 4:** Perspective Drawing and Town Planning-Elements of perspective drawing involving simple problems, one point and two-point perspectives, energy efficient buildings. Concepts of master plan, structure plan, detailed town planning scheme and action plan, estimating future needs planning standards for different land use, allocation for commerce, industries, public amenities, open areas etc., planning standards for density distributions, density zones, planning standards for traffic network, standard of roads and paths, provision for urban growth, growth models, plan implementation, town planning legislation and municipal acts.

| Course code                |                             |                         | Course Title                  |   |                |                             | Teaching Scheme         |                            |   |                 |   |                |
|----------------------------|-----------------------------|-------------------------|-------------------------------|---|----------------|-----------------------------|-------------------------|----------------------------|---|-----------------|---|----------------|
| Co                         | urse cou                    | e                       | Course The                    |   |                |                             | L                       | Т                          | Р | S               | Credits                                       |                |
| CE732                      |                             |                         | Ground Improvement Techniques |   |                |                             | 3                       | 0                          | 2 | 0               | 4   |                |
| Evaluation Scheme (Theory) |                             |                         |                               |   | Eva            | aluation Scheme (Practical) |                         |                            |   |                 |   |                |
| Mid<br>Term<br>Test -<br>I | Mid<br>Term<br>Test -<br>II | End<br>Ter<br>m<br>Test | Class<br>Participatio<br>n    | Additiona<br>l<br>Continuo<br>us<br>Evaluatio<br>n* | Total<br>Marks | Mid<br>Term<br>Test -<br>I  | End<br>Ter<br>m<br>Test | Class<br>Participatio<br>n |   | Ad<br>Co<br>Eva | dition<br>al<br>ntinuo<br>us<br>aluatio<br>n* | Total<br>Marks |
|                            |                             |                         |                               |   |                |                             |                         |                            |   |                 |   |                |

\*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

### Syllabus (Theory)

**Introduction:** Need for Ground Improvement, Different types of problematic soils, Emerging trends in ground Improvement, Shallow and deep compaction requirements, Principles and methods of soil compaction.

**Mechanical Stabilization:** Shallow compaction and methods, Properties of compacted soil and compaction control, Deep compaction and Vibratory methods, Dynamic compaction.

**Hydraulic Modification:** Ground Improvement by drainage, Dewatering methods, Design of dewatering systems, Preloading, Vertical drains, vacuum consolidation, Electro-kinetic dewatering, design and construction methods.

**Modification by Admixtures:** Cement stabilization and cement columns, Lime stabilization and lime columns, Stabilization using bitumen and emulsions, Stabilization using industrial wastes. Construction techniques and applications.

**Grouting:** Permeation grouting, compaction grouting, jet grouting, different varieties of grout materials, grouting under difficult conditions.

**In Situ Soil Treatment Methods:** Soil nailing, rock anchoring, micro-piles, design methods, construction techniques, Case studies of ground improvement projects.

Indian Standard Codes for Ground Improvement Technology (IS 13904, IS 5284, etc.) Ground Improvement Technologies for a Sustainable World Textbooks:

- 1. Koerner R.M., "Construction and Geotechnical Methods in Foundation Engineering", McGraw-Hill, 1994.
- 2. Purushothama Raj, P. "Ground Improvement Techniques", Tata McGraw-Hill Publishing Company, New Delhi, 1995

### **Reference Books**

- 1. Moseley M.P., Ground Improvement Blockie Academic and Professional, Chapman and Hall, Glassgow, 1993.
- 2. Jones J.E.P., Earth Reinforcement and Soil Structure, Butterworths, 1995.
- 3. Koerner, R.M., "Design with Geosynthetics", (3rd Edition) Prentice Hall, New Jersey, 2002

- 4. Jewell, R.A., "Soil Reinforcement with Geotextiles", CIRIA special publication, London, 1996
- 5. Das, B.M., "Principles of Foundation Engineering", Thomson Books / Cole, 2003.

| Course Title and Course Code | Advanced Foundation Engineering,<br>CE1210 |
|------------------------------|--|
| Hours per week               | L T P: 3 0 2                               |
| Credits                      | 4  |
| Students who can take        | B.Tech, Semester-VII (Batch: 2017-2021)    |
| Prerequisites                | <b>Basics of Geotechnical Engineering</b>  |

### **Course Objective:**

To introduce students to the fundamental concepts of soil exploration techniques, slope stability analyses, lateral earth pressure theories and bearing capacities of shallow and deep foundations.

# **Course Outcomes:**

On successful completion of this course, the students should be able to:

- CE1210.1 apply appropriate soil exploration technique necessary for site investigation.
- CE1210.2 evaluate lateral earth pressure by applying several earth pressure theories for cohesionless and cohesive soils.
- CE1210.3 analyze and determine the nature of slope based on slope stability analyses.
- CE1210.4 evaluate the bearing capacity of soil and adopt appropriate foundation type for sandy and clayey soils.

| Sr.<br>No | Specifications  | Marks |
|-----------|---|-------|
| 1.        | Attendance  | -     |
| 2.        | Assignment (5 Nos.)                                     | 20    |
| 3.        | Class Participation                                     | 5     |
| 4.        | Quiz (5 Nos.)   | 15    |
| 5.        | Theory Exam-I   | -     |
| 6.        | Theory Exam-II  | 15    |
| 7.        | Theory Exam-III   | 25    |
| 8.        | Report-I  | -     |
| 9.        | Report-II   | -     |
| 10.       | Report-III  | -     |
| 11.       | Project-I (Based on the application of Lab Experiments) | 10    |
| 12.       | Project-II  | -     |
| 13.       | Project-III   | -     |
| 14.       | Lab Evaluation-I  | -     |
| 15.       | Lab Evaluation-II                                       | 10    |
| 16.       | Course Portfolio  | -     |
|           | Total   | 100   |

### **Retest:**

| Sr.<br>No | Specifications  | Marks |
|-----------|-----------------|-------|
| 1.        | Theory Exam-III | 25    |

#### Syllabus (Theory):

- **Unit I** Soil exploration: Purpose and planning, boring methods, soil sampling, observation of ground water tables, standard penetration tests, cone penetration tests, coring of rocks, geophysical exploration.
- Unit II Slope stability analysis: Infinite and finite slopes, earth and rockfill dams, filter

criteria.

- Unit III Lateral earth pressure: Introduction, earth pressure at rest, active and passive earth pressures, Rankine's and Coulomb's theories, graphic solution for Coulomb's active earth pressure, cantilever and anchored sheet pile walls, braced cuts.
- **Unit IV** Shallow foundations: Bearing capacity: general concepts, Terzaghi's theory, effect of groundwater table, the general bearing capacity equation, eccentrically loaded foundations, plate load tests, foundation settlements.
- Unit V Deep foundations: Piles, types, bearing capacity of single pile and pile groups, pile load tests, settlement of piles, negative skin friction; Shaft and caisson foundations. Foundations on expansive soils; Elements of machine foundations; Laterally loaded piles-Cantilever method.

### Laboratory Experiments:

| Sl. | List of Experiments                           |
|-----|---|
| No. |   |
| 1.  | Permeability Test, Variable and Constant head |
| 2.  | Direct Shear Test                             |
| 3.  | Triaxial Test                                 |
| 4.  | Vane Shear Test                               |
| 5.  | Standard Penetration Test                     |
| 6.  | Cone Penetration Test                         |
| 7.  | Consolidation Test                            |

# **References:**

- 9. Arora, K. R. (1992). Soil Mechanics and Foundation Engineering in SI Units. Standard Publishers Distributors.
- 10. Coduto, D. P. (1999). *Geotechnical Engineering: Principles and Practices*, Pearson.
- 11. Lambe, T. W., & Whitman, R. V. (2008). *Soil mechanics SI version*. John Wiley & Sons.

- 12. Murthy, V. N. S. (2002). *Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering*. CRC press.
- 13. Punmia, B., & Jain, A. K. (2005). *Soil Mechanics and Foundations*. Firewall Media.
- 14. Ranjan, G., & Rao, A. S. R. (2007). *Basic and Applied Soil Mechanics*. New Age International.
- 15. Singh, A., & Chowdhary, G. R. (1967). *Soil Engineering in Theory and Practice*. Asia Publishing House.
- 16. Venkatramaiah, C. (1995). *Geotechnical Engineering*. New Age International.

### **Online Resources:**

- 1. https://nptel.ac.in/courses/105/108/105108069/
- 2. https://nptel.ac.in/courses/105/105/105105039/

## Virtual Lab:

1. http://smfe-iiith.vlabs.ac.in/

| Course code                |                             |          | Course Title   |                |                         | Teaching Scheme     |                                      |  |                           |               |  |  |
|----------------------------|-----------------------------|----------|--|----------------|-------------------------|---------------------|--------------------------------------|--|---------------------------|---------------|--|--|
|                            |                             |          | Course Title   |                |                         |                     | Т                                    | Р  | S                         | Credits       |  |  |
| C                          | CE1111                      |          | Earthquake   | 3              | 1                       | 0                   | 0                                    | 4  |                           |               |  |  |
|                            | Eval                        | uation S | n Scheme (Theory)  |                |                         |                     | <b>Evaluation Scheme (Practical)</b> |  |                           |               |  |  |
| Mid<br>Term<br>Test<br>– I | Mid<br>Term<br>Test<br>- II |          | Class<br>Participation<br>/<br>Additional<br>Continuous<br>Evaluation* | Total<br>Marks | Mid<br>Term<br>Test - I | End<br>Term<br>Test | Par<br>Ac<br>Co<br>Eva               | Class<br>ticipa<br>/<br>ldition<br>ntinu<br>aluati | tion<br>nal<br>ous<br>on* | Total Marks** |  |  |
|                            |                             |          |  |                |                         |                     |                                      |  |                           |               |  |  |

\*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

### Course Syllabi (Theory):

**Elements of Seismology** – General effects of an earthquake, terminology, structure of earth, causes of an earthquake, plate tectonic theory, seismic waves, magnitude and intensity, methods of measurement, energy released, seismograph, strong motion earthquakes, accelerogram, soil liquefaction, prominent earthquakes of India.

**Free vibrations of single degree-of-freedom systems** – Dynamic loads and dynamic analysis, degrees of freedom, Undamped free vibrations, multiple elastic forces, viscously damped vibrations, equations of motion and solution, logarithmic decrement.

**Forced vibrations of single degree-of-freedom systems** – Forced vibrations (harmonic loading) of single degree of freedom systems. Undamped and viscously damped vibrations, equations of motion and solution, Force transmitted to foundation, transmissibility, response to harmonic support excitations.

**Response spectrum theory**: Response to general dynamic loading, Duhamel's integral, rectangular and triangular loading, Earthquake response spectrum, tripartite spectrum, construction of design response spectrum, effect of foundation and structural damping on design spectrum.

**Principles of earthquake resistant design** – Sustainable design aspect in earthquake resistance buildings, Planning aspects, symmetry, simplicity, regularity. Resistance of structural elements and structures for dynamic load, design criteria, strength and deflection.

**Evaluations of Seismic Forces** – Philosophy of earthquake resistant design, Provisions of IS 1893, Soft storey, Design spectrum of IS 1893, evaluation of lateral loads due to earthquake on multistory buildings.

**Ductile detailing of RCC members-** Concept of ductility, different ways of measuring ductility, factors affecting ductility, energy absorption, provisions of IS 13920.

**SDOF Systems Subjected to General Dynamic Loading:** Duhamel's integral, Application to simple loading cases, numerical evaluation of response integral, Piece wise exact method, Newmark's-Beta method.

**Free Vibration Analysis of MDOF systems** – **I:** MDOF systems, selection of DOFs, formulation of equations of motion, Stiffness matrices, Static condensation, Free Vibration as Eigen Value problem, Frequencies and Mode Shapes, Determination of natural frequencies and mode shapes by Stodola- Vianello method, Orthogonality conditions.

## **Textbooks:**

- 1. Dynamics of Structures –A.K. Chopra
- 2. Structural Dynamics Mario Paz CBS Publication
- 3. Earthquake Resistant Structures –D.J. Dowrick John Wiely Publication
- 4. Dynamics of Structures R. M. Clough and Penzian, McGraw Hill co.New Delhi
- 5. Mechanical Vibrations G. R. Grover Roorkee University, Roorkee
- 6. Analysis and Design of Foundations for Vibrations P. J. Moove. Oxford and I. B. H. Publication, Delhi

#### **Reference Books:**

- 1. Foundation Design Manual N. V. Nayak, Dhanpatrai and sons, Delhi
- 2. Manual of Earthquake Resistant Non Engineering Construction, University of Roorkee
- 3. Elements of Earthquake Engineering Jai Krishna, South Asian Pub.New Delhi
- 4. Earthquake Resistant, Design of Masonry and Timber Structures A.S. Arya
| Course code                            |                             | Com                 | Course Title  |                               | Teaching Scheme            |                     |                             |                           |                             |         |                       |
|--|-----------------------------|---------------------|---|-------------------------------|----------------------------|---------------------|-----------------------------|---------------------------|-----------------------------|---------|-----------------------|
|  |                             | Cour                | Course Title  |                               |                            | L                   | Т                           | Р                         | S                           | Credits |                       |
| CE510 Hydrology and Water Resources En |                             |                     | Enginee   | ring                          | 3                          | 1                   | 0                           | 0                         | 4                           |         |                       |
| Evaluation Scheme (Theory) Eva         |                             |                     | Evalua  | Evaluation Scheme (Practical) |                            |                     |                             |                           |                             |         |                       |
| Mid<br>Term<br>Test -<br>I             | Mid<br>Term<br>Test -<br>II | End<br>Term<br>Test | Class<br>Participation /<br>Additional<br>Continuous<br>Evaluation* | Total<br>Marks                | Mid<br>Term<br>Test -<br>I | End<br>Term<br>Test | Cla<br>/<br>Ad<br>Co<br>Eva | dition<br>ntinu<br>aluati | articij<br>al<br>ous<br>on* | patio   | n<br>Total<br>Marks** |
|  |                             |                     |   |                               |                            |                     |                             |                           |                             |         |                       |

\*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

\*\*The ratio of weightage between Theory and Practical content will be 60%: 40%

## Course Syllabi (Theory):

Hydrologic cycle - rainfall and its measurement - computation of mean rainfall over a catchment area using arithmetic mean, Theissen polygon and Isohyetal methods - Runoff -infiltration indices - Storm Hydrograph and unit hydrograph River regions and their characteristics - classification of rivers on alluvial plains - meandering of rivers – Design of river training works with IS codes. Sustainability of Water Resources: Consumptive use of surface Water and Ground Water, Importance of Water Harvesting, Water recycling

Reservoir planning - Investigations - zones of storage in a reservoir - single purpose and multipurpose reservoir - determination of storage capacity and yield - reservoir sedimentation - Reservoir life - Sediment prevention - Flood estimation- Flood forecasting - Flood routing.

Ground water - types of aquifers - storage coefficient - coefficient of transmissibility - steady radial flow into a well located in an unconfined and confined aquifer - Tube wells and Open wells. Yield from an open well. Water logging - causes and effects of water logging - remedial measures - land reclamation - land drainage - benefits - classification of drains - surface drains - subsurface drains - design principles and maintenance of drainage systems.

#### Textbook(s)/ Reference Book(s)

- 1. Punmia, B.C., Irrigation and Water Power Engineering, Standard Publishers, 2001.
- 2. Ragunath. H.M., Hydrology, Willey Eastern Limited, New Delhi, 2000.
- 3. Subramanya, Engineering Hydrology, Tata-McGraw Hill, 2004.

#### **Reference:**

1. Ven Te Chaw, Maidment – Applied Hydrology, Tata Mc Graw Hill Publisher, 2001.

| Course Title and Code                          |                             |  |  |  |
|--|-----------------------------|--|--|--|
| <b>Railway and Airport Engineering:</b> CE1209 |                             |  |  |  |
| Hours per Week                                 | L-T-P: 3-1-0                |  |  |  |
| Credits  | 4                           |  |  |  |
| Students who can take                          | B. Tech VII sem (2017-2021) |  |  |  |
|  | (CE)                        |  |  |  |

**Course Objective:** This course aims to develop understanding of civil works related to two major modes of transportation, railways and airways. Railway Engineering involves the planning, design, construction, operation and maintenance of railway lines. Airport engineering involves the design and construction of various facilities of an airport which are necessary for efficient working of the airways.

#### **Course Outcomes:**

#### On completion of the course, the student should be able to:

- CE1209.1 Design the cross sections for railway track.
- CE1209.2 Analyze the impact of hauling capacity and speed on the design of track.
- CE1209.3 Design the points, crossings and signals for railway tracks.
- CE1209.4 Design the various components of Airports.

#### **Evaluation Scheme:**

| Sr. No. | Evaluation Component         | Marks |
|---------|------------------------------|-------|
| 1       | Attendance                   | Nil   |
| 2       | Assignment (5 No.)           | 20    |
| 3       | Class Participation          | 5     |
| 4       | Quiz (2)                     | 10    |
| 5       | Theory Exam-I                | Nil   |
| 6       | Theory Exam-II               | 20    |
| 7       | Theory Exam-III              | 30    |
| 8       | Report-I                     | 5     |
| 9       | Report-II                    | Nil   |
| 10      | Report-III                   | Nil   |
| 11      | Project-I                    | 10    |
| 12      | Project-II                   | Nil   |
| 13      | Project-III                  | Nil   |
| 14      | Lab Evaluation-I             | Nil   |
| 15      | Lab Evaluation-II            | Nil   |
| 16      | Course Portfolio             | Nil   |
|         | Total (100)                  |       |
|         | Evaluation scheme for retest |       |
|         | Theory Exam III              | 30    |

## Syllabus (Theory)

## **RAILWAY ENGINEERING**

**INTRODUCTION:** Role of railways in transportation, Indian Railways, Gauges and types, Typical cross sections-single and double line B G track in cutting, embankment and electrified tracks, Coning of wheels and tilting of rails, Rails-Functions-requirements—types and sections length- defects-wear-creep-welding-joints, creep of rails

**SLEEPERS AND BALLAST**: Functions, Types, Track fitting and fasteners-Dog spike, screw spike and Pandrol clip,-Fish plates-bearing plates, Calculation of quantity of materials required for laying a track-Examples, Tractate resistances and hauling capacity

**GEOMETRIC DESIGN**: Necessity, Safe speed on curves, Cant-cant deficiency-negative cantsafe speed based on various criteria, (both for normal and high speed tracks) Transition curve, Gradient and types, grade compensation, Examples on above.

**POINTS AND CROSSING**: Components of a turnout, Details of Points and Crossing, Design of turnouts with examples (No derivations) types of switches, crossings, track junctions Stations and Types, Types of yards, Signalling-Objects and types of signals, station and yard Equipment-Turn table, Fouling mark, buffer stop, level crossing, track defects, and maintenance.

## AIRPORT ENGINEERING

**INTRODUCTION:** Layout of an airport with component parts and functions, Site selection for airport, Aircraft characteristics affecting the design and planning of airport, Airport classification, Runway orientation using wind rose with examples.

**RUNWAY-** Basic runway length-Corrections and examples, Runway geometrics, Taxiway-Factors affecting the layout - geometrics of taxiway-Design of exit taxiway with examples, Visual aids- Airport marking – lighting-Instrumental Landing System.

## **Text /Reference Books:**

- 5. Saxena S. C. and Arora S. P., A text book of Railway Engineering, Dhanpat Rai & Sons, New Delhi, 2017
- 6. Mundrey J S., Railway Track Engineering, McGraw Hill Publications
- 7. Agarwal M. M., Indian Railway Track, Jaico Publications, Bombay
- 8. Saxena S. C. Airport Engineering Planning and Design, CBS Publishers and Distributors, New Delhi, 2017
- 9. Khanna S. K., Arora M. G. and Jain S. S. Airport Planning and Design, Nem Chand Bros, Roorkee, 2016

## **Online Resources:**

NPTEL course Transportation Engineering-II

https://nptel.ac.in/courses/105/107/105107123/#

| Course Title and Code: Advanced Highway Engineering CE1211 |  |  |  |  |
|--|--|--|--|--|
| Hours per Week   | L-T-P: 3-0-2                             |  |  |  |
| Credits  | 4  |  |  |  |
| Prerequisite   | Highway Engineering                      |  |  |  |
| Students who can take                                      | B.Tech Semester-VII (Batch: 2017-21)/ DE |  |  |  |

## **Course Objective:**

This course aims to develop understanding about statistical analysis of traffic data & their application in traffic management and design of sustainable bituminous mixes. It also includes various measures to control noise and air pollution due to road traffic.

## **Course Outcomes**:

## On successful completion of this course, students will be able to:

- CE1211.1 analyze traffic data by using various statistical methods.
- CE1211.2 design traffic signals and rotaries.
- CE1211.3 design hot mix asphalt as per IRC standards.
- CE1211.4 utilize waste materials such as recycled asphalt pavement, plastic waste and various slags for the construction of sustainable bituminous roads.

CE1211.5 categorize the levels of air and noise pollution generated by the road

traffic.

| Evaluatio | on Scheme                                |       |
|-----------|--|-------|
| Sr. No.   | Evaluation Component                     | Marks |
| 1         | Attendance                               | NIL   |
| 2         | Assignment (02 Nos)                      | 10    |
| 3         | Class Participation                      | 10    |
| 4         | Quiz (02 Nos)                            | 10    |
| 5         | Theory Exam-I                            | NIL   |
| 6         | Theory Exam-II                           | 15    |
| 7         | Theory Exam-III (End term)               | 25    |
| 8         | Report-I                                 | NIL   |
| 9         | Report-II                                | NIL   |
| 10        | Report-III                               | NIL   |
| 11        | Project-I                                | 10    |
| 12        | Project-II                               | NIL   |
| 13        | Project-III                              | NIL   |
| 14        | Lab Evaluation-I (Continuous Evaluation) | 10    |
| 15        | Lab Evaluation-II (End term)             | NIL   |
| 16        | Course Portfolio (Coursera Course:       | 10    |
|           | Mastering bitumen for better roads and   |       |
|           | innovative applications)                 |       |
|           | Total (100)                              | 100   |

Retest scheme: Theory Exam-III

## Course Syllabi (Theory):

- 1. Statistical Methods for Traffic Engineering: Elementary concepts of probability, mean, standard deviation and variance, Binomial, Poisson & Normal distribution, sampling theory and significance testing, Linear Regression and correlation.
- Traffic Control Devices: Traffic signs-classifications & general specifications, Signals-advantages and warrants of traffic signals; design of signals, Road markings: objects & classification. Road Intersections: Classifications and importance; design of rotary intersection. Road safety audit.
- Hot Mix Asphalt: Objectives of mix design, gradation and blending of aggregates, volumetric properties of compacted specimens, analysis of compacted asphalt mix, Various methods of mix design, Marshall method of mix design.
- 4. Types of bituminous mixes based on gradation: Dense graded; semi-dense graded; open graded and gap graded. Different types of bituminous mixes used in India as per MoRTH specifications. Sustainable highway construction materials such as Recycled Asphalt Pavements (RAP), plastic waste, steel slag, iron slag and copper slag as per IRC recommendations.
- 5. Asphalt pavement distresses: Identification, causes and treatments. Traffic and Environment: Detrimental effects of traffic noise, generation of noise by road traffic, techniques for control of traffic noise. Major air pollutants, air quality standards, measures for controlling air pollution.

## **Syllabus (Practical)**

- 1. Proportioning of aggregates to achieve desired gradation for various mixes
- 2. Marshall method for design of bituminous mixes
- 3. Case study of road safety audit.
- 4. Design of rotary intersection
- 5. Case study of distress analysis of bituminous pavement
- 6. Case study to measure air and noise pollution at intersection

## Text & References books:

- 1. Bituminous Road Construction in India by Prithvi Singh Kandhal, PHI Learning Pvt. Ltd., 2016.
- 2. Highway Engineering by S K Khanna, CEG Justo & Veeraragavan, Nem Chand Bros, Roorkee, 2014.

- 3. Traffic Engineering & Transport Planning by L R Kadiyali, Khanna Publishers, New Delhi.
- 4. Specifications for Road and Bridge Works, Ministry of Surface Transport & Highways, IRC, New Delhi (5<sup>th</sup> revision)
- 5. IRC codes

## **Online References:**

- 1. https://nptel.ac.in/courses/105/101/105101008/
- 2. https://www.coursera.org/programs/j-k-lakshmipat-university-on-courserakzogk?skipBrowseRedirect=true

| Course                                    | e Title and Course   | Integrated Waste Management for Smart Cities   |  |  |
|---|--|--|--|--|
| Code                                      |  | CE1207   |  |  |
| Hours                                     | per week   | L TP: 310  |  |  |
| Credit                                    | <b>S</b>   | 03   |  |  |
| Studen                                    | its who can take   | B. Tech VII Semester (DE)  |  |  |
| Prereq                                    | uisites  | Environmental Sciences, Basics of  |  |  |
|   |  | Environmental Engineering  |  |  |
| Course<br>aspects<br>impact o<br>smart ci | <b>Objective:</b> The objection of Integrated solid was of waste management a ty development will be | we of this course is to provide a broader understanding on various<br>ste management practiced w.r.t. smart cities. The environmental<br>and its relationship on the big picture sustainable development and<br>discussed. |  |  |
| Course                                    | e Outcomes: On succ  | essful completion of course, student will able to:   |  |  |
| CE1<br>CE1                                | 207.1 Examine the management<br>207.2 Make route o system.   | technical issues that are required to set up a solid waste<br>system<br>ptimization for a solid waste collection and transport   |  |  |
| CE1                                       | 207.3 Setup waste p  | processing technologies and recycling system   |  |  |
| CE1                                       | 207.4 Design a sust  | ainable integrated solid waste management system based   |  |  |
|   | on multiple c  | riteria  |  |  |
| CE  | 1207.5 Apply the var   | rious government regulations, standards for integrated solid   |  |  |
|   | waste manager  | ment.  |  |  |
| Evalua                                    | tion Scheme:   |  |  |  |
| Sr.No                                     | Specifications   | Marks  |  |  |
| 1.  | Attendance   | Nil  |  |  |
| 2.  | Assignment (04)  | 20   |  |  |
| 3.  | <b>Class Participation</b>   | 10   |  |  |
| 4.  | Quiz (02)  | 10   |  |  |
| 5.  | Theory Exam-I  | Nil  |  |  |
| 6.  | Theory Exam-II   | 15   |  |  |
| 7.  | Theory Exam-III  | 25   |  |  |
| 8.  | Report-I   | 20   |  |  |
| 9.  | Report-II  | Nil  |  |  |
| 10.                                       | Report-III   | Nil  |  |  |
| 11.                                       | Project-I  | Nil  |  |  |
| 12.                                       | Project-II   | Nil  |  |  |
| 13.                                       | Project-III  | Nil  |  |  |
| 14.                                       | Lab Evaluation-I [C  | Continuous evaluation] Nil   |  |  |
| 15.                                       | Lab Evaluation-II  | Nil  |  |  |
| 16.                                       | Course Portfolio   | Nil  |  |  |
| Total                                     |  | 100  |  |  |

| Evaluation Scheme for Retest |                 |       |  |  |
|------------------------------|-----------------|-------|--|--|
| Sr. No                       | Specifications  | Marks |  |  |
| 1                            | Theory Exam-III | 25    |  |  |

## COURSE SYLLABUS (Theory):

## UNIT-01

Types and Sources of solid and hazardous wastes - Need for solid and hazardous waste management, MSW Rules 2016, Swachh Bharat Mission and Smart Cities Program.

## UNIT-02

Waste generation rates, Composition, Hazardous Characteristics – TCLP tests – waste sampling Source reduction of wastes, Recycling and reuse. Handling and segregation of wastes at source, storage and collection of municipal solid wastes, Analysis of Collection systems, Need for transfer and transport, Transfer stations, labeling and handling of hazardous wastes.

## UNIT-03

Waste processing, processing technologies, biological and chemical conversion technologies, Composting - thermal conversion technologies, energy recovery, incineration, solidification and stabilization of hazardous wastes, treatment of biomedical wastes.

## UNIT-04

Construction and Demolition (C&D) Waste Management –Overview, Electronic Waste (E-Waste) Management – Issues and Status in India, Disposal of waste in landfills. **UNIT-05** 

Current Issues in Solid Waste Management, Review of MSW Management Status in Smart Cities in the Country, Legislations on management and handling of municipal solid wastes, hazardous wastes, and biomedical wastes, C&D Waste Regulations, Globally E-Waste Management Rules 2016

## **UNIT-06:**

Wastewater treatment, sewage and effluent, sources of wastewater, classification of wastewater, pollutions, characteristics and testing of sewage, composition, sampling, physical and chemical analysis, Sewage treatment Plant (STP), Sludge management.

## **Reference books:**

1. Tchobanoglous, G., Theisen, H., & Vigil, S.A; Integrated Solid Waste Management: McGraw Hill, New York

- 2. Solid Waste Engineering, Principle & Management issues by VenTe Chow
- 3. Bhide, A.D., B.B. Sundaresan, Solid Waste Management in developing countries.
- 4. Manual on Municipal solid Waste Management, CPHEEO, Govt. of India.
- 5. Guidelines for Management and Handling of Hazardous wastes MOEF (1991), Govt. of India.
- 6. Datta, M; Waste Disposal in Engineered Land fills, Narosa Publishers, Delhi.
- 7. OP Gupta, Elements of Solid Hazardous Waste and Management, Khanna Publishing House.

8. Waste Management "Asian and Pacific Center for Transfer of Technology (N.D.) India", September 1993.

9. Environmental engineering, HS Paevy, DR Rowe, G Tchobanoglous, McGraw Hill

10. William A Worrell and P. Aarne Veslind Solid Waste Engineering, 2nd Edition (SI Edition) Cengage Learning, 2012 (ISBN-13: 978-1-4390-6217-3)

- 11. MSW Management Rules 2016, Govt. of India, available online at CPCB website.
- 12. Electronic Waste Management Rules 2016, Govt. of India, available online at CPCB website

#### **MOOC Courses:**

- 1) https://nptel.ac.in/courses/105/105/105105160/
- 2) <u>https://swayam.gov.in/nd2\_ugc19\_bt18/preview</u>
- 3) <a href="http://ugcmoocs.inflibnet.ac.in/ugcmoocs/view\_module\_ug.php/281">http://ugcmoocs.inflibnet.ac.in/ugcmoocs/view\_module\_ug.php/281</a>

#### Websites (related to the course)

- 1) http://www.cpcb.nic.in/
- 2) http://www.rpcb.rajasthan.gov.in
- 3) http://www.bis.org.in/
- 4) http://www.who.int/en/
- 5) http://www.moef.gov.in/
- 6) <u>http://smartcities.gov.in/content/</u>

| Course Title and Code: Design of Advanced Concrete Structures (CE1208) |   |  |  |  |
|--|---|--|--|--|
| Hours per Week   | 310   |  |  |  |
| Credits  | 4   |  |  |  |
| Prerequisite   | Basic concepts of RCC Design                |  |  |  |
| Students who can take  | B.Tech Semester-VII (Batch:<br>2017-21)/ DE |  |  |  |

## **Course Objective:**

This course aims to develop understanding about design of concrete structures such as continuous beams, staircases, columns, column footings, retaining walls and concept of pre-stressing in concrete structures.

Course Outcomes:

## On successful completion of this course, students will be able to:

CE1208.1 design staircases.

CE1208.2 design continuous beams.

CE1208.3 design columns and column footings.

CE1208.4 design retaining walls.

CE1208.5 analyze the pre-stressed concrete beams in flexure and sustainable concrete for construction.

| Evaluatio | on Scheme                  |       |
|-----------|----------------------------|-------|
| Sr. No.   | Evaluation Component       | Marks |
| 1         | Attendance                 | NIL   |
| 2         | Assignments (04 Nos)       | 20    |
| 3         | Class Participation        | NIL   |
| 4         | Quiz (04 Nos)              | 20    |
| 5         | Theory Exam-I              | NIL   |
| 6         | Theory Exam-II             | 15    |
| 7         | Theory Exam-III (End term) | 25    |
| 8         | Report-I                   | NIL   |
| 9         | Report-II                  | NIL   |
| 10        | Report-III                 | NIL   |
| 11        | Project-I                  | 10    |
| 12        | Project-II                 | 10    |
| 13        | Project-III                | NIL   |
| 14        | Lab Evaluation-I           | NIL   |
| 15        | Lab Evaluation-II          | NIL   |
| 16        | Course Portfolio           | NIL   |
|           | Total (100)                | 100   |

Retest: Theory Exam:

## Course Syllabus:

**Design of Staircases:** Loads & load effects on stair cases, design of stairs spanning horizontally and dog-legged stairs.

**Design of Continuous Beams:** Effective span, span/depth ratio, BM & SF, design of continuous beams.

**Design of Columns:** Effective length, code requirements on slenderness limits, minimum eccentricity & reinforcement, design of short columns under axial compression.

**Design of Column Footings:** Types of footings, general design consideration and code requirements, design of isolated rectangular and square column footings.

**Design of Retaining Walls**: Types, forces and stability of retaining walls, design of retaining walls.

**Pre-stressed Concrete:** Introduction, basic concepts, classification and types of prestressing, Pre-stressing systems, analysis of beams for flexure, losses in pre-stress, Sustainable concrete construction.

## **References:**

## Text and reference books:

- 1. Reinforced concrete design, Limit state design, Ashok K. Jain, Nem Chand & Bros, Roorkee, 2002
- 2. Limit state design of reinforced concrete, B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications (P) Ltd, 2016
- 3. Reinforced concrete design, S. N. Sinha, Tata Mc Graw Hill Education Pvt Ltd, New-Delhi, 2002
- 4. Reinforced concrete design, P. C. Varghese, Prentice-Hall of India, New Delhi, 2001
- Advanced reinforced concrete design, N. Krishna Raju, CBS Publishers & Distributors Pvt Ltd, 3<sup>rd</sup> Edition, 2016
- 6. IS codes (IS 456, IS SP 16, IS 875)

## Online references:

- 1. <u>https://swayam.gov.in/nd1\_noc20\_ce39/preview</u>
- 2. <u>https://nptel.ac.in/courses/105/106/105106118/</u>
- 3. <u>https://www.slideshare.net/PraveenKumarShanmuga/design-of-columns-axial-load-as-per-is-4562000</u>
- 4. <u>https://www.slideshare.net/PraveenKumarShanmuga/design-of-footing-as-per-is-4562000?next\_slideshow=1</u>

| Course Title and Code: CAD-BIM Specialization: CE1401 |                                       |  |  |
|---|---------------------------------------|--|--|
| Hours per Week  | Curated MOOC (approx. 1 hr. per week) |  |  |
| Credits   | 4                                     |  |  |
| Students who can take                                 | B.Tech.                               |  |  |

**Course Objective:** This course aims to develop understanding about Autodesk Revit to build BIM models, clash detection, quantity takeoff, and 4D simulation. We will use Autodesk Revit and Navisworks to build our BIM models in this course.

#### **Course Outcome:**

On successful completion of this course, the students should be able to:

- CE1401.1 Create 2D and 3D computer drawings and models of columns and stairs.
- CE1401.2 Analyze and interpret different building component and assemble components as per material availability.
- CE1401.3 Evaluate computer aided design models and assemblies.
- CE1401 .4 Apply key BIM standards.

## Prerequisites: Basic knowledge of AutoCAD Evaluation Scheme

| Sr. No | Specifications          | Marks            |
|--------|-------------------------|------------------|
| 1      | Attendance              | Nil              |
| 2      | Assignment (4 No.)      | 20<br>(MOOC:10)  |
| 3      | Class Participation     | Nil              |
| 4      | Quiz(6No.)              | 25 (MOOC:<br>15) |
| 5      | Theory Exam I           | Nil              |
| 6      | Theory Exam-II          | 15               |
| 7      | Theory Exam (End Term)  | Nil              |
| 8      | Report-1                | Nil              |
| 9      | Report-2                | Nil              |
| 10     | Report-3                | Nil              |
| 11     | Project -1              | 15               |
| 12     | Project -2              | Nil              |
| 13     | Project -3              | Nil              |
| 14     | Lab Evaluation          | Nil              |
| 15     | Lab Evaluation2         | 10               |
| 16     | Course portfolio (MOOC) | 15               |
|        | Total (100)             | 100              |

#### Retest

| 1 | Theory Exam    | 15 |  |  |
|---|----------------|----|--|--|
| 2 | Lab Evaluation | 10 |  |  |

## **Course Contents:**

**3D CAD Fundamental:** Welcome to CAD/BIM specialization, Magic Cube: familiar with [Line], [Divide], [Push/Pull], [Tape Measure] and [Guides], Curtain: familiar with [Scale], [Arcs], [Copy] and [Mirror] Solid Tool familiar with [Subtract], [Union], [Intersect] and [Split].

**3D CAD Application:** Basis of 3D modeling: Learn basic concept and start modeling, Building Structure: Create columns, walls, beams and slabs, Staircases: Create staircases and railings, Windows: Create detailed components, Modify and Place Component: Place components into building model, Model Assembling and Materials: Complete this building model.

**BIM Fundamentals for Engineers:** Fundamental BIM Knowledge, View & Retrieve Information from BIM Models, Modeling a BIM model.

## **Suggested Reading Materials:**

## **BOOKS AND REFERENCES**

- Building Information Modeling: BIM in Current and Future Practice, Publisher: John Wiley & Sons; 1 edition (15 August 2014), Language: English, ISBN-10: 9781118766309
- AutoCAD 2016 a Problem-Solving Approach 3D and Advance 22nd Edition
- Visualizing with CAD: An Auto CAD Exploration of Geometric and Architectural Forms
- Computer-aided Design/Engineering (CAD/CAE) Techniques and Their Applications: Advances in Theory by Cornelius T. Leondes
- Building Information Modeling by Kensek and Noble.
- "BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors" by Charles M. Eastman, Rafael Sacks, Paul Teicholz, Kathleen Liston

# This course would be delivered on coursera by Prof. Jessy kang National Taiwan University.