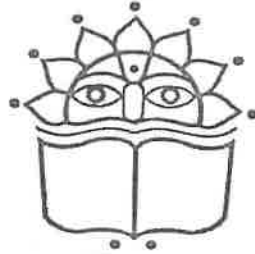


**Vidya Pratishthan's  
Kamalnayan Bajaj Institute of Engineering and Technology,  
Baramati  
(An Autonomous Institute)**



## **Board of Studies**

**Department of Civil Engineering**

**Syllabus**


**Final Year B. Tech  
Civil Engineering**

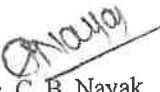
**(2023 Pattern w.e.f. AY:2026-2027)**

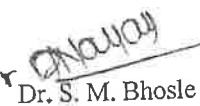



## SEMESTER-VII


Course Type	Course Code	Course Name	Teaching Scheme			Examination Scheme and Marks							Credits			
			TH	PR	TUT	CAA	ISE	ESE	TW	PR	OR	Total	TH	PR	TUT	Total
IJOT	CE23401PR	Internship/On-job Training	-	24	-	100	-	-	100	-	150	350	-	12	-	12
EEMC	HS23402TH	Entrepreneurship Development	3	-	-	30	-	70	-	-	100	3	-	-	4	
EEMC	HS23402TUT	Entrepreneurship Development	-	-	1	-	-	-	-	30	30	-	-	1		
RM	HS23403TH	Research Methodology & IPR	3	-	-	30	-	70	-	-	100	3	-	-	4	
RM	HS23403TUT	Research Methodology & IPR	-	-	1	-	-	-	30	-	30	-	-	1		
AEC	HS23404TH	Public Speaking and Aptitude	1	-	-	40	-	-	-	-	40	1	-	-	2	
AEC	HS23404TUT	Public Speaking and Aptitude	-	-	1	-	-	-	-	30	30	-	-	1		
<b>Total</b>			<b>7</b>	<b>24</b>	<b>3</b>	<b>200</b>	<b>0</b>	<b>140</b>	<b>130</b>	<b>0</b>	<b>210</b>	<b>680</b>	<b>7</b>	<b>12</b>	<b>3</b>	<b>22</b>

  
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Dr. S. B. Lande  
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**Principal**  
Vidya Pratishthan's  
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Engineering & Technology, Baramati  
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## SEMESTER-VIII

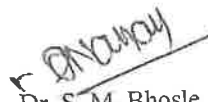
Course Type	Course Code	Course Name	Teaching Scheme			Examination Scheme and Marks							Credits				
			TH	PR	TUT	CA A	ISE	ESE	TW	PR	OR	Total	TH	PR	TUT	Total	
PCC	CE23411TH	Quantity Surveying & Contract Management	3	-	-	10	30	60	-	-	-	100	3	-	-	4	
PCC	CE23411PR	Quantity Surveying & Contract Management	-	2	-	-	-	-	30	-	-	30	-	1	-		
PEC	CE23412XTH	Programme Elective IV Course	3	-	-	10	30	60	-	-	-	100	3	-	-	4	
PEC	CE23412XPR	Programme Elective IV Course	-	2	-	-	-	-	-	-	30	30	-	1	-		
PEC	CE23413XTH	Programme Elective V Course	2	-	-	10	-	60	-	-	-	70	2	-	-	3	
PEC	CE23413XPR	Programme Elective V Course	-	2	-	-	-	-	-	-	30	30	-	1	-		
MDM	MD23XXXTH	Multi-disciplinary minor	2	-	-	20	20	50	-	-	-	90	2	-	-	3	
MDM	MD23XXXPR	Multi-disciplinary minor	-	2	-	-	-	-	20	-	-	20	-	1	-		
PROJ	CE23414PR	Project	-	8	-	-	-	-	80	-	-	50	130	-	4	-	4
OE	OE230XX	Open Elective	2	-	-	-	-	50	-	-	-	50	2	-	-	2	
<b>Total</b>			12	16	0	50	80	280	130	0	110	650	12	8	00	20	


### List of Program Electives

Code	Program Elective-IV Course	Code	Program Elective-V Course
CE23412A	Total Quality Management and MIS	CE23413A	Rural Water Supply and Sanitation
CE23412B	Irrigation and Drainage	CE23413B	Structural Design of Foundations
CE23412C	Design of Precast and Composite Structures	CE23413C	Planning and Management of Integrated Water Resources
CE23412D	Geosynthetic Engineering	CE23413E	Architecture and Town Planning
CE23412F	GIS & Remote Sensing	CE23413F	Advanced Transportation Engineering


  
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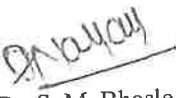



**List of Multi-Disciplinary Minor and Open Elective**

Code	Multi-Disciplinary Minor	Code	Open Elective
AI23051	AI & Machine Learning	OE23001	Digital Marketing (MKCL)
AI23052	Data Science	OE23002	Professional Leadership
AI23053	Generative AI	OE23003	Organizational Behaviour
CO23051	Cloud Computing	OE23004	Industrial Management
CO23052	High Performance Computing	OE23005	Disaster Management
CO23053	Computer Graphics & Gaming	OE23006	Energy Economic & Management
IT23051	Cyber Security	OE23007	Operation Research
IT23052	Full Stack development	OE23008	Intellectual Property Rights
ET23051	Embedded Systems	OE23009	Cyber Laws
ET23052	Drone Technology	OE23010	Bioinformatics
ET23053	Internet of Things	OE23011	Biotechnology
CE23051	Waste Management	OE23012	International Relations
CE23052	Green Building & Smart Cities	OE23013	Universal Human Values
ME23051	Introduction to 3D Printing Technologies	OE23014	Education Technology
ME23052	Introduction to Robotics & Automation	OE23015	Design Thinking
EL23051	Fundamentals of Solar Technology	OE23016	Accounting & Finance
EL23052	Industrial Automation	OE23017	Sustainability & Climate Change
GS23051	Nanotechnology	OE23018	Agriculture Technology
GS23052	Linear Algebra & statistics	OE23019	Architectural Technology


  
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Vidyanagar, Baramati-413133



## CE23401PR- INTERNSHIP

Teaching Scheme:

Credits: 12

Examination Scheme:

TH: 00 Hrs./Week  
PR: 24 Hrs./Week

Theory: 00  
Practical: 12

CAA:100 Marks  
Term Work :100 Marks  
Lab Evaluation: 150 Marks

### Prerequisites:

Students should have successfully completed **Semester VI** of the Engineering program.

### Course Objectives:

- To learn and practice hands-on technical skills.
- To provide opportunities for acquiring, comprehending, and refining practical technical proficiencies.
- To gain exposure to professional industrial practices and environments.
- To understand how real-world factors like cost, society, and management affect a company.
- To cultivate ethical principles aligned with professional and societal standards.

### Course Outcomes:

- CO 1. Understand how people in the industry approach and solve problems.  
CO 2. Learn how to write clear and effective technical reports.  
CO 3. Work effectively and professionally as part of a team.  
CO 4. Learn to pick the right tools and technology to solve a given problem.  
CO 5. Analyze various career opportunities and decide career goals.  
CO 6. Demonstrate abilities of a responsible professional and use ethical practices in day-to-day life.


### Internship work Identification:

Student may choose to undergo Internship at Industry/Govt. Organizations/NGO/MSME/Rural Internship/ Innovation/IPR/Entrepreneurship. Student may choose either to work on innovation or Entrepreneurial activities resulting in start-up or undergo internship with industry/NGO's/Government organizations/Micro/Small/ Medium enterprises to make themselves ready for the industry.

Internship work identification process should be initiated in the VI semester in coordination with training and placement cell/ industry institute cell. This will help students to start their internship work on time.

Student can take internship work in the form of the following but not limited to:

1. Working for consultancy/ research project,
2. Contribution in Incubation/ Innovation/ Entrepreneurship Cell/ Institutional Innovation Council/ startups cells of institute /
3. Learning at Departmental Lab/ Institutional workshop,
4. Development of new product/ Business Plan/ registration of start-up,
5. Industry / Government Organization Internship,
6. Internship through Internshala,
7. In-house product development, intercollegiate, inter department research internship under research lab/group, micro/small/medium enterprise/online internship,
8. Research internship under professors, IISC, IIT's, Research organizations,
9. NGOs or Social Internships, rural internship,
10. Participate in open source development.

  
J.C. Bhong

**Duration:**

Internship is to be completed after semester 6 and before commencement of semester 8 of at least 14 to 20 weeks; and it is to be assessed and evaluated in semester 7.

**Guidelines for students**

1. All B.Tech students are required to undergo an internship for a minimum duration of **14–16 weeks**. Students must **obtain a Final Year - Bonafide Certificate through the college office**, which is **mandatory** for commencing the internship.
2. Student must submit application form with all documents and Undertaking forms to department IIC Coordinator through mentor
3. Students can take mini projects, assignments, case studies by discussing it with concerned authority from industry and can work on it during internship.
4. All students should compulsorily follow the rules and regulations as laid by industry.
5. Every student should take prior permissions from concerned industrial authority if they want to use any drawings, photographs or any other document from industry.
6. Student should follow all ethical practices and SOP of industry.
7. Students have to take necessary health and safety precautions as laid by the industry.
8. Student should contact his /her academic guide from college on weekly basis to communicate the progress.
9. Each student has to prepare internship report in consultation with the academic guide.

**Internship Diary / Internship Workbook**

1. Students must maintain a daily diary **in the format prescribed by the college**, documenting observations, tasks performed, information gathered, and any suggestions.
2. The diary should include relevant sketches, drawings, or diagrams based on daily observations.
3. The industry supervisor or section in-charge must **verify and sign the diary every week**.
4. Students must present the diary to the **Faculty Mentor during each industry visit** for verification and ratification.
5. Upon completion of the internship, students must submit the following to the Institute:
  - o Student's Daily Diary (as per college format)
  - o Internship Report
  - o Attendance Record
  - o Evaluation Sheet duly signed and stamped by the industry
6. The diary will be evaluated based on **regularity of entries, completeness, and adherence to the prescribed format**.

**Internship Report**

1. Students must prepare a **comprehensive internship report** in the **format prescribed by the department**, covering observations, tasks performed, and key learning outcomes.
2. Students may consult the **Industry Supervisor and Faculty Mentor** to obtain specific topics or problem statements to be included in the report.
3. Students should use the **daily diary** as a reference while preparing the report, as it already contains detailed information recorded during the internship.
4. The completed report must be **signed by the Industry Supervisor and Faculty Mentor** before submission to the department.

Bhargava  
J.C. Bhargava

5. The internship report will be evaluated based on the following criteria:

- o Originality of content
- o Adequacy and purposefulness of the write-up
- o Organization, formatting, quality of sketches/drawings, writing style, and language
- o Variety and relevance of the learning experiences documented
- o Linkage of practical applications with theoretical concepts learned in coursework

### **Evaluation Guidelines:**

Every student is required to prepare and maintain documentary proofs of the activities done by him/her as internship diary or as workbook. The evaluation of these activities will be done by Department IIC Coordinator / faculty mentor or Industry Supervisor/Appointed External Examiner based on- Overall compilation of internship activities, sub-activities, the level of achievement expected, evidence needed to assign the points and the duration for certain activities. Assessment and Evaluation is to be done in consultation with internship supervisor (Internal and External – a supervisor from place of internship.)

<b>Component</b>	<b>Marks</b>
A. Continuous Assessment Activity	100
B. Term-Work (Internship Report)	100
C. Oral Examination / Viva	150
<b>TOTAL</b>	<b>350</b>

1. **Continuous Assessment (100 Marks):** Evaluation includes attendance, discipline, workplace behavior, and the quality of the learning diary or logbook. Mid-semester progress presentations and structured industry supervisor feedback form an integral part of the continuous review process.
2. **Term-Work (150 Marks):** Assessment covers the structure and completeness of the internship report, technical depth, problem-solving ability, and reflection on skills developed. Supporting evidence—drawings, screenshots, certificates, and attendance records—is verified, along with a plagiarism check to ensure originality.
3. **Oral Examination / Viva (150 Marks):** Evaluation focuses on understanding of tasks performed, application of engineering concepts, clarity of communication, industry relevance, and the ability to respond logically during interaction with examiners. Joint assessment by internal and external examiners ensures transparency and fairness.

## Internship Evaluation Scheme (Total: 350 Marks)

Component	Marks	Evaluation Basis	Mode of Assessment / Evaluator
<b>A. Continuous Assessment (100 Marks)</b>			
Attendance, Discipline & Professionalism	20	Regularity, punctuality, adherence to workplace culture	Attendance record + Industry Supervisor note
Diary / Logbook	20	Weekly reflection of tasks, learning outcomes, challenges	Logbook review by Faculty Mentor
Mid-Semester Progress Presentation	20	Presentation on tasks performed, tools/technologies learned, contributions	Faculty review (in consultation with Industry Supervisor)
Industry Supervisor Feedback	40	Attitude, initiative, teamwork, professional conduct	Structured feedback form
<b>Subtotal (A)</b>	<b>100</b>		
<b>B. Term-Work (Internship Report)- (100 Marks)</b>			
Internship Report (Structure & Completeness)	20	Cover page, acknowledgement, organization profile, objectives, methodology, tasks, outcomes, conclusion	Faculty Panel Evaluation
Technical Content & Problem Solving	30	Depth of technical work, relevance to discipline, engineering application	Faculty Panel
Skill Development Reflection	20	Technical/professional skills, tools learned, employability skills (NEP focus)	Faculty Panel
Evidence & Annexures	15	Screenshots, codes, drawings, certificates, datasheets, attendance logs	Faculty Panel
Plagiarism / Originality	15	Minimum 80% originality; no copy-paste	Plagiarism check + Faculty review
<b>Subtotal (B)</b>	<b>100</b>		
<b>C. Presentation &amp; Oral Examination / Viva ( 150 Marks)</b>			
Understanding of Work Done	30	Explanation of tasks performed, process understanding, technical depth	Internal + External Examiners
Application of Knowledge	30	Linkage with curriculum, application of engineering concepts	Viva Panel
Soft Skills & Communication	30	Presentation skills, clarity, professional conduct	Viva Panel
Industry Relevance & Employability	30	Awareness of industry practices, teamwork, adaptability	Viva Panel (Industry input)
Q&A Interaction	30	Logical reasoning and accuracy of responses	Viva Panel
<b>Subtotal (C)</b>	<b>150</b>		
<b>Total A+B+C</b>	<b>350</b>		

  
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**Feedback from internship supervisor**

Post internship, faculty coordinator/Mentor should collect feedback about student with recommended parameters include as- Technical knowledge, Discipline, Punctuality, Commitment, Willingness to do the work, Communication skill, individual work, Team work, Leadership

**Reference:**

1. <https://internship.aicte-india.org/>
2. Circular No. 29-2024 Internship Cell- BOD Link\_15022024.pdf
3. <https://www.aicte-india.org/sites/default/files/AICTE%20Internship%20Policy.pdf>

*Abhngti*  
J.c. Bhong

HS23402- ENTREPRENEURSHIP DEVELOPMENT		
<b>Teaching Scheme:</b>	<b>Credits: 04</b>	<b>Examination Scheme:</b>
<b>TH: 03 Hrs./Week</b> <b>TUT: 01 Hrs./Week</b>	<b>Theory : 03</b> <b>Tutorial : 01</b>	<b>CAA: 30 Marks</b>
		<b>End-Semester Exam: 70 Marks</b>
		<b>Oral Exam: 30 Marks</b>

### Course Outcomes:

On completion of the course, learner will be able to

**CO1:** Understand the fundamentals of entrepreneurship, the entrepreneurial mindset, traits, and the role of entrepreneurs in economic development.

**CO2:** Explain the growth of entrepreneurship in India and analyze the role of institutional support systems and government initiatives.

**CO3:** Apply design thinking principles and innovation strategies in product/service selection and development.

**CO4:** Conduct market and feasibility studies and prepare a comprehensive business plan.

**CO5:** Develop strategies for enterprise management, risk handling, funding acquisition, and incubation support.

**CO6:** Analyze the startup ecosystem and evaluate real-world entrepreneurial case studies.

### Course Contents

<b>Unit-1: Introduction to Entrepreneurship</b>
Introduction to Entrepreneurship, Concept and Definitions of Entrepreneur and Entrepreneurship, Objectives of Entrepreneurship Development, Phases of Entrepreneurship Development, Role of Entrepreneurship in Economic Development, The Entrepreneurial Mindset, Characteristics and Traits of Entrepreneurs, Entrepreneurship Skills.
<b>Unit-2: Entrepreneurial Growth in India</b>
Sources of Entrepreneurship in India, Entrepreneurial Development Programmes (EDPs): Concept, Need and Phases, Institutions Conducting EDPs in India, Role of Key Institutions: Maharashtra Centre for Entrepreneurship Development, National Institute for Micro, Small and Medium Enterprises, Prime Minister Employment Generation Programme, Directorate of Industries, Khadi and Village Industries Commission.
<b>Unit-3: Design Thinking and Product Selection</b>

Design Thinking, Technology Readiness Levels (TRL), Product/Service Selection Process Product/Service Life Cycle, New Product/Service Development Process, Mortality Curve, Creativity and Innovation in Product/Service Development and Modification.

#### **Unit-4: Market Study and Business Plan Preparation**

Market Study Procedures: Questionnaire Design, Sampling Techniques, Market Survey, Data Analysis. Feasibility Study, Forms of Ownership, Capital and Budgeting, Feasibility Report Preparation and Evaluation Criteria, Business Plan Preparation.

#### **Unit-5: Managing Enterprise**

Unique Selling Proposition (USP), Identification and Development of Marketing Plan, Policy Making and Strategic Planning, Risk Management and Calculated Risk-Taking, Angel Investors and Venture Capitalists, Incubation Centers: Role and Procedure.

#### **Unit-6: Startup Ecosystem and Case Studies**

Concept of Startup Ecosystem, Components of Startup Ecosystem, Role of Government, Investors, Incubators, and Accelerators, Case Studies of Successful Startups/Entrepreneurs, Lessons from Startup Success and Failures.

#### **Text Books:**

1. Entrepreneurship Development – Dr. K. Natarajan & Prof. E. Gordon, Himalaya Publishing House.
2. Introduction to Entrepreneurship Development – Abhik Kumar Mukherjee & Shaunak Roy, Oxford University Press.
3. Entrepreneurship Development – Dr. J. Ravi, Manglam Publications.
4. The Dynamics of Entrepreneurial Development and Management – Vasanth Desai, Himalaya Publishing House.

#### **Reference Books:**

1. Entrepreneurship – Robert D. Hisrich, Michael P. Peters & Dean A. Shepherd, McGraw-Hill.
2. Entrepreneurship Development and Small Business Enterprises – Poornima M. Charanthimath, Pearson Education.
3. Entrepreneurship Development – S. L. Gupta & Arun Mittal, International Book House.
4. Management and Entrepreneurship Development – Sudha G. S., Indus Valley Publication.

## HS23403TH: Research Methodology and IPR

Credits: 03 (Theory) and 01 (Tutorial)

### Teaching Scheme:

Theory : 03 hrs. /week  
Tutorial: 01 hrs. /week

### Examination Scheme:

CAA : 30 Marks  
In-semester : ----  
End semester : 70 Marks  
TW : 30 Marks

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### Prerequisites:

Project based learning of all subjects, Fundamental laws and principles of all subjects, Soft and communication skills.

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### Course Objectives:

1. The course has been developed with orientation towards research related activities and recognizing the ensuing knowledge as property.
2. It will create consciousness for Intellectual Property Rights and its constituents.
3. Learners will be able to perform documentation and administrative procedures relating to IPR in India as well as abroad.

### Course Outcomes:

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

1. Formulate a research problem for engineering and technology domain.
2. Analyze the available literature for given research problem and understand different techniques of data collection.
3. Investigate the statistical and reliability methods of preliminary data analysis and present the results in graphical form.
4. Understand the importance of technical writing and presentation skills.
5. Comprehend the various forms of the intellectual property, its relevance and business impact in the changing global business environment.
6. Realize the importance of patents, trademark and copyright and follow research ethics.

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### Course Contents

#### Unit 1: Introduction

Introduction, Meaning of research, Objectives of research, Types of research, Research approaches, Significance of research, Research methods versus methodology, Research and scientific method, Research process, Criteria of good research, Problems encountered in India for good research, Formulation of research hypotheses, Search for causation, Format for research proposal, Funding for the proposal, Different funding agencies, Framework for the planning.

#### Unit 2: Literature Review

Definition of literature and literature survey, Significance of literature survey, Sources of literature, Elements and objectives of literature survey, Styles of literature survey, Strategies of literature survey, Searching the existing literature, Reviewing the selected literature, Writing about the literature reviewed and gap identified, literature analysis, data collection, and interpretation.

#### Unit 3: Preliminary Data Analysis

Testing of hypothesis- concepts and testing, Review of theory of reliability, Hazard models, System reliability. Data presentation skills, Features of statistical analysis, Histogram, bar charts, Pie charts, 2D & 3D plots, Interpolation & extrapolation techniques, Curve fitting.

#### **Unit 4 Technical Writing and Presentation**

Effective technical writing, thesis writing, research proposal writing, research paper writing. Significance of report writing, Different steps in writing report, Layout of the research report, Types of reports, Mechanics of writing a research report, Precautions for writing research reports, Presentation skills, tools for technical writing and presentation. Plagiarism, avoiding plagiarism, Research ethics, Tools for plagiarism checking, technical writing and presentation.

#### **Unit 5: Intellectual Property Rights**

Introduction and significance of intellectual property rights, Types of Intellectual Property Rights, Copyright and its significance, Introduction to patents and its filing, Introduction to patent drafting, Best practices in national and international patent filing, Copyrightable work examples.

#### **Unit 6: Patent Rights**

Patents and its basics, Patentable items, Designs, Process of filing patent at national and international level, Process of patenting and development, Technological research and patents, innovation, Patent and copyright international intellectual property, Procedure for grants of patents; Need of specifications, Types of patent applications, Provisional and complete specification, Patent specifications and its contents, Trade and copyright.

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#### **Books**

##### **Text books:**

1. Ranjit Kumar (2005), 2<sup>nd</sup> edition, Research Methodology: A Step by Step Guide for beginners (Pearson Education).
2. C. K. Kothari (2004), 2<sup>nd</sup> edition, Research Methodology Methods & Techniques (New Age International, New Delhi).
3. T. Ramappa (2016), 2<sup>nd</sup> edition, Intellectual Property Rights-Law in India (Asia Law House, Hyderabad).

##### **Reference Books:**

1. Louis Cohen, Manion, Morrison and Routledge (2017), 8<sup>th</sup> edition, Research Methods in Education (Taylor & Francis Group- Cambridge University Press India Pvt. Ltd.).
2. John Best and James Kahn (1998), 8<sup>th</sup> edition, Research in Education (Prentice Hall of India Pvt. Ltd.).
3. Stuart Melville and Wayne Goddard (2001), Research Methodology: An Introduction for Science and Engineering Students. (Juta & Co Ltd.).
4. Benjamine Niebel and Alan Draper (1974), Product Design and Process Engineering, (McGraw Hill International Publishers).
5. Halbert D. J. (2007), 2<sup>nd</sup> edition, Resisting Intellectual Property (Taylor and Francis Ltd.).
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley (2016), Intellectual Property in New Technological Age (Stanford Public Law Working Paper No. 2780190, Elsevier Publishers).

## HS23403TH: Research Methodology and IPR

Credits: 01 (Tutorial)

**Teaching Scheme:**

Tutorial: 01 hrs. /week

**Examination Scheme:**

TW : 30 Marks

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The term work should consist of following assignments.

1. **Literature Review:** Collect the existing literature on any research idea in engineering/technology and identify the research gap. (Performed in a group of three or four students)
2. **Report and Seminar Presentation:** Prepare a research proposal based on the identified research gap, which may serve as a basis for the project work. The report should be checked for plagiarism and language quality (e.g., using Grammarly or equivalent tools), and the idea should be presented. (Performed in a group of three or four students)
3. **Blank Format of Research Proposal:** Identify national and international funding agencies and prepare/print the blank format of a research proposal of any one agency, for understanding proposal structuring relevant to research work. (Performed in a group of three or four students)
4. **Citation and Referencing Styles:** Write a report on different citation and referencing styles adopted by various publishers, facilitating proper documentation of the research work.
5. **IPR Case Study:** Write a report on a case study of any existing patent/copyright/trademark, providing insight into intellectual property aspects related to project development.
6. **Journal Study:** Collect information on any one peer-reviewed journal and write a report covering abstracting and indexing, H-index, SJR rating, impact factor, aims and scope, and submission guidelines.

**Course Name with Code: Total Quality Management and MIS (CE23412A)**

**Teaching Scheme:**  
**TH: 3 Hrs. / week**  
**PR: 2 Hrs. / week**

**Credits**  
**4**

**Examination Scheme:**  
**CAA : 10 Marks**  
**In-semester : 30 Marks**  
**End semester : 60 Marks**  
**OR : 30 Marks**

**Pre-requisites:**

Project management & engineering economics, construction management

**Course objectives:**

01. Engineers with the ability to propose total quality management system in the construction projects
02. Engineers with the ability to appraise quality system standards in the construction projects.
03. Engineers with the ability to choose MIS for a construction organization

**Course outcomes:**

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

- CO1. Recognize quality and contribution of quality gurus for evaluation of best practices.
- CO2. Relate the functioning and application of TQM & Six Sigma in the domain of construction sector.
- CO3. Recommend ISO 9001 principles in preparation of quality manual to construction business.
- CO4. Apply management control & certification systems for construction industry.
- CO5. Choose TQM process implementation and various quality awards for construction sector
- CO6. Propose MIS for allied fields in construction sector.

**Unit 1: Construction Quality**

**(07 hours)**

Quality: various definitions and interpretation, importance of quality on a project in the context of global challenges, factors affecting quality of construction, reasons for poor quality & measures to overcome, Contribution of various quality gurus (Juran, Deming, Crosby, Ishikawa). Evolution of TQM-QC, TQC, QA, QMS, TQM, PDCA cycle .

**Unit 2: TQM and Six Sigma** (06 hours)

TQM: Necessity, advantages, old and new 7 QC tools, quality function deployment (QFD), Six sigma: importance, levels, run chart and case study. Defects & its classification in construction, measures to prevent and rectify defects and case study.

**Unit 3: ISO and Quality Manual** (06 hours)

Study of ISO 9001:2015 principles. Quality manual: importance, contents, documentation, importance of check-lists in achieving quality, typical checklist for concreting activity, formwork activity, steel reinforcement activity. Corrective and preventive actions, conformity and NC reports

**Unit 4: Management Control and Certifications** (06 hours)

Benchmarking in TQM, quality circle, categories of cost of quality, CONQAS, CIDC-CQRA certifications

**Unit 5: Techniques in TQM Implementation and Awards** (07 hours)

Five S techniques, failure mode effect analysis (FMEA), zero defects, Japanese tools and practices: JIT, KAIZEN, KANBAN, total productive maintenance, National & International quality awards- Rajeev Gandhi Award, Jamunalal Bajaj Award, Golden Peacock Award, Deming Prize, Malcolm Baldrige awards.

**Unit 6: Management information systems** (07 hours)

Introduction to management information systems (MIS), overview, definition, MIS and decision support systems, information resources, management subsystems of MIS, MIS based on management activity whether for operational control, management control, strategic control. Study of an MIS for a construction organization associated with building works.

**Text Books:**

01. Total Quality Management, Dr. Gunmala Suri and Dr. Puja Chhabra Sharma, Biztantra
02. Quality Control and Total Quality Management, P. L. Jain- Tata McGraw Hill Publ. Company.
03. Total Quality Management, Dr. S.Rajaram and Dr. M. Sivakumar, Biztantra.
04. Total Engineering Quality Management, Sunil Sharma, Macmillan India Ltd. Publishing
05. Management Information System, James O'Brien, Tata McGraw Hill Publishing

### Reference Books:

01. Importance of quality on a project in the context of global challenges. Importance of quality on a project in the context of global challenges, Juran's Quality Handbook, Juran Publication.
02. Management: Principle, process and practices, by Bhat, Oxford University Press.
03. Juran's Quality Planning & Analysis, Frank Gryna, Richard Chua, Joseph Defeo, McGraw Hill Publishing.
04. Management Information Systems, Gordon B. Davis, Margrethe H. Olson, Tata McGraw Hill Publishing.
05. Total Project Management: The Indian Context, P. K. Joy, Macmillan India Ltd Publishing.

### LABORATORY WORK (Perform Any 6):

The term/lab. work shall consist of a journal includes various activities to be conducted on the following contents. **Oral** is based on the above syllabus and term work completed.

1. Prepare and analyze the following quality tools using real or simulated data:
  - Check Sheet • Pareto Chart • Cause–Effect (Fishbone) Diagram • Histogram • Control Chart
2. Analyze a case study from construction/industry and identify quality problems and improvement strategies.
3. Study ISO 9001 documentation requirements and prepare a sample quality manual.
4. Study basic tools used in MIS.
5. Create a simple **database for construction project data** (materials, labour, cost).
6. Study how MIS supports managerial decision-making. - Case study.
7. Study the concept and applications of **SAP ERP** in construction/project management.

### CAA:

Students have to submit assignments for each unit as a part of continuous assessment activities (CAA).

**Course Name with Code: Irrigation and drainage (CE 23412B)**

**Teaching Scheme:**  
**TH: 3 Hrs. / week**  
**PR: 2 Hrs. / week**

**Credits**  
**4**

**Examination Scheme:**  
**CAA : 10 Marks**  
**In-semester : 30 Marks**  
**End semester : 60 Marks**  
**OR : 30 Marks**

**Prerequisites:**

Basic knowledge of fluid mechanics, geotechnical engineering, and hydrology and water resources engineering

**Course Objectives:**

01. To study different irrigation and drainage systems.
02. To introduce students about basic concepts of water, plant, and their interactions.
03. To calculate evapotranspiration and crop water requirement.
04. To develop analytical skills relevant to the design of irrigation and drainage projects, planning and management.

**Course Outcomes:**

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

- CO1. Summarize types of irrigation methods.
- CO2. Estimate evapotranspiration and crop-water requirement.
- CO3. Understand component parts and their design considerations of lift irrigation system.
- CO4. Design drip and sprinkler irrigation systems.
- CO5. Understand basics of salt affected soils and estimate leaching requirement.
- CO6. Design surface and subsurface drainage systems

**Unit 1: Introduction**

**(06 hours)**

Definition, necessity of irrigation, benefits of irrigation, ill effects of irrigation, crop pattern, irrigation efficiency, cropping intensity, water use efficiency, canal and pipe distribution system, types of irrigation systems, techniques of water distribution in the farm, factors affecting the choice of irrigation methods, quality of irrigation water. Surface and subsurface irrigation methods,

concept of deficit irrigation, micro irrigation (theory only), application of AI in irrigation and drainage.

## **Unit 2: Soil Moisture and Evapotranspiration**

**(07 hours)**

Soil Moisture: soil texture, soil structure, soil groups of India, field capacity, wilting point, maximum allowable deficiency (MAD), kinds of soil water, soil moisture tension, root zone, soil profile, soil water relationships, soil-moisture characteristic curve, measurement of soil moisture, tensiometer. Evapotranspiration (consumptive use): direct measurement of evapotranspiration: Lysimeters, field plots; evapotranspiration equations – Penman's equation, FAO Penman - Monteith equation, Blaney-Criddle formula, Thornthwaite formula, reference crop evapotranspiration, procedure to estimate actual evapotranspiration, frequency of irrigation, crop water requirement in peak fortnight, design discharge for canal and pipe distribution system. (No numerical should be asked on Penman's and FAO Penman - Monteith equation in theory exam).

## **Unit 3: Lift Irrigation and Drip Irrigation**

**(06 hours)**

Centrifugal pump (CP): working, component parts, heads of CP, NPSH, computation of power requirement, characteristic curves of CP. Lift Irrigation: general concepts, advantages, disadvantages, elements of lift Irrigation schemes, design considerations involved in intake well, jack well, rising main, distribution systems. Drip Irrigation: definition and functions, advantages and disadvantages of drip irrigation systems, suitability of drip irrigation system, wetting pattern (width and depth of wetting front), components of drip irrigation system, planning and design of drip irrigation systems, installation and maintenance of drip assembly.

## **Unit 4: Sprinkler Irrigation**

**(07 hours)**

Introduction of sprinkler irrigation, advantages and limitations of Sprinkler Irrigation, types of sprinkler systems, components of sprinkler Irrigation system (Pumping set, main and lateral pipe lines, sprinkler heads, perforated pipes, debris screen and desilting basin, booster pumps, take off valves and flow control valves, fertilizer applicators), moisture distribution patterns and uniformity of coverage, uniformity coefficient. Design of sprinkler irrigation systems (inventory of resources and conditions, criteria for system layout, selection of sprinkler and its spacing, discharge capacity of the pump, hydraulic design of sprinkler systems- (discharge of sprinkler nozzle, main and lateral pipe sizes, pumps and power units), cost estimation, operation and maintenance.

## **Unit 5: Management of Salt Affected Soil**

**(06 hours)**

Salinity, salinity units, electrical conductivity, pH, quality of irrigation water, sodium adsorption ratio (SAR) and exchangeable sodium percentage (ESP), classification of saline and alkaline soils, osmotic potential, salinity stress coefficient, water stress coefficient, yield reduction, salt balance (mass balance) at farm level. Reclamation of saline soils: leaching requirement (LR) - Rhoades

equation, requirement of irrigation water to meet crop demand and LR. Reclamation of alkali soils: Gypsum requirement

#### **Unit 6: Drainage of Irrigated Land**

**(07 hours)**

Definition and objectives of drainage, water logging, definition, classification and impact; types of drainage systems, surface, subsurface, vertical or tube well. Surface drainage system: design considerations for land drainage; design considerations for land grading/leveling, design consideration for field drains and field laterals; layout and design considerations of field drains and laterals - random field drain system, bedding field drain system, parallel field drain system; design of surface drainage channel (computation of design discharge only). Subsurface drainage systems: purpose and benefits; location and alignment of drains pipes; sub surface drainage system layouts- random system, parallel grid system, herringbone system, combined system; drain pipe envelope; structures of pipe drainage system- outlet of a pipe drain into a ditch or canal, junctions and inspection chamber, surface water inlets, bedding; drainage coefficient; drain spacing design – steady state formula (Hooghoudt formula), unsteady state formula (Glover-Dumm equation); design of drain pipe diameter; materials for drain pipe – clay, concrete, plastic, drainage wells. (No derivation of Hooghoudt and GloverDumm formulae).

#### **Text books:**

01. Irrigation Engineering and Hydraulic Structures, Garg, S. K., Khanna Publishers, New Delhi.
02. Irrigation, Theory and Practice, A. M. Michael, Vikas Publishing House Pvt. Ltd. New Delhi.
03. Irrigation Engineering and Hydraulic Structures, S. R. Sahasrabudhe, Kataria & Sons, New Delhi.
04. Engineering Hydrology, K Subramanya, McGraw Hill Education (India) Pv. Ltd.

#### **Reference books:**

01. Drip and Sprinkler Irrigation, R. K. Biswas, New India Publishing Agency, New Delhi.
02. Land Drainage, Battacharaya A. K. & Michael A. M., Vikas Publ.
03. An introduction to Drip Irrigation Systems, Ajai Singh, New Delhi Publishers.
04. Irrigation Engineering, H. M. Raghunath, Wiley India.
05. Irrigation and Drainage Engineering, Peter Waller and Muluneh Yitayew, Springer.
06. Trickle Irrigation for Crop Production, F. S. Nakayama and D. A. Bucks, Elsevier.

07. Urban Drainage, David Butler and John W. Davies, Taylor & Francis.

08. Guidelines for Planning and Design of Piped Irrigation Network, Central Water Commission, Ministry of Water Resources, River Development & Ganga Rejuvenation, Govt. of India, New Delhi.

09. Pipe Distribution Network for Irrigation”, WRD Handbook-Chapter 4 (Vol I, 2019), Water Resources Department, Govt. of Maharashtra.

### **LABORATORY WORK:**

Term work consists of the following experiments or assignments. Term work marks will be based on continuous assessment. Oral is based on the above syllabus and term work completed

01. Assignment to summarize types of irrigation methods and application of artificial intelligence techniques in irrigation and drainage.
02. Assignment on evapotranspiration estimation using Penman’s equation or FAO Penman Monteith equation. (Hand calculations).
03. Assignment on solution of Assignment 2 using computer programme/spreadsheet.
04. Assignment on design of drip irrigation system.
05. Assignment on design of sprinkler irrigation system.
06. Assignment based on Unit 5. (Min. 6 questions).
07. Assignment on design of surface drainage system and design of subsurface drainage system
08. Assignment on use of CropWat software to determine crop water requirement and irrigation scheduling.

### **CAA:**

Students have to submit assignments for each unit as a part of continuous assessment activities (CAA).

**Course Name with Code: Planning and Management of Integrated Water Resources  
(CE 23413C)**

**Teaching Scheme:**  
**TH: 2 Hrs. / week**  
**PR: 2 Hrs. / week**

**Credits**  
**3**

**Examination Scheme:**  
**CAA : 10 Marks**  
**End semester : 60 Marks**  
**OR : 30 Marks**

**Pre-requisites:**

Basics of fluid mechanics, geology, geotechnical engineering, hydrology and surveying

**Course objectives:**

To introduce connections of agriculture and water with IWRP & M.

**Course outcomes:**

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

CO1. Understand concerned organizations, IWRP & M objectives, principles, challenges, application & analysis of IWRP&M approaches.

CO2. Understand water requirement for food production, assessment of surface and ground water quality.

CO3. Understand water economics and funding, application & analysis of planning for a sustainable water future.

CO4. Understand flood control & power generation for IWRP & M, application QIGIS for analysis of a basin for IWRP & M

**Unit I: Introduction to IWRP & M**

**(07 hours)**

Concept, definitions, objectives, principles, challenges and needs, components, approaches of IWRP & M, water as a global issue, introduction of global water partnership (GWP), introduction of central water commission (CWC), introduction of water and land management institute (WALMI), national water policy (only introductory), discussion of one case study, Dublin Principles (1992),

**Unit 2: Consideration for Agriculture, water supply & health****(07 hours)**

Agriculture in the concept of integrated water resources, water requirement for food production (numerical to be covered), blue Vs green water disputes, global water security -virtual water trading, irrigation methods and efficiencies of these methods (numerical to be covered), current water pricing, ground water quality protection, sea water intrusion into fresh water aquifers due to human activities, ground water recharge (no numerical on ground water), Importance of assessment of river water quality, prevention & control of surface & ground water pollution, cost effective water quality monitoring for basins, environmental impact assessment (EIA), central pollution control board (CPCB) regulations, need of training to water users for sustainability

**Unit 3: Water Economics and IWRP & M****(07 hours)**

Water as economic good, economic value of water, water scarcity, importance of Water to the Indian economy, principles of planning and financing of water resources project: discussion on any two case studies, sustainability principles for water management, framework for planning a sustainable water future, economics and decision making, inter-basin water transfers and integrated water resources management, water rights & priorities.

**Unit 4: Flood Control & Power Generation****(07 hours)**

Role of dams in flood control and power generation and its importance in IWRM, management of flood plains, flood risk mapping, flood forecasting and disaster relief, coordination between co-basins for flood management, use of QGIS for IWRM, effects of hydraulic structures on river surface profiles and sediment transport, hydro power generation, basic introduction of soft computing techniques for flood forecasting (only introductory).

**Text Books**

01 Integrated Water Resources Management: Water in South Asia Volume I, Peter P Mollinga, Ajaya Dixit and Kusum Athukorala, Sage Publications.

02 Ecosystem Principles and Sustainable Agriculture, Sithampanathan, Rangasamy A. and Arunachalam, N, Scitech Publications (India) Pvt. Ltd, Chennai.

**Reference Books:**

01. Water Resources System Planning & Management, M. C. Chaturvedi, Tata McGraw-Hill.

02. Water Resources Systems Engg, D. P. Loucks, Prentice Hall.

03. Economics of Water Recourses Plann.ing, L. D. James & R. R. Lee, McGraw Hills, New York

04. Integrated Water Resources Management: Global Theory, Emerging Practice and Local Needs, Peter P Mollinga, SAGE Publication
05. Principles of Water Resources: History, Development, Management and Policy, Thomas V., John Wiley and Sons Inc., New York. 2003.
06. Watershed Management in India, Murthy, J. V. S., Wiley Eastern Ltd., New York, 1995.
07. Soil Conservation and Land Management, Dalte, S.J . C., International Book Distribution

### **LABORATORY WORK:**

Term Work Term work will consist of the following. (Complete Any 8). **Oral** is based on the whole syllabus and term work.

- 01 Detail report on components and approaches of IWRP & M
- 02 Detail report on national water policy
- 03 Detail report on participatory irrigation management and water distribution societies
- 04 Detail report on effluent quality standards as per CPCB
- 05 Detail report on economics in IWRP & M and decision making
- 06 Detail report on Dublin Principles (1992)
- 07 Detail report on water economics considering case study.
- 08 Detail report on global water partnership (GWP)
- 09 Application of soft computing tool for flood forecasting
10. Application of QGIS for IWRM

### **CAA:**

Assignment for each unit.

## CE23052 – Green Building and Smart Cities

<b>Teaching Scheme:</b>	<b>Credits: 3</b>	<b>Examination Scheme:</b>
<b>TH: 2 Hrs./week</b>	<b>Theory: 2</b>	<b>CAA: 20 Marks</b>
		<b>In semester: 20 Marks</b>
		<b>End Semester: 50 Marks</b>
<b>PR: 2 Hrs./week</b>	<b>Practical: 1</b>	<b>TW: 20 Marks</b>

### Prerequisite:

1. Global Warming.
2. Building Materials.

### Course Objectives:

1. To understand the definition, concept & objectives of the green building and to imbibe basics of green
2. To understand planning specifications of green building.
3. To understand the definition, concept & objectives of the smart city.
4. To understand the policies of smart city.

**Course Outcomes:** After Completion of course students will be able to

CO1: Demonstrate green concept skills and apply tools of green building assessment.

CO2: Select appropriate green building material and technique.

CO3: Acquaint knowledge on smart cities planning and development.

CO4: Develop work break down structure, scheduling and project management of smart cities.

### Course Contents

#### Unit 1: Concept of Green Building

06 Hours

- a) Definition and history of Green Buildings, typical features of green buildings, Necessity, Initiatives, Green buildings in India, Green building Assessment- Green Building Rating Systems (BREEAM, USGBC, LEED, IGBC, TERI-GRIHA, GREEN STAR), Criteria for rating, Energy efficient criteria, environmental benefits economic benefits, health and social benefits, Major energy efficiency areas for building, Life cycle cost of buildings, Codes and Certification Program
- b) **Green Design:** Definition, Principles of sustainable development in Building Design, Characteristics of Sustainable Buildings, sustainably managed Materials, Integrated Lifecycle design of Materials and Structures (Concepts only).

#### Unit 2: Green Building Materials, Planning and Specifications

06 Hours

- a) **Green Building Materials:** Sustainably managed Materials, depleting natural resources of

building materials; renewable and recyclable resources; energy efficient materials; Embodied Energy of Materials, Green cement, Biodegradable materials, Smart materials, Manufactured Materials, Volatile Organic Compounds (VOC's), Natural Non-Petroleum Based Materials, Recycled materials, Renewable and Indigenous Building Materials, Engineering evaluation of these materials.

- b) **Green Building Planning and Specifications:** Environment friendly and cost-effective Building Technologies, Integrated Life cycle design of Materials and Structures, Green Strategies for Building Systems, Alternative Construction Methods, Energy Conservation Measures in Buildings, Waste & Water management and Recycling in Sustainable Facilities, Heating, Ventilation and Air Conditioning, Passive Solar & Daylight, Plumbing and its Effect on Energy Consumption.

**Unit 3: Introduction to Smart Cities**

**06 Hours**

- a) Introduction of Smart City, Concept of smart city, Objectives for smart cities, History of Smart city world and India. Need to develop smart city. Introduction to city planning, Concept, principle stakeholders, key trends in smart cities developments.
- b) **Intelligent transport systems:** Smart vehicles and fuels, GIS, GPS, Navigation system, traffic safety management, mobility services, E-ticketing.

**Unit 4: Project management and Policy for Smart City**

**06 Hours**

- a) **Project management:** Phases, Stages of project and work break down Structure, Project organization structure, Planning, Scheduling and CPM, Project cost analysis, resource allocation & leveling, Line of balancing technique., Project monitoring and control. Project risk management. Storage and conveyance system of water, sustainable water and sanitation, sewerage system, flood management, conservation system.
- b) **Policy for Smart City:** Integrated infrastructure management systems for smart city, Infrastructure management system applications for existing smart city. Worldwide policies for smart city Government of India - policy for smart city, Mission statement & guidelines, Smart cities in India, Case studies of smart city.

**Books & Other Resources:**

**Textbooks**

1. Alternative Building Materials and Technologies – By K S Jagadeesh, B V Venkata Rama Reddy & K S Nanjunda Rao – New Age International Publishers.
2. Integrated Life Cycle Design of Structures – By AskoSarja – SPON Press.
3. Green Buildings (McGraw hill publication): by Gevorkian.
4. Smart City on Future Life - Scientific Planning and Construction by Xianyi Li.

5. The Age of Intelligent Cities: Smart Environments and Innovation-for-all Strategies (Regions and Cities) by Nicos Komninos.
6. Mission statement & guidelines on Smart City Scheme". Government of India - Ministry of Urban Development.

**List of free reference guides/resources available on the net:**

1. [http://smartcities.gov.in/upload/uploadfiles/files/Smart City Guidelines](http://smartcities.gov.in/upload/uploadfiles/files/Smart%20City%20Guidelines).
2. IGBC reference guide.
3. Free abridged versions of LEED reference guides.

**For term work submission students have to complete following practical/assignments.**

**Term work**

1. Assignment on- Identify sources of pollution in your area.
2. Assignment on- Technology involved in different construction of green building.
3. Assignment on- Technology involved in different construction of smart building
4. Assignment on- Permanent installation of energy meter.
5. Assignment on- Reducing the consumption of water used outdoors

**Activity:**

One assignment on each unit.

## CE23411TH– Quantity Surveying Contract & Management

<b>Teaching Scheme:</b>	<b>Credits:</b>	<b>Examination Scheme:</b>
<b>TH: 3 Hrs./week</b>	<b>Theory: 3</b>	<b>CAA: 10 Marks</b>
		<b>In semester: 30 Marks</b>
		<b>End Semester: 60 Marks</b>
<b>PR: 2 Hrs./week</b>	<b>Practical: 1</b>	<b>TW: 30 Marks</b>

### Prerequisite:

1. Basics of Civil Engineering, Building Materials and Construction, Engineering Drawing, etc.

### Course Objectives:

1. Impart knowledge to prepare approximate and detailed estimate of Civil Engineering works
2. To draft detailed specification and work out rate analysis according to material, labor requirements as per specified norms.
3. To teach concepts of tendering process, contract document & Arbitration
4. Impart knowledge of valuation, depreciation to carry out valuation of properties

**Course Outcomes:** After Completion of course students will be able to

**CO1:** Understand the concept of estimation and prepare approximate estimates for various civil engineering works.

**CO2:** Prepare detailed estimates of buildings using different methods and calculate the quantity of steel using a Bar Bending Schedule (BBS).

**CO3:** Prepare detailed estimates of important civil engineering structures using different estimation methods.

**CO4:** Describe the tendering process, construction contracts, and aspects of arbitration, and prepare tender documents.

**CO5:** Analyze different types of construction contracts and tender procedures used in civil engineering projects.

**CO6:** Evaluate depreciation and valuation of property based on present condition, specifications, and prevailing market trends.

### Course Contents

#### Unit 1: Introduction to Estimates:

07 Hours

Definition of estimation. Purpose of estimation. Type of estimates, data required for estimation as a pre requisite. Meaning of an item of work, and enlisting the items of work for different Civil Engineering projects. Units of measurement. Mode of measurement of building items/ works. Introduction to components of estimates: face sheet, abstract sheet (BOQ), measurement sheet, Rate Analysis, lead statement. Provisional sum & prime cost items, contingencies, work charge establishment, centage charges administrative approval, Technical sanction Contingencies - Work charged establishments . Introduction to D. S. R. Definition- Purposes of approximate estimates - types

- Methods for preparing approximate estimates & numerical based on methods

## **Unit 2: Detailed Estimate**

**07 Hours**

Definition purposes of detailed estimate - Data required for preparation of detailed estimate. Methods of taking out quantities- long wall- short wall method and Centre line method Preparation of detailed estimate of R.C.C framed and load bearing structures. Bar Bending Schedule & its necessity - preparation of bar bending schedule of various structural elements.

## **Unit 3: Detail Estimate of Important Structures**

**(07 Hours)**

Estimate of Steel truss, septic tanks and slab culvert. Quantity Estimation for Roads: Computation of volume of earthwork fully in banking, cutting, partly cutting and partly filling by mid-section, trapezoidal and Prismoidal Methods.

## **Unit 4: Specification & Rate Analysis**

**07 Hours**

Specification for Civil Engineering Works: Objective of writing specifications essentials in specifications, general and detail specifications of different items of works in buildings and roads. Drafting detailed specifications for materials, quality, workmanship, method of execution, mode of measurement and payment for major items.

Rate Analysis: Meaning and factors affecting rate of an item of work, materials, sundries, labour, tools & plant, overheads & profit. Task work or out turn, factors effecting task work. Working out Rate Analysis for major items.

## **Unit 5: Contract Management**

**07 Hours**

Tenders: Definition, detailed tendering process and procedure, conditions regarding earnest money, security deposit, retention money, pre and post qualification of contractors, 3 bid, 2 bid and single bid system, qualitative and quantitative evaluation of tenders, comparative statement, pre-bid conference, acceptance/ rejection of tenders, BOT & Global Tendering, E-tendering. PWD procedure for executing, works piecework, rate list and daily labor, introduction to registration as a contractor in PWD.

Contracts: definition, objectives & essentials of a valid contract as per Indian Contract Act (1872), types of contracts, conditions of contract- defective work, subletting, etc. termination of contract,

defect liability period, liquidated damages, interim payment or running account bills, advance payment, secured advance, final bill. Arbitration: Introduction to arbitrations as per Indian Arbitration & Conciliation Act (1996) - meaning and need of arbitration, qualities and powers of an arbitrator.

### **Unit 6: Valuation**

**07 Hours**

Introduction, valuation- purpose, types of property-real property and personal property, meaning of price, cost and value, factors affecting value, gross income, net income, outgoings, various forms of values. concept of free hold and lease hold property, depreciation, methods of calculating depreciation, obsolescence, sinking fund, years purchase, annuity. Methods of valuation of land and building: rental basis, direct comparison method, profit based method, development method, and rent fixation for building. Methods of Valuation of land: belting method of land valuation and other methods.

### **Books & Other Resources:**

#### **Text Books:**

1. A Textbook of Estimating and Costing (Civil), D D Kohli and R C Kohli, S. Chand & company, New Delhi.
2. Civil Engineering Contracts and Estimates, B. S. Patil, Universities press
3. 03 A Text Book of Estimating and Costing for Civil Engineering, G.S. Birdie, Dhanpat Rai Publishing Company

#### **Reference Books:**

1. Estimating and Costing in Civil Engineering: Theory and Practice, B. N Dutta and S. Dutta, 28th revised edition, CBS Publishers and distributors.
2. Estimating, Costing Specifications & valuation in Civil Engineering, M. Chakraborty.
3. Estimating and Costing, R. C. Rangwala, Charotar Publishing House Pvt Ltd, Anand.
4. Theory and Practice of Valuation, Dr. Roshan Namavati, Lakhani Publications.
5. Valuation Principles and Procedures, Ashok Nain, Dewpoint Publication.
6. Laws for Engineers, Dr. Vandana Bhat and Priyanka Vyas, ProCare.

### **Hand books and Indian Standards**

1. Standard contract clauses for domestic bidding contracts: ministry of statistics and program implementation, Government of India.
2. Document: Federation International Des Ingenieurs Conseils (FIDIC) i.e. International Federation of Consulting Civil Engineers, Geneva, Switzerland.

3. Indian Practical Civil Engineers Handbook: P. N. Khanna, UBS Publication Distri. Pvt. Ltd.
4. Quantity Surveyor's Pocket Book by Duncan Cartlidge.
5. IS 1200: --- (Part 1 to 25): Methods of Measurement of Building & Civil Engineering Works, Bureau of Indian Standards, New Delhi.
6. IS 3861:1966, Method of measurement of areas and cubical contents of buildings, Bureau of Indian Standards, New Delhi.
7. D. S. R. (District Schedule of Rates) for current year.
8. PWD Redbooks, Vol 1 & 2

**For term work submission students have to complete following practical/assignments.**

**Term work**

1. Detailed estimate of load bearing structure
2. Working out detailed quantities of R.C.C. framed building.
3. Preparation of bar bending schedule of various structural elements
4. Detailed estimate for any one of the following
  - a. Factory Shed of Steel Roof Truss
  - b. Elevated Water Reservoir
  - c. Pipe/Slab Culvert
  - d. Road / Railway Track/Runway
5. Detailed specifications for major construction items of building/road
6. Working out rate analysis for major construction items of building/road.
7. Preparation of tender documents for exercise No. 1 or 2 (Preparation of schedule A & B, conditions of contract regarding time, labour payment, etc.) and collection of tender notice for different government construction works
8. Preparing valuation report of a Residential building and writing report using O-1 form
9. Appropriate software/excel spread sheet for exercise in serial No 1 to 4 is recommended.
10. Site visit and reports for understanding of BBS.
11. Estimation using any Software

**Activity:** Based on the above syllabus, assignments, case studies, and model-making activities (any one) will be conducted for each unit.

## CE23412C – Design of Precast and Composite Structures

<b>Teaching Scheme:</b>	<b>Credits: 04</b>	<b>Examination Scheme:</b>
<b>TH: 03 Hrs./week</b>	<b>Theory: 03</b>	<b>CAA: 10Marks</b> <b>In semester: 30Marks</b> <b>End Semester: 60 Marks</b>
<b>PR: 02 Hrs./week</b>	<b>Practical: 01</b>	<b>OR: 30 Marks</b>

### Prerequisite:

1. Fundamentals of Engineering Mechanics, Mechanics of Materials, Structural Analysis, Design of Steel and Concrete Structures.

### Course Objectives:

1. To study the principles and methods of composite and precast construction.

**Course Outcomes:** After Completion of course students will be able to

- CO1: Develop the understanding of design and problem-solving techniques.
- CO2: Analyze the idea of precast building.
- CO3: Learn the fundamentals and layout of precast buildings.
- CO4: Recognize the benefits, drawbacks, and necessity of composite materials.
- CO5: Analyze composite structures such as floors, beams, columns, and shear connectors using fundamental mechanical concepts.
- CO6: Design the structural components employing composite materials, comprehend and implement numerous provisions in accordance with Indian norms.

### Course Contents

#### Unit 1: Overview of Precast Concrete Constructions 07Hours

General fabrication principles, the necessity of prefabrication, how it differs from monolithic construction, types of prefabrication, prefabrication at sites and plants, prefabrication economy, modular coordination, standardization, materials, systems, production, transportation, and erection.

#### Unit 2: Production and Fabrication 06Hours

Production technology, production setup selection, manufacturing techniques, stationary and mobile production, production setup planning, precast element storage, dimensional tolerances, concrete hardening acceleration, hoisting technology, equipment for hoisting and erection, methods for erecting various types of members like beams, slabs, wall panels, and columns, vacuum lifting pads

#### Unit 3: Precast Concrete Element Design 07Hours

Introduction to prefabricated load carrying members: types of beams, design of simple rectangular and I beams, handling and erection stresses, removal of erection stresses in beams, types of slabs: roof and floor slab construction, hollow core slab design, columns: construction and design principles of columns, study of IS: 15916 and their applications.

#### **Unit 4: Overview of Composite Construction**

**06Hours**

Basic concepts, types of composite constructions, steel concrete composite, analysis, and design of simply supported composite beams with solid steel beams are all covered in this introduction to composite construction.

#### **Unit 5: Design of Shear Connectors**

**07Hours**

Introduction to shear connection types, functions, analysis, and design for concrete slabs and beams.

#### **Unit 6: Design of Composite Columns**

**06Hours**

Concepts and design, introduction to IS: 11384 and its applications, steel concrete composite column design, columns subjected to axial loads and moments, and encased composite construction of beams and columns.

#### **Books & Other Resources:**

##### **Textbooks**

1. Design and Construction of Precast Concrete Structures, Ramachandra Murthy D. S., 1st Edition, Dipti Press OPC Private Limited, Chennai.
2. Precast Concrete Structures, Hubert Bachmann and Alfred Steinle, Earns and Sohn.
3. Steel-concrete Composite Structures, Narayanan R, Vol. 7, CRC Press.

##### **Reference Books**

1. Handbook of Composite Construction Engineering, Gajanan M. Sabnis and Van Nostrand Reinhold Inc., U.S.
2. Composite Structures of Steel and Concrete: Beams, Slabs, Columns and Frames for Buildings, Roger P. Johnson, 4th Kindle Edition.
3. The Institute for Steel Development & Growth (INSDAG) course Material.

##### **Reference codes and standards:-**

1. IS 15916: 2010, Code of Practice for Building Design and Erection using Prefabricated Concrete, Bureau of Indian Standards, New Delhi.
2. IS 11384: 1985, Code of Practice for Composite Construction in Structural Steel and Concrete, Bureau of Indian Standards, New Delhi
3. IS 3935: 1966, Code of practice for composite construction, Bureau of Indian Standards, New Delhi.

**For term work submission students have to complete following practical/assignments.**

**Term work:** - Term work should consist of the following. Oral examination based on term work.

1. Assignment on any one topics from unit-1 in detail.
2. Assignment on any one topics from unit-2 in detail.
3. Full imperial drawing sheet: detailing of any one design problem from Unit 3 or Unit 4.
4. Full imperial drawing sheet: detailing of any one design problem from Unit 5 or Unit 6.
5. Report on site visit (Precast or Composite Structures) covering the contents of the syllabus Mentioned above.
6. Analysis and design of composite building using any suitable FE based software.

**Activity:** One assignment on each unit covering all topics.

## CE23412D – Geosynthetic Engineering

<b>Teaching Scheme:</b>	<b>Credits: 4</b>	<b>Examination Scheme:</b>
		<b>CAA: 10 Marks</b>
<b>TH : 03 Hrs/week</b>	<b>Theory: 3</b>	<b>In semester: 30 Marks</b>
		<b>End Semester: 60 Marks</b>
<b>PR : 02 Hrs/Week</b>	<b>Practical: 1</b>	<b>OR: 30 Marks</b>

### Prerequisite:

Geotechnical Engineering, Foundation Engineering

### Course Objectives:

1. To deal with the geo-synthetics as construction materials in Civil Engineering project.
2. To introduce the manufacture, behaviour and concept of geo-synthetics.
3. Applications of geo-synthetics in different Civil Engineering projects.

**Course Outcomes:** After Completion of course students will be able to

CO1: Explain types of Geo-synthetic material and its application in construction industry.

CO2: Define physical and engineering properties of geo-synthetics material.

CO3: Describe function of geo-synthetics material and its application in Geo environment Engineering.

CO4: Analyse effect of geo-synthetics in design of flexible pavements.

CO5: Design the reinforced soil retaining structures.

CO6: Explain mechanism of soil reinforcement to improve bearing capacity of soil.

Course Contents	
<b>Unit I: Overview of Geo-synthetics</b>	<b>(7 Hours)</b>
Types of geo-synthetics: Geo-textile, geo-grid, geo-nets, geo-membranes, geo-foam, geo-composite, introduction of geo-synthetic clay liners, primary functions of each geo-synthetics material, manufacturing of geo-synthetics, raw materials used, different types of geo-synthetics manufacturing system	
<b>Unit II: Properties of Geo-synthetics material</b>	<b>(6 Hours)</b>
Geo-synthetics testing, various properties of geo-synthetics, physical properties, mechanical properties, hydraulic properties and endurance properties	

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<b>Unit III: Functions of Geo-synthetics material</b>	<b>(7 Hours)</b>
Geo-synthetics in filtration, drainage and erosion control, mechanism of filtration and drainage function and their application, design step for erosion control and re-composite drainage, application of geo-synthetics in geo environment.	
<b>Unit IV: Geo-synthetics in Pavement</b>	<b>(6 Hours)</b>
Mechanism and concept of pavement, design of unpaved road using geo-synthetic material, giroud and Noiray method, airfield pavement design.	
<b>Unit V: Geo-synthetics in reinforced soil retaining wall</b>	<b>(7 Hours)</b>
Types of the facing element, construction procedure, cost, design of geo-synthetics wrap around face wall, geo-grid reinforced soil wall, geo-cell wall and gabion wall.	
<b>Unit VI: Geo-synthetics in ground improvement</b>	<b>(6 Hours)</b>
Consolidation technique, prefabricated vertical drain, ground instrumentation and monitoring, design of encased stone column, bearing capacity of geo-synthetics reinforced soil system, mechanism of geo-cell reinforced sand overlaying soft clay.	
<b>Books &amp; Other Resources:</b>	
<b>Textbooks:</b>	
1. Advanced Soil Mechanics, Das. B. M. 2008, Taylor and Francis group, London	
<b>Reference books:</b>	
1. Designing with Geo-synthetics. Vols. 1 & 2, Koerner, R. M., 6th Edition, Xlibris Corporation, USA. 02 Geo-synthetics Design and Construction Guidelines, Holtz. R. D., Christopher. B. R. and Berg. R. R. Technical Consultant, Dr. DiMaggio, U.S. Department of Transportation, Washington DC, FHWA-H1-98-038	
<b>For Oral examination students have to complete following practical/assignments.</b>	
The students have to perform at least 07 out of 10 of the following experiments.	
Oral Examination would be based on the practicals.	
<ol style="list-style-type: none"> <li>1. Determination of tensile strength of geotextile/geogris/ geonet.</li> <li>2. Determination of Puncture resistance of geomembrane.</li> <li>3. Determination of In -plane and cross-plane permeability of the Geotextile.</li> <li>4. Study and identification of different types of geosynthetics materials.</li> <li>5. Study of geocell reinforcement mechanism in soft soil.</li> </ol>	

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6. Determination of mass per unit area (GSM) of geotextile.
7. Determination of thickness of geotextile.
8. Determination of Apparent Opening Size (AOS) of geotextile.
9. Study of filtration and drainage mechanism using geotextile.
10. Model study of unpaved road reinforced with geosynthetics.

**Activity:**

Assignment on each unit.

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## CE23412F-GIS & Remote Sensing

<b>Teaching Scheme:</b>	<b>Credits: 4</b>	<b>Examination Scheme:</b>
<b>TH: 3 Hrs./week</b>	<b>Theory: 3</b>	<b>CAA: 10 Marks</b>
		<b>In semester: 30 Marks</b>
		<b>End Semester: 60 Marks</b>
<b>PR: 2 Hrs./week</b>	<b>Practical:1</b>	<b>OR: 30 Marks</b>

### Prerequisite:

The basic knowledge of Engineering Mathematic, Physics, Surveying, Engineering Geology

### Course Objectives:

- 01 To comprehend fundamentals and principles of RS and GIS techniques.
  - 02 To enhance students' capacity to interpret images and extract information of earth surface from multi-resolution imagery at multi-scale level.
  - 03 To develop skills of Image processing and GIS
  - 04 To utilize RS and GIS techniques in Engineering Geology and civil engineering.
  - 05 To study satellite image processing, satellite image interpretation, digitization and generation of thematic maps in a GIS.
  - 06 To learn buffering and layer analysis for civil engineering applications
- Course Outcomes:** After Completion of course, students will be able to
- CO1. Explain fundamentals and applications of GIS
  - CO2. Acquire skills of data processing and its applications using GIS
  - CO3. Distinguish working of various spaces-based positioning systems.
  - CO4. Articulate fundamentals and principles of RS techniques.
  - CO5. Demonstrate the knowledge of remote sensing and sensor characteristics.
  - CO6. Analyze the RS data and image processing to utilize in Civil Engineering.

### Course Contents

#### Unit I: Introduction to GIS

(7 Hours)

Geographic information system, definition, spatial and non-spatial data, data inputs, data storage and retrieval, data transformation, Introduction to cloud computing (types & applications), data reporting, advantages of GIS, essential elements of GIS hardware, software GIS data types, thematic layers and layer combinations, difference between drafting software's and GIS, fundamentals of cartography and map design, applications of RS and GIS in civil engineering, hydrogeology, engineering geology, surveying and mapping

#### Unit II: GIS Data types and interpretation

(7 Hours)

GIS data types and data representation, data acquisition, geo-referencing of data, projection systems, raster and vector data, raster to vector conversion, attribute data models and its types, remote sensing data in GIS, GIS database and database management system. Case studies: demarcation of dam catchment and command area, application in reservoir sediment analysis, application in land measurement work for land record department, applications of land use and land cover pattern, application in urban planning, applications in irrigation planning and scheduling, application in smart cities planning and development.

**Unit III: Introduction to GNSS**

**(7 Hours)**

Introduction to GNSS and Types, IRNSS, GPS, GPS components, differential GPS, types of GPS tracking, application of GNSS in surveying, mapping and navigation.

**Unit IV: Remote Sensing**

**(6 Hours)**

Definition and scope, history and development of remote sensing technology, electromagnetic radiation (EMR) and electromagnetic spectrum, EMR interaction with atmosphere and earth surface; atmospheric window, RS platforms, elements of remote sensing for visual interpretation viz. tone, shape, size, pattern, texture, shadow and association, applications in civil engineering/town planning.

**Unit V: Remote Sensing Satellites and Sensor Characteristics**

**(6 Hours)**

Types and their characteristics, types of sensors, orbital and sensor characteristics of major earth resource satellites, Indian remote sensing satellite programs, introduction to various open-source satellite data portals, global satellite programs, sensor classification, applications of sensor, concept of Swath & Nadir, resolutions, digital image. Introduction to spatial resolution, spectral resolution, radiometric resolution and temporal resolution, visual image interpretation, image interpretation

**Unit VI: Digital Image interpretation**

**(6 Hours)**

Digital image, visual image interpretation, image interpretation keys, concept of spectral signatures curve, digital image processing, preprocessing and post processing, image registration, image enhancement, image transformations, digital image classification (supervised & unsupervised). Digital elevation model (DEM) and its derivatives, triangular irregular network model (TIN) and other models & their applications.

### **Books & Other Resources:**

#### **Textbooks**

- 01 Principals of Remote Sensing, Panda B C, Viva Books Private Limited
- 02 Remote Sensing & Geographical Information System, M. Anji Reddy, BS Publications, Hyderabad.

#### **Reference Books**

- 01 Remote Sensing & Digital Image Processing, John R. Jensen, Department of Geography University of South Carolina Columbia
- 02 Remote Sensing and Image Interpretation, Lillesand Thomas M. and Kiefer Ralph, John Willey
- 03 Textbook on Remote Sensing, C. S. Agarwal and P. K. Garg, Wheeler Publishing

**Students have to complete seven experiments, out of which 1 to 6 are compulsory and any one from 7 to 9.**

- 01 Study of fundamental tools of software for data processing.
- 02 Import and export data GIS software to the Auto-CAD or Revit software and mention all the necessary steps used.
- 03 Geo-reference and Geo-tag using Google earth/ base map.
- 04 Digitize the given part of toposheet using software & attribute (Name, area, length, as per requirements).
- 05 Generation of thematic maps (contour, drainage, road etc.) in software.
- 06 Visual image interpretation from aerial photos and/or satellite images.
- 07 Preparation of DEM to study geomorphological features and nature of slope.
- 08 Explore utilization of RS and GIS for development of smart city.
- 09 Land use classification using RS data.

**Note: Use open-source software like QGIS, GRASS etc. for performing the experiments.**

**Oral examination is based on the above laboratory work.**

#### **CAA:**

Student should complete assignments on each unit as a part of CAA.

## CE23413A – Rural Water Supply and Sanitation

<b>Teaching Scheme:</b>	<b>Credits: 3</b>	<b>Examination Scheme:</b>
<b>TH: 2 Hrs./week</b>	<b>Theory: 2</b>	<b>CAA: 10 Marks</b> <b>In semester: Nil</b> <b>End Semester: 60 Marks</b>
<b>PR: 2 Hrs./week</b>	<b>Practical: 1</b>	<b>OR: 30 Marks</b>

### Prerequisite:

1. Basic knowledge of Environmental Engineering, Hydrology and Water Supply Engineering.

### Course Objectives:

1. To introduce techno-economic aspects of rural water supply systems.
2. To understand planning, design, and operation of rural water supply infrastructure.
3. To study administrative, socio-economic, and participatory approaches in rural water supply and sanitation.
4. To introduce modern technologies, automation, and sanitation systems for sustainable rural development.

**Course Outcomes:** After Completion of course students will be able to

1. Understand water availability issues and sources of rural water supply.
2. Analyze planning and design of rural water supply schemes and infrastructure.
3. Understand interdisciplinary aspects such as electro-mechanical systems, hydraulic design and automation.
4. Evaluate modern sanitation technologies, wastewater management, and sustainable practices in rural areas.

### Course Contents

#### Unit 1: Introduction to Water Related Issues

07 Hours

Source vs population relationship for groundwater and surface water, Reservation of water and permissions for lifting water from rivers, Water related issues in rural areas, Single village and group village water supply schemes, Groundwater occurrence and role of geology, Role of GSDA in groundwater development.

**Source strengthening methods:** horizontal bore, hydro-fracturing, well sinking. Yield test of open wells, tube wells and bore wells. Rainwater harvesting and traditional water storage systems. Water quantity and quality issues

#### Unit 2: Socio-Economic and Institutional Aspects

06 Hours

Role of departments involved in water conservation and supply. Participatory approach in rural water supply schemes, Community participation and role of Gram Panchayat, Capacity building and training of villagers, Financial schemes available for rural water supply, Government programs for water supply and sanitation, Case studies such as Hiware Bazar, Palsoshi (Bhor), Lamkani (Dhule).

#### Unit 3: Components and Design of Rural Water Supply Schemes

06 Hours

Single village and regional rural water supply schemes, Intake structures: jack well, pump house, percolation wells. Infiltration galleries and slotted pipe galleries. Conveyance systems: rising



mains and gravity mains. Selection of pipe materials and diameters. Hydraulic grade line and friction losses. Basic water treatment processes and water treatment plants. Storage reservoirs: ESR, GSR and MBR. Distribution systems and layout, House service connections and ferrule connections

#### **Unit 4: Modern Technologies and Rural Sanitation**

**07 Hours**

Pumps and pumping machinery used in water supply, Hydraulic testing of pipelines, Residual pressure requirements in distribution systems, SCADA and PLC based automation in water supply systems, Applications of GPS and GIS in water supply engineering, Hydraulic modelling and design software such as JALTANTRA. **Importance of sanitation for public health.** On-site sanitation systems: Septic tanks, soak pits, twin pit toilets. Decentralized wastewater treatment systems (DEWATS). Faecal sludge management and greywater reuse.

#### **Books & Other Resources:**

##### **Textbooks**

1. S. K. Garg – Water Supply Engineering, Khanna Publishers.
2. P. N. Modi – Water Supply Engineering, Standard Book House.

##### **Reference Books**

1. CPHEEO Manual on Water Supply and Treatment
2. Rural Water Supply And Sanitation by Sanjay Gupta
3. IWWA Technical Data Book (Available with IWWA Pune Local Centre)
4. Special Reference Material Recommended:

Compendium of Training Materials for the Capacity Building of the Faculty and Students of Engineering Colleges on Under the Unnat Maharashtra Abhiyan (UMA) Prepared By Institute for Resource Analysis and Policy, Hyderabad & CTARA, IIT Bombay Supported by UNICEF, Mumbai March, 2018

##### **Laboratory Experiments**

**The term work shall consist of a journal based on the 7 experiments from following list. Oral**

**Examination will be based on the term work.**

1. Study of rural water supply scheme components.
2. Field visit to rural water supply project.
3. Study of pumping machinery used in water supply.
4. Hydraulic calculations for rising mains.
5. Study of GIS/GPS applications in water supply.
6. Case study report on rural water supply or sanitation project.
7. Study of septic tank and rural sanitation systems.
8. Preparation of layout of village water supply scheme.

**Activity:** Assignments for each unit.



## CE23413B-Structural Design of Foundations

Teaching Scheme:	Credits: 3	Examination Scheme:
TH:3 Hrs./week	Theory: 2	CAA: 10 Marks End Semester: 60 Marks
PR: 2 Hrs./week	Practical: 1	OR: 30Marks

### Prerequisite:

Basics of geotechnical engineering

### Course Objectives:

- 01 To assess the soil condition at a given location in order to suggest suitable foundation based upon bearing capacity.
- 02 To study design procedure of raft foundation and Machine foundations.
- 03 To study design principles of pile foundation, pile caps, well and caissons foundations.
- 04 To have knowledge on methods of retaining structures.

**Course Outcomes:** After Completion of course students will be able to

CO 1- Design Raft foundations based on the suitability of the available soil category.

CO2- Decide suitable type of pile foundation for different soil stratum and evaluation of group capacity by formulation.

CO3- Design Retaining Structures.

CO4- Design different types of Machine foundations.

### Course Contents

#### Unit I: Raft Foundation

( 7 Hours)

Review of soil investigation, estimation of bearing capacity, Structural design of rafts by conventional method, principles of design of buoyancy raft and basement (no design problems), pressure relieve valves or ground/rock anchors (no design problems), concept of modulus of sub-grade reactions.

**Unit II: Pile Foundation****(6 Hours)**

Types of pile foundations and their applications, estimation of load capacity of piles by static and dynamic formulae, pile load test, settlement and detailing as per IS 2911, concept of negative skin friction, piles subjected to uplift load (including under reamed piles), structural design of piles and pile caps, modulus of sub-grade reaction for laterally loaded piles.

**Unit III: Retaining walls****(7 Hours)**

Types of flexible and rigid earth retention systems: counter fort, gravity, diaphragm walls, sheet pile walls, soldier piles and lagging, support systems for flexible retaining walls (struts, anchoring), construction methods, stability calculations, design of flexible and rigid retaining walls (Cantilever), types of reinforced earth (RE) walls, gabions, soil nailing & rock bolting.

**Unit IV: Machine Foundations****(6 Hours)**

General requirements and design criteria, analysis and design by Barkan's method, determination of coefficient of uniform elastic compression, design of a machine foundation, IS. Method of design (IS 2974).

**Books & Other Resources:**

- 01 Soil Mechanics and Foundation Engineering, A. K. Arora, Standard Publishers
- 02 Soil Mechanics and Foundation Engineering, B. C. Punmia, Laxmi Publication.
- 03 Foundation Engineering, P. C. Varghese, PHI learning private limited
- 04 Principles of Foundation Engineering, Dass B. M., Thomson Learning

**Reference books:**

- 01 Advanced Foundation Engineering, Murthy V. N. S., C.B.S. Publishers
- 02 Foundation Analysis and Design, Bowels J. E., McGraw-Hill International Book Co.
- 03 Foundation Design: Principles and Practice, Coduto, Donald P., Prentice Hall
- 04 Principles of Foundations Engineering, Braja M. Das, Thomson Asia (P) Ltd.
- 05 Foundation Design manual for Practicing Engineers, Nayak, N. V., Dhanpat Rai and Sons
- 06 Foundation Engineering Handbook, Robert W. Day, Tata McGraw- Hill Companies Inc.
- 07 Foundation Design and Construction, Tomlinson, M. J. and Boorman. R., ELBS Longman.

**Students have to complete 7 out of 10 practicals from the following list.**

1. Study and interpretation of soil investigation report including bore log data and identification of soil strata.

2. Determination of safe bearing capacity of soil using analytical methods based on \*\*Karl Terzaghi bearing capacity theory.
3. Design of a raft foundation by conventional method for a given column load and soil bearing capacity.
4. Determination of modulus of sub-grade reaction using plate load test data and its application in raft foundation design.
5. Estimation of load carrying capacity of piles using static and dynamic formulae.
6. Study and interpretation of pile load test results and preparation of load-settlement curve.
7. Design and reinforcement detailing of pile cap for a group of piles as per provisions of IS 2911.
8. Stability analysis of cantilever retaining wall including calculation of earth pressure, factor of safety against sliding and overturning.
9. Study of different flexible retaining systems such as sheet pile walls, soldier piles and lagging, and anchored retaining walls.
10. Design of block type machine foundation using \*\*Barkan method as per IS 2974 guidelines.

**CAA:**

Student should complete the assignment on each unit.

## CE23413E– Architecture and Town Planning

<b>Teaching Scheme:</b>	<b>Credits: 3</b>	<b>Examination Scheme:</b>
<b>TH: 2 Hrs./week</b>	<b>Theory: 2</b>	<b>CAA: 10 Marks</b> <b>In semester: Nil</b> <b>End Semester: 60 Marks</b>
<b>PR: 2 Hrs./week</b>	<b>Practical: 1</b>	<b>OR: 30 Marks</b>

### Prerequisite:

1. Fundamentals of Building Technology and Architectural Planning.

### Course Objectives:

1. To understand principles of architectural planning and landscaping for improved built environment.
2. To study fundamentals of town planning and planning hierarchy in urban development.
3. To analyze civic surveys and infrastructure planning required for development plans.
4. To understand planning regulations, acts and modern tools used in town planning.

**Course Outcomes:** After completion of course students will be able to

- CO1: Apply principles of architectural planning and landscaping for improving quality of life.
- CO2: Explain town planning concepts, planning hierarchy and development plans.
- CO3: Analyze civic survey data and urban infrastructure requirements.
- CO4: Interpret planning acts, guidelines and modern planning tools used in urban and rural planning.

### Course Contents

#### Unit 1: Architectural Planning and Landscaping 07 Hours

**Principles and elements of architectural composition:** Balance, symmetry, rhythm, proportion, scale and harmony. Qualities of good architecture such as user-friendly design, contextual architecture, eco-friendly buildings and future expansion. Role of Architect and urban planner in spatial planning. Landscaping objectives, principles and elements, Soft and hard landscape materials, Green roofs, vertical gardens and sustainable landscape design, Urban renewal and conservation.

#### Unit 2: Town Planning 06 Hours

Scope, purpose and benefits of town planning, Components of Town planning including land use planning, housing, transportation and environmental planning, Levels of planning: regional plan, development plan, town planning scheme and neighborhood planning, Concept of satellite towns and new towns, Legislative mechanism for preparation of Development Plans with reference to MRTTP Act 1966, Use of GIS, Remote Sensing and GPS in planning.

#### Unit 3: Civic Survey and Urban Infrastructure 06 Hours

Civic surveys and their importance in preparation of development plans, Types of surveys such as demographic, housing, land use, water supply and sanitation surveys, Planning agencies such as CIDCO, MHADA, MIDC, MMRDA/PMRDA, SRA and HUDCO, Traffic and transportation systems including hierarchy of roads, traffic management and Intelligent Transport Systems (ITS).



#### **Unit 4: Planning Acts, Special Townships and Rural Planning**

**07 Hours**

Land Acquisition, Rehabilitation and Resettlement Act 2013, Real Estate Regulation and Development Act 2016 (MAHA-RERA). URDPFI guidelines for urban planning, National Urban Digital Mission (NUDM) and AMRUT 2.0, Special townships such as SEZ and CRZ, Application of GIS, GPS and Remote Sensing, Digital Twins, 3D LiDAR, and GeoAI in town planning, Need and strategies for rural planning.

#### **Books & Other Resources:**

##### **Textbooks**

- 01 Town Planning, G. K. Hiraskar, Dhanpat Rai Publications
- 02 Town Planning, S. C. Rangwala, Charotar Publishing House Pvt. Ltd.

##### **Reference Books**

- 01 MRTP Act 1966 : The director, government printing, stationary and publications, Maharashtra state, Mumbai
- 02 URDPFI & AMRUT Guidelines: Ministry of housing and urban affairs, Government of India
- 03 LARR Act 2013: Ministry of law and justice, Government of India
- 04 Climate Responsive Architecture, Arvind Krishnan, Nick Baker, Simos Yannas and Steve Szokolay, McGraw Hill Education
- 05 An Introduction to Landscape Architecture, Michael Laurie, American Elsevier Publishing Company

**The term work shall consist of a journal based on the following experiments. Oral Examination would be based on the term work.**

**Experiment No. 1, 2 and 10 are compulsory and any five from remaining.**

1. Study and analysis of development plan with respect to land use, services, infrastructure and housing.
2. Neighbourhood planning with basic calculations.
3. Report on contribution of engineers, planners and architects in post-independence India.
4. Study of any planned city or satellite town (e.g., Navi Mumbai or Gandhinagar).
5. Study of salient features of urban renewal schemes.
6. Study of any existing town planning scheme.
7. Study of URDPFI or AMRUT guidelines with a case study.
8. Study of special townships such as SEZ, CRZ or rural planning strategies.
9. Study of urban conservation or traditional sustainable architecture.
10. E-learning report on MAHA-RERA portal.

**Activity:** Assignments for each unit.



## CE23413F – Advanced Transportation Engineering

Teaching Scheme:	Credits: 03	Examination Scheme:
TH: 02 Hrs./week	Theory: 02	CAA: 10 Marks End Semester: 60 Marks
PR: 02 Hrs./week	Practical: 01	OR: 30 Marks

### Prerequisite:

1. Surveying and levelling, concrete technology and fundamental of transportation engineering.

### Course Objectives:

1. To create a methodical approach to the urban transportation system.
2. To provide information about sustainable transportation.
3. To develop effective pavement structures.

**Course Outcomes:** After Completion of course students will be able to

- CO1: Evaluate travel demand model and forecasting.
- CO2: Analysis relative importance of various modes and their capacities.
- CO3: Determine the fundamental features of the signal design and traffic stream.
- CO4: Analysis and design flexible pavements.

### Course Contents

#### Unit 1: Planning for Transportation Systems

06 Hours

Destination surveys, origin types, and the transportation planning process. Origin: destination matrix; travel demand forecasting; trip generation: growth factor and synthetic models; modal split analysis; trip distribution and route assignment analysis; transportation system management (TSM); use in detailed project reports (DPR) and comprehensive mobility plans (CMP).

#### Unit 2: Non-Motorized Transportation (NMT) and Urban Transportation Technology

06Hours

Introduction of NMT in sustainable urban development, Classification of transit system, introduction to intelligent transportation system (ITS) and its application for urban roads (IRC SP 110:2017), public transport policy (National and Maharashtra State), introduction to BRT, Mono rail, Metro rail, Bullet train and Hyperloop, use of drone, concept of integrated inter model transit system, freight transportation. Environmental impact assessment: EIA requirement of highway projects.

#### Unit 3: Systems of Traffic

07Hours

Traffic Stream Models: Indo-HCM, Greenshield's model, Greenberg's logarithmic model, and the Highway Capacity Manual's (HCM) notion of level of service (LOS). Concepts of queuing and delay in traffic streams, Webster's and IRC methods for designing traffic signals, a summary of IRC SP: 12-2015, and rules for parking facilities in cities.

#### **Unit 4: Analysis and Design of Flexible and Rigid Pavement**

**07Hours**

Analysis and design of flexible pavement as per IRC 37: 2018 (Complete design including the use of IITPAVE), distresses in flexible pavement and recommended rectification as per IRC 82: 2015, surface unevenness and measuring road roughness as per IRC SP: 16 - 2019. Analysis and design of flexible pavement as per IRC 58: 2015.

#### **Books & Other Resources:**

##### **Textbooks**

1. Traffic Engineering and Transport Planning, L R Kadiyali, Khanna Publishers.
2. Understanding Traffic System, Michel A Taylor, William Young, Peter W Bonsall.
3. Principles of Urban Transport Systems Planning, B. G. Hutchinson.
4. Principles of Transportation Engineering, Partha Chakraborty and Animesh Das.
5. Introduction to transport planning, M. J. Bruton.

##### **Reference Books**

1. Transport Networks, Potts Oliver (Academic Press).
2. Principles of Pavement Design, E. F. Yoder (John Wiley & Sons, Inc USA).
3. Fundamentals of Transportation Engineering, C. S. Papacostas.
4. Pavement analysis and Design, Huang Y H, Prentice Hall, Englewood Cliff, New Jersey.
5. Introduction to Transportation Engg. and Planning, Morlok E K, McGraw-Hill company.
6. Fundamentals of Traffic Flow Theory, Drew, McGraw-Hill book co.
7. A Course in Traffic Planning and Design, Saxena Subhash, Dhanpat Rai & sons, Delhi.

##### **Indian Standards and Handbooks:**

1. IRC 37-2018, Guidelines for the design of Flexible Pavement (Fourth Revision).
2. IRC 58-2015, Guidelines for the Design of Plain Jointed Rigid Pavements for Highways (Fourth Revision).
3. IRC 81-1997, Guidelines for Strengthening of Flexible Road Pavements using Benkelman Beam Deflection Technique (First Revision).
4. IRC 82-2015, Code of Practice for Maintenance of Bituminous Surfaces of Highways.
5. IRC SP 110: 2017, Application of Intelligent Transport System for Urban Roads.
6. IRC SP: 12 – 2015, Guidelines for Parking Facilities in Urban Areas (First Revision).
7. IRC 93: 1985, Guidelines on Design and Installation of Road Traffic Signals.
8. IRC SP: 16 – 2019, Guidelines on Measuring Road Roughness and Norms. (Second Revision).
9. IRC SP: 83 – 2018, Guidelines for Maintenance, Repairs & Rehabilitation of Cement Concrete Pavements.
10. Handbook of Road Technology, Lay M. G. Gordon Breach Science Pub. Newyork.

**For term work submission students have to complete following practical/assignments.**

**Term work:** - The oral examination will be based on the following term work.

1. Marshall Stability Test: Evaluates strength and flow properties of bituminous mixes for pavement design.
2. Traffic Signal Design: Designing signal timing and phasing for intersections.
3. Traffic Volume Studies: Manual or automatic counts at junctions and mid-blocks.
4. Benkelman Beam Deflection: Assessing in-situ flexible pavement strength.
5. Sustainable Material Analysis: Testing road performance using plastic waste or recycled materials.

**Activity:** Assignments for each unit.

## CE23414PR- Project

Teaching Scheme:

Credits: 4

Examination Scheme:

PR: 8 Hrs./week

Practical: 4

TW: 80 Marks

TW: 50 Marks

### Prerequisite:

Project Based Learning, Internship/Mini Project, Laboratory works, Skill Development, Audit Courses, Industrial Visits

### Course Objectives:

1. To identify and analyze contemporary technical and practical problems in various domains of Civil Engineering, considering real-world constraints and emerging trends.
2. To develop the ability to understand, interpret, and critically analyze technical literature and engineering data, enhancing problem-solving skills.
3. To build competence in technical report writing and effective presentation, thereby fostering critical thinking, professional communication, and documentation skills.

**Course Outcomes:** After Completion of the course students will be able to

CO1: Identify and explain contemporary problems and recent advancements in Civil Engineering domains.

CO2: Apply appropriate engineering knowledge and tools to formulate problem statements and develop methodologies.

CO3: Analyze technical literature, research papers, and case studies to extract relevant information and insights.

CO4: Evaluate alternative solutions and interpret results to draw meaningful engineering conclusions.

CO5: Design and develop a solution/project model/system considering practical constraints and standards.

CO5: Demonstrate effective communication through technical presentations and viva voce, showcasing clarity and confidence.

CO5: Exhibit teamwork, project management, and ethical responsibility in executing Civil Engineering

### Course Contents

#### Project Identification and Problem Definition

- Identification of real-life Civil Engineering problems
- Selection of project topic based on societal/industrial needs
- Defining objectives, scope, and limitations
- Problem statement formulation
- Planning and scheduling of project work

#### Literature Review and Data Collection

- Review of recent literature (journals, codes, reports, case studies)

- Identification of research gaps
- Collection of field/experimental/secondary data
- Use of relevant standards (IS codes, IRC, etc.)
- Documentation of literature findings

#### **Methodology and Theoretical Development**

- Development of methodology/approach for the project
- Analytical, experimental, or numerical methods
- Use of software tools (e.g., ETABS, STAAD, Excel, MATLAB, GIS, etc.)
- Design considerations and assumptions
- Flowchart/model development

#### **Analysis, Design, and Implementation**

- Analysis and/or design as per project requirements
- Execution of experimental/field work (if applicable)
- Data processing and interpretation
- Application of relevant codes and standards
- Optimization and validation techniques

#### **Results, Discussion, and Validation**

- Presentation of results (graphs, tables, charts)
- Critical analysis and discussion of findings
- Comparison with standard practices/literature
- Validation of results (analytical/experimental/software-based)
- Addressing limitations and errors

#### **Report Writing and Presentation**

- Preparation of detailed project report in standard format
- Technical writing: clarity, formatting, referencing
- Use of plagiarism-free content and proper citations
- Preparation of drawings, charts, and annexures
- Oral presentation and viva voce

#### **Professional and Societal Aspects**

- Consideration of sustainability and environmental impact
- Safety, ethics, and professional responsibility
- Cost analysis and feasibility (if applicable)
- Societal relevance and impact of the project
- Scope for future work and innovation

**Additional Requirements:**

- Submission of final project report (hard + soft copy)
- Presentation and viva voce examination
- Publication/presentation in conference/journal (recommended)
- Maintenance of project diary/logbook

**Web References:**

1. SWAYAM-NPTEL Course.
2. MOOCs' Courses.

**Guidelines for Project Execution****At the end of the 6<sup>th</sup> Semester,**

1. A group of 3-4 students shall be formed according to their suitability.
2. Students will interact with guides for the scope and outline of the project.
3. A maximum of two groups will be given to a guide.
4. Guide and Project groups will be finalized at the end of the sixth semester so that project work can be started at the start of the seventh semester.

**During the 7<sup>th</sup> Semester,**

1. Project topic Identification and Literature review are expected to be done during the 7<sup>th</sup> semester.
2. Project Topic Identification Presentation is to be taken at the end of the 7<sup>th</sup> semester, in which student groups will present their problem statement along with a literature review related to the topic.
3. Students can prepare and submit a review paper to a reputed journal/conference based on the literature review completed.
4. Project activities in the 7<sup>th</sup> semester are to be executed in conjunction with the other courses, Research Methodology (Termwork), and Internship.

**During the 8<sup>th</sup> Semester,**

1. Project work is expected to be done in the Project Lab.
2. Projects must be executed in association with industrial experts/facilities.
3. Progress of project work is monitored regularly on weekly project slots/project days.
4. Regular interval presentations are to be arranged to review and assess the work.
5. Project work is monitored and continuous assessment is done by guides and authorities.

### Activity

10 marks will be allocated for Participation activities. Students shall prepare and submit a review/research paper to a reputed journal/conference, and are encouraged to file a Patent or Copyright based on their project work. Evaluation will be based on quality, originality, and adherence to publication/IPR standards (10 marks).

### Term Work

1. In Project, one topic approval presentation and two reviews shall be taken for a total of 30 marks (10 marks each)

2. Review I shall be based on the approximate end of Design/Experiment/Numerical validation, etc., in front of an expert panel from the department.

3. Review II shall be based on the complete project work in front of an expert panel from the department.

4. The evaluation committee shall consist of the Guide, one Industry person, and two Faculty appointed by the Institution.

5. Students shall be encouraged to publish a research paper/patent/technical note. Their credential shall be considered during the term work evaluation.

- The student shall prepare the duly certified final report of project work in standard format for satisfactory completion of the work by the concerned guide and head of the Department/Institute.

- Recommended performance measure parameters may include: Problem definition and scope of the project, Literature Survey, Appropriate Engineering approach used, Exhaustive and Rational Requirement Analysis.

- Comprehensive Implementation - Design, modeling, documentation, Usability, Optimization considerations (Time, Resources, Costing), Thorough Testing, Project Presentation and Demonstration (ease of use and usability), Social and environmental aspects.

- The term work under the project submitted by students shall include a Work Diary; Work Diary to be maintained by a group and countersigned by the guide (weekly). The contents of the work diary shall reflect the efforts taken by project group for;

- a. Searching suitable project work

- b. Brief report preferably on journals/research or conference papers/books or literature surveyed to select and bring up the project.

- c. Brief report of feasibility studies carried to implement the conclusion.

- d. Rough Sketches/ Design Calculations

- e. Synopsis

- The group should submit the synopsis in the following form.

- i. Title of Project

- ii. Names of Students

- iii. Name of Guide

iv. Relevance

v. Present Theory and Practices

vi. Proposed work

vii. Expenditure

viii. References

- The synopsis shall be signed by each student in the group, approved by the guide (along with the external guide in case of sponsored projects), and endorsed by the Head of the Department.
- Presentation: The group has to make a presentation in front of the faculty of the department at the end of the semester.

### **Examination Scheme**

1. The examination committee shall consist of the Internal Examiner and the External Examiner appointed by the Department. (External Examiner shall be a competent Industry/Research/Laboratory person.)
2. Soft copies of the project shall be shared with the examination committee well in advance
  - During examination Internal examiner (preferably the guide) and the External examiners jointly evaluate the project work.
  - During the process of monitoring and continuous assessment & evaluation, the individual and team performance is to be measured.
  - The project term work shall be evaluated based on reviews.
  - The final presentation shall be taken in front of an external examiner and will be evaluated 50 for 30 marks, 15 marks for presentation (Oral, Written), 15 marks for quality of the project work

### **Presentation of Project Work**

Presentation of work in the form of Project Report (s), Understanding individual capacity, Role & involvement in the project, Team Work (Distribution of work, intra-team communication and togetherness), Participation in various contests, Publications and IPR, Manuals (Project Report, Quick reference, System, Installation guide) among other parameters. Team members with guide information shall be added at the end of the report.

### **Project Report**

1. The report shall be both side print hard bound. A hardbound report shall be made after examination and the examiner and guide's expected correction, before that report must be loosely bound.
2. Plagiarism check is a must, and the certificate shall be attached in the report.
3. A group activity shall be presented in the report.
4. Report copies shall be submitted to the department, one for the department and one for the supervisor.
5. For standardization of the project reports, the following format shall be strictly followed. Page

size: Trimmed A4

Top Margin: 1”

Bottom Margin: 1.32”

Left Margin: 1.5”

Right Margin: 1”

Para Text: Times New Roman 12-point font Line Spacing: 1.15 Lines

Page Numbers: Right-aligned at footer. Font 12-point Times New Roman Headings: Times New Roman, 14 Points, Boldface 10.

### **Certificate**

1. All students shall attach a standard format of Certificate as described by the department.
2. Certificates shall be awarded to project groups and not individual students of the group.
3. Certificates shall have signatures of Guide, External Examiner, HOD and Principal.

### **Index of Report**

1. Title Sheet
2. Certificate (Institution)
3. Certificate (Company, if sponsored by company)
4. Acknowledgement
5. Abstract of the Project
6. List of Figures
7. List of Photographs / Plates
8. List of Tables
9. Table of Contents
10. Introduction
11. Literature Survey / Theory
12. Design / Experimentation / Fabrication / Production / Actual work carried out for the same
13. Observation Results
14. Discussion on Result and Conclusion
15. Student and Guide details. (A common photograph with project)

### **References:**

References format MUST BE STANDARD API 7<sup>th</sup> STYLE

## HS23404- PUBLIC SPEAKING AND APTITUDE

<b>Teaching Scheme</b>	<b>Credits: 02</b>	<b>Examination Scheme</b>
Theory 1 Hr. / Week	Theory Credit: 1	<b>CAA:</b> 40 Marks
Tutorial 1 Hr. / Week	Tutorial Credit: 1	<b>Oral:</b> 30 Marks

### Course Objectives:

1. To develop effective public speaking styles through conversational and communication skills and also enhance speaking skills by focusing on body language and understanding the situational requirements for effective public speaking
2. To develop students' quantitative, logical and analytical abilities required to solve aptitude-based problems commonly encountered in competitive examinations and also enhance their problem-solving speed, decision-making ability and logical reasoning skills

### Course Outcomes: On the completion of the course, students will be able to:

1. Communicate effectively in various public speaking situations and deliver organised and engaging speeches with appropriate body language, voice modulation and confident speech techniques
2. Apply appropriate quantitative, logical, and reasoning strategies to efficiently solve numerical aptitude, data interpretation, and logical reasoning problems with improved speed and accuracy in placement and competitive examination contexts and apply rapid analytical, logical and decision-making strategies to solve time-bound problems with improved accuracy and efficiency

### Course Contents:

#### Unit 1: Essentials and Art of Public Speaking

**(6 Hours)**

Sentence Mastery (Sentence Structure + Subject-Verb Agreement), Verb Tense Control (Past / Present / Future Tenses), Functional Usage (Prepositions + Common Errors & Correct Usage), Verbal & Non-Verbal Communication, Active Listening Skills, Public Speaking & Presentation Skills, Confidence Building, Interpersonal Skills & Relationship Building, Teamwork & Collaboration, Body Language & First Impression, Professional Email, Message & Business Writing, Time Management & Prioritization, Interview Skills & Group Discussion, Workplace Etiquette &

Professional Behavior, Emotional Intelligence & Anxiety Control, Stress Management & Work-Life Balance, LinkedIn Profile & Resume Writing, Mock Interviews & Feedback

**Unit 2: Quantitative Aptitude**

**(6 Hrs)**

Number System, Percentages, Ratio & Proportion, Profit, Loss & Discount, Averages, Time, Speed & Distance, Time & Work + Pipes, Simple & Compound Interest (Basic), Data Interpretation (DI), Data Sufficiency, Seating Arrangement (Linear & Circular), Blood Relations, Coding-Decoding, Syllogisms, Statement-Assumption / Argument

**Textbooks & Other Resources:**

1. King, Dale. *Effective Communication Skills: The Nine-Keys Guidebook for Developing the Art of Persuasion through Public Speaking, Social Intelligence, Verbal Dexterity, Charisma, and Eloquence*, Hamatea Publishing Studio, 2020
2. King, Patrick. *How to Speak Effectively: Master Communication Skills, Public Speaking and Influence | Improve Conversations, Confidence, and Social and Professional Presentations, and Making an Impact on People*, Penguin, 2024
3. Tuhovsky, Tuhovsky. *Communication Skills: A Practical Guide to Improving Your Social Intelligence, Presentation, Persuasion and Public Speaking: 9 (Positive Psychology Coaching)*, Createspace Independent Publishing, 2015
4. Aggarwal. R.S., *Quantitative Aptitude for Competitive Examinations*, S Chand and Company Ltd. 2025

## OE23019 – Architectural Technology

Teaching Scheme:

Credits: 2

Examination Scheme:

TH: 2 Hrs./week

Theory: 2

CAA: Nil

In semester: Nil

End Semester: 50 Marks

### Prerequisite:

1. Basics of Civil Engineering, Building Planning.

### Course Objectives:

1. To understand architectural design concepts
2. To practice Architectural Graphics tools
3. To justify use of software for preparation of statutory drawings
4. To explain building codes and regulations for development control

**Course Outcomes:** After completion of course students will be able to

1. Understand architectural design concepts
2. Practice Architectural Graphics tools
3. Justify use of software for preparation of statutory drawings
4. Explain building codes and regulations for development control

### Course Contents

#### Unit 1: Architectural Design

07 Hours

Study of anthropometry and its association with built environment, understanding space and its volumetric sense through various configurations, exploring form alternatives with a sense of visual appeal, interrelationships of form and function. Expressing design ideas through presentation drawings.

#### Unit 2: Architectural Graphics

06 Hours

**Introduction:** Basic terminology of perspective drawing - Vanishing Point, Horizon, Picture Plane, Point of View, Projection Plane, Reference Plane. Perspectives - One Point Perspective, Two Point Perspective, Three Point Perspective. **Sociography:** Study of shades and shadows cast by building surfaces or a combination of objects on each other in perspective.

#### Unit 3: Use of Software's

06 Hours

**AutoCAD:** Creation of files, tools, commands, layers, blocks and symbols in AutoCAD; Creation of orthographic projections, isometric views and 2-D drawing of solids through AutoCAD. **Google SketchUp:** Development of a set of architectural drawings.

#### Unit 4: Building Codes and Regulations

07 Hours

Historical background and need for codes and bye-laws for buildings and land use development in urban context. National Building Code and provisions related to general building requirements, fire and life safety, lighting and ventilation, MEP, acoustics, vertical circulation, sustainability etc. Energy Conservation Building Code. Overview of various development regulations, building bye-laws and architectural controls. Study of building bye-laws/regulations of selected cities with emphasis on zoning, architectural controls and frame controls. Requirements of statutory drawings



- submission drawings, as built drawings and completion drawings.

### **Books & Other Resources:**

#### **Textbooks**

1. Ching, F.D.K., "Design Drawing", Van Nostrand Reinhold.
2. Dorley, Scott, Witthoft, Scott, "Make Space – How to set the stage for creative collaboration", John Wiley & Sons.
3. Bhatt, N.D. and Panchal, V.M., "Engineering Drawing – Plane and Solid Geometry", 48th Ed., Charotar Publishing House.
4. Griffin, A.W. and Brunicardi, V.A., "Introduction to Architectural Presentation Graphics", Prentice Hall..

#### **Reference Books**

1. Watson, D. (Editor), "Time-saver Standards for Architectural Design: Technical Data for Professional Practice", 8th 2003/2005 Ed., McGraw-Hill.
2. Mike Tardos, "Google SketchUp", Peachpit Press.
3. Ellen Finkelstein, "AutoCAD 2012 and AutoCAD LT 2012 Bible", Wiley Publishing Inc.
4. National Building Code.
5. ECBC (Energy Conservation Building Code).
6. Building Byelaws of different cities of India.

