

RAMAIAH Institute of Technology

# CURRICULUM

# **Outcome Based Education**

Academic year 2023 – 2024

# **CIVIL ENGINEERING**

V & VI SEMESTER B.E.

# **RAMAIAH INSTITUTE OF TECHNOLOGY**

(Autonomous Institute, Affiliated to VTU) Bangalore – 560054.

### About the Institute:

Dr. M. S. Ramajah a philanthropist, founded 'Gokula Education Foundation' in 1962 with an objective of serving the society. M S Ramajah Institute of Technology (MSRIT) was established under the aegis of this foundation in the same year, creating a landmark in technical education in India. MSRIT offers 17 UG programs and 11 PG programs. All these programs are approved by AICTE. All eligible UG and PG programs are accredited by National Board of Accreditation (NBA). The institute is accredited with 'A+' grade by NAAC in March 2021 for 5 years. University Grants Commission (UGC) & Visvesvarava Technological University (VTU) have conferred Autonomous Status to MSRIT for both UG and PG Programs since 2007. The institute has also been conferred autonomous status for Ph.D. program since 2021. The institute is a participant to the Technical Education Quality Improvement Program (TEOIP), an initiative of the Government of India. The institute has 380 competent faculty out of which 67% are doctorates. Some of the distinguished features of MSRIT are: State of the art laboratories, individual computing facility for all faculty members, all research departments active with sponsored funded projects and more than 300 scholars pursuing Ph.D. To promote research culture, the institute has established Centre of Excellence for Imaging Technologies, Centre for Advanced Materials Technology, Centre for Antennas and Radio Frequency systems (CARFS), Center for Cyber Physical Systems, Schneider Centre of Excellence & Centre for Bio and Energy Materials Innovation, Ramaiah Institute of Technology has obtained "Scimago Institutions Rankings" All India Rank 107 & world ranking 600 for the year 2022.

The Entrepreneurship Development Cell (EDC) and Section 8 company "Ramaiah Evolute" have been set up on campus to incubate startups. **M S Ramaiah Institute of Technology is recognized by Atal Ranking of Institutions on Innovation Achievements (ARIIA), MoE, Govt. of India.** MSRIT has a strong Placement and Training department with a committed team, a good Mentoring/Proctorial system, a fully equipped Sports department, large air-conditioned library with good collection of book volumes and subscription to International and National Journals. The Digital Library subscribes to online e-journals from Elsevier Science Direct, IEEE, Taylor & Francis, Springer Link, etc. The Institute is a member of DELNET, CMTI and VTU E-Library Consortium. The Institute has a modern auditorium, recording studio, and several hi-tech conference halls with video conferencing facilities. The institute has excellent hostel facilities for boys and girls. MSRIT Alumni have distinguished themselves by occupying high positions in India and abroad and are in touch with the institute through an active Alumni Association.

As per the National Institutional Ranking Framework (NIRF), MoE, Government of India, Ramaiah Institute of Technology has achieved 78<sup>th</sup> rank among 1314 top Engineering Institutions & 23<sup>rd</sup> Rank for School of Architecture in India for the year 2023.

#### **About the Department:**

The Department of Civil Engineering was started as the third department in the institute with an intake of 60 students in the year 1971. Structural Engineering was first Post Graduate program started in the year 1984 of the institute with an intake of 10 students. The UG and PG programs have been accredited by NBA for three years 2017-2020 and 2019-2022 respectively. After obtaining the autonomous status in the year 2007, the department focused towards providing state of the art curriculum development, offering electives of the present day need and techno innovative projects. These initiatives resulted in enhanced performance of the students in terms of increase in placement, increase in the number of students writing competitive examinations and pursuing higher education in the foreign universities.

Further Department of Civil Engineering was recognized as a research centre in the year 1994 leading to PhD/MSc in Civil Engineering under Bangalore University till 1994 and later it was brought under State Technological University VTU. The research centre has attracted 30 PhD research scholars to pursue their degree from this research centre and 19 research scholars have completed PhD degree. The areas of research include Structural Engineering, Transportation Engineering, Geo-Technical Engineering, Water Resources Engineering and Environmental Engineering.

The Department has close interaction with number of industries and Government agencies through R&D, and consultancy works. It also has MOU's with industries and other institutes for improved interactions and coordination with outside world.

# **VISION OF THE INSTITUTE**

To be an Institution of International Eminence, renowned for imparting quality technical education, cutting edge research and innovation to meet global socioeconomic needs

# **MISSION OF THE INSTITUTE**

#### MSRIT shall meet the global socio-economic needs through

- 1. Imparting quality technical education by nurturing a conducive learning environment through continuous improvement and customization
- 2. Establishing research clusters in emerging areas in collaboration with globally reputed organizations
- 3. Establishing innovative skills development, techno-entrepreneurial activities and consultancy for socio-economic needs

# **QUALITY POLICY**

We at M. S. Ramaiah Institute of Technology strive to deliver comprehensive, continually enhanced, global quality technical and management education through an established Quality Management System complemented by the synergistic interaction of the stake holders concerned

# VISION OF THE DEPARTMENT

To become a premier Department to impart state-of-the-art technical knowledge and professional skills through effective learning process with research ambience to produce global quality Civil Engineers to develop sustainable society.

# **MISSION OF THE DEPARTMENT**

To transform the young minds into employable professionals by providing contemporary technical knowledge and appropriate professional skills through suitable teaching learning process.

To provide rigorous training and acquaint the students with necessary skills and leadership qualities along with ethical values to address the complex and multi-faceted Civil Engineering Problems.

To provide opportunity to develop their potential by fostering intellectual curiosity to promote them for pursuing higher studies and research through exposure to the modern engineering tools and techno innovative projects.

# **PROGRAM EDUCATIONAL OBJECTIVES (PEOs):**

Bachelor of engineering graduates of Civil Engineering program of M S Ramaiah Institute of Technology shall attain the following PEO's within three to four years of graduation.

PEO1	To perform well in Engineering profession as competent professionals using contemporary technical knowledge and professional skills.(THEME: Perform well in Engineering profession as competent professionals)
PEO2	To pursue higher education and show intellectual curiosity for lifelong learning. (THEME: Higher education and lifelong learning)
PEO3	To communicate effectively to work in multi-disciplinary environments embedded with ethical values and social responsibilities.(THEME: Effective communication, leadership and ethical values)

# **PROGRAM OUTCOMES (POs):**

**PO1: Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**PO2: Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO3: Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO4:** Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**PO6: The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7:** Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO9: Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12: Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of

technological change.

# **PROGRAM SPECIFIC OUTCOMES (PSOs):**

- **PSO1:** Apply the knowledge of basic sciences, geology and environmental science along with the conceptual knowledge of engineering sciences to illustrate the process involved in planning, analysis and design of sustainable civil engineering systems.
- **PSO2:** Conduct laboratory experiments/field investigations, and analyze / interpret the experimental results for appropriate conclusions and recommendations to a real-world civil engineering problem with a significant perspective of economy, society and environment.
- **PSO3:** Demonstrate professional ethics and implement the principles of project management, business and public policy to lead the project execution as per the design requirement, with the state-of-the-art technology and contemporary skills.

# Semester wise Credit Breakdown for B.E Degree Curriculum Batch 2021-25

Semester Course Category	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Total Credits
Basic Sciences (BSC)	08	08	03	03					22
Engineering Sciences (ESC)	11	09							20
Humanities, Social Sciences and Management (HSMC)		02	01	01	03	03			10
Ability Enhancement Course (AEC)	01	01	01	01	01		03		08
Universal Human Values (UHV)			02						02
Professional Core Courses (PCC)			11	12	11	05	04		43
Integrated Professional Core Course (IPCC)			03	03	03		04		13
Professional Elective Courses (PEC)					03	06	03		12
Institutional Open Elective Courses (IOE)						03	03		06
Internship (INT)				02		02		05	09
Mini Project / Project Work (PW)						03	03	09	15
Non Credit Mandatory Courses (NCMC)			Yes		Yes				
Total Credits	20	20	21	22	21	22	20	14	160

Sl.	Subject	Subject	Teaching	Catagory		Cre	Total contact		
No.	Code	Subject	Department	Category	L	Т	Р	Total	hours/week
1	CV51	Geotechnical Engineering - I	Civil	PCC	2	1	0	3	4
2	CV52	Construction Materials and Concrete Technology	Civil	IPCC	2	0	1	3	4
3	CV53	Design of Reinforced Concrete Elements	Civil	PCC	2	1	0	3	4
4	CV54	Transportation Modes and Infrastructure	Civil	PCC	3	0	0	3	3
5	CVE55x	Program Elective Course – 1	Civil	PEC	3	0	0	3	3
6	CVL56	Environmental Engineering Laboratory	Civil	PCC	0	0	1	1	2
7	CVL57	Building Construction Laboratory	Civil	PCC	0	0	1	1	2
8	AL58	Research Methodology & Intellectual property rights	Civil	HSMC	3	0	0	3	3
9	AEC510	Ability Enhancement Course	Civil	AEC	1	0	0	1	1
				Total				21	25
10	HS59	Environmental Studies *		NCMC	0	0	0	0	1

# SCHEME OF TEACHING V SEMESTER

#### **Professional Elective Course-1**

Sl. No	Sub Code	Subject
1	CVE551	Matrix method of Analysis
2	CVE552	Irrigation & Hydraulics Structures
3	CVE553	Industrial Wastewater Treatment
4	CVE554	Traffic Engineering
5	CVE555	Building Planning and Services

\* Environmental Studies is under the category of NCMC, 1 hour teaching per week has to be allocated in the time table.

Nomenclature: IPCC: Integrated Professional Core Course, PCC: Professional Core Course, HSMC: Humanity and Social Science & Management Courses, PEC: Professional Elective Courses, AEC–Ability Enhancement Courses, NCMC: Non-credit Mandatory Course

L-Lecture, T-Tutorial, P-Practical/Drawing

**Note:** XXE55x, where x=1,2,3,4,5

**Integrated Professional Core Course (IPCC):** Refers to Professional Theory Core Course Integrated with practical of the same course. Credit for IPCC is 03 and its Teaching–Learning hours (L : T : P) can be considered as (2 : 0 : 1). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated only by CIE (no SEE). However, questions from the practical part of IPCC can be included in the SEE question paper.

**Professional Elective Courses:** A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course out of five courses. The minimum student's strength for offering professional electives is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

**Innovation/ Societal/ Entrepreneurship based Internship**: At the End of fourth Semester four - weeks Summer Internship Shall Be Carried Out – Based On industrial/Govt./NGO/MSME/Rural Internship/Innovation/Entrepreneurship. Credited in fifth Semester. All the students admitted shall have to undergo mandatory internship of 04 weeks during the vacation of IV semester. A Viva-Voce examination shall be conducted during VI semester and the prescribed credit shall be included in VI semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the internship shall be declared fail and shall have to complete during subsequent examination after satisfying the internship requirements.

AICTE Activity Points to be earned by students admitted to BE program (For more details refer to Chapter 6, AICTE, Activity Point Program, Model Internship Guidelines):

Every regular student, who is admitted to the 4-year degree program, is required to earn 100 activity points in addition to the total credits earned for the program. Students entering 4 years' degree program through lateral entry are required to earn 75 activity points in addition to the total credits earned for the program. The activity points earned by the student shall be reflected on the students 8<sup>th</sup> semester grade card. The activities to earn the points can be spread over the duration of the course. However, minimum prescribed duration should be fulfilled. Activity points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression. Incase student fail to earn the prescribed activity points; 8<sup>th</sup> semester grade card shall be issued only after earning the required activity Points. Students shall be eligible for the award of degree only after the release of the 8<sup>th</sup> semester grade card.

The Non-Credit Mandatory Course The students shall attend classes for the course during the semester and complete all formalities of attendance and CIE. In case, any student fails to secure the minimum 40% of the prescribed CIE marks, he/she shall be deemed to have secured 'F' grade. In such a case, the student has to fulfill the requirements during subsequent semester/s to appear for CIE. This Course shall not be considered for vertical progression, but completion of the course shall be mandatory for the award of the degree.

# SCHEME OF TEACHING VI SEMESTER

						C	redits	Total	
Sl. No.	Subject Code	Subject	Teaching Departme nt	Category	L	Т	Р	Total	contact hours /week
1	AL61	Management & Entrepreneurship	Civil	HSMC	3	0	0	3	3
2	CV62	Design of Structural Steel Elements	Civil	PCC	2	1	0	3	4
3	CVE63x	Program Elective Course – 2	Civil	PEC	3	0	0	3	3
4	CVE64x	Program Elective Course – 3	Civil	PEC	3	0	0	3	3
5	CVL65	Geotechnical Engineering Laboratory	Civil	PCC	0	0	1	1	2
6	CVL66	Detailing of Structural Elements Laboratory	Civil	PCC	0	0	1	1	2
7	CVOE0x*	Institutional Open Elective - 1	Civil	IOE	3	0	0	3	3
8	CVP67	Extensive Survey Camp	Civil	PW	0	0	3	3	-
9	INT68	Innovation/Societal/ Entrepreneurship based Internship		INT	0	0	2	2	-
	Total							22	21

#### **Professional Elective Course – 2**

Sl. No	Sub Code	Subject
1	CVE631	Principles of Bridge Engineering
2	CVE632	Ground Improvement Techniques
3	CVE633	Environmental Impact Assessment
4	CVE634	Pavement Management System
5	CVE635	Applied Hydraulics

Sl. No	Sub Code	Subject
1	CVE641	Advanced Design of Concrete Structures
2	CVE642	Design of PSC Structures
3	CVE643	Solid Waste Management
4	CVE644	Urban Transport Planning
5	CVE645	Design of Form work & Scaffolding

#### **Professional Elective Course – 3**

Nomenclature, PCC: Professional Core Course, PEC: Professional Elective Courses, IOE: Institutional Open Elective, PW: Mini Project, INT –Internship

L –Lecture, T – Tutorial, P- Practical/ Drawing

Note: XXE63x , where x=1,2,3,4,5

XXE64x, where x=1,2,3,4,5

XXOE0x\*, where x=1,2,..,.. continued from previous

#### L –Lecture, T – Tutorial, P- Practical/ Drawing/ Project work

**Professional Elective Courses:** A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course out of five courses. The minimum student's strength for offering professional electives is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

#### Institutional Open Elective Courses:

Students belonging to a particular stream of Engineering and Technology are not entitled for the open electives offered by their parent department. However, they can take an elective offered by other departments, provided they satisfy the prerequisite condition, if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor.

#### Selection of an open elective shall not be allowed if,

- 1. The candidate has studied the same course during the previous semesters of the program.
- 2. The syllabus content of open electives is similar to that of the Departmental core courses or professional electives.

- 3. A similar course, under any category, is prescribed in the higher semesters of the program.
- 4. The minimum students' strength for offering open electives is 10. However, this condition shall not be applicable to cases where the admission to the program is less than 10.

**Mini-project work:** Mini Project is a laboratory-oriented course which will provide a platform to students to enhance their practical knowledge and skills by the development of small systems/applications.

Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary Mini- project can be assigned to an individual student or to a group having not more than 4 students.

#### CIE procedure for Mini-project:

(i) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two faculty members of the Department, one of them being the Guide. The CIE marks awarded for the Mini-project work shall be based on the evaluation of project report, project presentation skill, and question and answer session as per the rubrics defined by the department.

(ii) Interdisciplinary: Continuous Internal Evaluation shall be group-wise at the college level with the participation of all the guides of the project.

The CIE marks awarded for the Mini-project, shall be based on the evaluation of project report, project presentation skill, and question and answer session as per the rubrics defined by the parent department.

**SEE component for Mini-Project:** SEE will be conducted by the two examiners appointed by the Institute. SEE marks awarded for the mini project shall be based on the evaluation of project work report, project presentation skill and question and answer session.

**Research/Industrial Internship** - At the end of sixth / seventh semester (in two cycles to accommodate all the students of the) Research/Industrial Internship shall be carried out – Based on Industrial/Govt./NGO/MSME/Rural Internship/Innovation/Entrepreneurship. All the students admitted shall have to undergo mandatory internship of 24 weeks during the vacation of VI/VII semesters. A Viva-Voce examination shall be conducted during VII semester and the prescribed credit shall be included in VII semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the internship shall be declared fail and shall have to complete during subsequent examination after satisfying the internship requirements.

**Research internship** Students have to take up research internship at Centers of Excellence (CoE) / Study Centers established in the same institute and /or out of the institute at reputed research organization / Institutes. Research internship is basically intended to give you the flavor of current research going on in a particular topic/s. The internships serve this purpose. They help students get familiarized with the field, the skill needed the effort amount and kind of effort required for carrying out research in that field.

**Industry internships:** Is an extended period of work experience undertaken by /Institute students looking to supplement their degree with professional development. The students are allowed to prepare themselves for the workplace and develop practical skills as well as academic

ones. It also helps them learn to overcome unexpected obstacles and successfully navigate organizations, perspectives, and cultures. Dealing with "unexpected contingencies" helps students recognize, appreciate, and adapt to organization realities by tempering knowledge with practical constraints.

AICTE Activity Points to be earned by students admitted to BE program (For more details refer to Chapter 6, AICTE, Activity Point Program, Model Internship Guidelines):

Every regular student, who is admitted to the 4-year degree program, is required to earn 100 activity points in addition to the total credits earned for the program. Students entering 4 years' degree program through lateral entry are required to earn 75 activity points in addition to the total credits earned for the program. The activity points earned by the student shall be reflected on the students 8<sup>th</sup> semester grade card. The activities to earn the points can be spread over the duration of the course. However, minimum prescribed duration should be fulfilled. Activity points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression. Incase student fail to earn the prescribed activity points; 8<sup>th</sup> semester grade card shall be issued only after earning the required activity Points. Students shall be eligible for the award of degree only after the release of the 8<sup>th</sup> semester grade card.

# V Semester

# **GEOTECHNICAL ENGINEERING - I**

Subject Code: CV51

Pre requisites: -

Credits: 2:1:0

**Course Coordinator: Dr. J Sumalatha** 

Contact Hours: 28L+14T

#### **Course Content**

#### Unit I

Introduction to Geotechnical Engineering: Phase Diagram, Definitions of Voids ratio, Porosity, Percentage Air voids, Air content, Degree of saturation, Moisture content, Specific gravity, Bulk density, Dry density, Saturated density, Submerged density and their inter relationships. Density Index / Relative density, Problems on interrelationships.

**Index Properties of Soils and their Determination:** Index Properties of soils – Water content, Specific Gravity, Particle size distribution, Relative Density, Consistency limits and indices, in-situ density. Importance of index properties in foundation design, Problems on index properties.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links:: https://nptel.ac.in/courses/105103097
   https://archive.nptel.ac.in/courses/105/105/105105168/

 Impartus recording: https://a.impartus.com/ilc/#/globalsearch?q=index%20properties&page=1&mo de=00000000000 https://a.impartus.com/ilc/#/globalsearch?q=atterberg%20limits&page=1&mod e=0000000000

#### Unit II

**Classification of Soils:** Purpose of soil classification, basis for soil classification, Particle size classification, Unified soil classification and IS classification. Plasticity chart and its importance, Field identification of soils, Clay mineralogy

**Soil Water & Permeability**: Free water, held water – adsorbed water & capillary water, Capillary phenomenon, Darcy's law- assumptions and validity, coefficient of permeability, factors affecting permeability, permeability of stratified soils, Seepage velocity, Superficial velocity and coefficient of percolation. Importance of permeability in stability analysis of slopes & earthen dams.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: https://nptel.ac.in/courses/105103097
  - https://archive.nptel.ac.in/courses/105/105/105105168/
- Impartus recording: https://a.impartus.com/ilc/#/globalsearch?q=classification%20of%20soils&pag e=1&mode=0000000000 https://a.impartus.com/ilc/#/globalsearch?q=permeability%20of%20soils&page =1&mode=0000000000

#### Unit III

**Stresses in Soils & Seepage Analysis:** Effective stress concept - total pressure and effective stress, quick sand phenomenon. Stresses in Soils: Boussinesq's theory – Assumptions; Vertical stress under Concentrated, Line, Strip and circular loaded area with UDL (no derivations). Pressure distribution diagrams; Concept of Isobar diagram and Pressure Bulb; Westergaard's theory; Newmark's chart and its applications. Contact pressure below foundations. Laplace's equation, assumptions and limitations, characteristics and uses of flow-nets. Estimation of quantity of seepage for Dams and sheet pile walls. Determination of phreatic line in earth dams with and without horizontal filter near the toe. Importance of flow-nets & hydraulic gradient in stability analysis of slopes/ earthen dams.

**Compaction of Soils:** Definition, Principle of compaction, Standard and Modified proctor compaction tests, factors affecting compaction, effect of compaction on soil properties, types of field compaction, Field compaction control, Proctor's needle, relative compaction, concept of dynamic compaction & vibro-flotation.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: https://nptel.ac.in/courses/105103097 https://archive.nptel.ac.in/courses/105/105/105105168/
- Impartus recording: <u>https://a.impartus.com/ilc/#/video/id/3381776</u> https://a.impartus.com/ilc/#/globalsearch?q=compaction%20of%20soils&page =1&mode=0000000000

#### Unit IV

**Consolidation of Soils:** Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory-assumption and limitations (no derivation), determination of Consolidation characteristics of soil (Cc,  $a_v$ , mv and Cv), determination of coefficient of consolidation by square root of time fitting method and logarithm of time fitting method. Normally consolidated, under consolidated and over consolidated soils, preconsolidation pressure and its determination by Casagrande's method. Types of

settlements in soil, estimation of consolidation settlement, Mitigation of consolidation settlement, Numericals on consolidation of soils.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: https://nptel.ac.in/courses/105103097 https://archive.nptel.ac.in/courses/105/105/105105168/
- Impartus recording: <u>https://a.impartus.com/ilc/#/globalsearch?q=consolidation%20of%20soils&pag</u> <u>e=3&mode=0000000000</u>

   <u>https://a.impartus.com/ilc/#/globalsearch?q=consolidation%20of%20soils&pag</u>

https://a.impartus.com/ilc/#/globalsearch?q=consolidation%20of%20soils&pag e=3&mode=0000000000

#### Unit V

Shear Strength of Soils: Concept of shear strength, Mohr's strength theory, Mohrcoulomb theory, conventional and modified failure envelopes, Total and effective shear strength parameters, Concept of pore pressure, Sensitivity and Thixotropy of clays. Determination of shear parameters (C &  $\emptyset$ ) using - Direct shear test, Unconfined compression test and Triaxial compression test; Shear strength tests under different drainage conditions, importance of pore pressure & shear strength in geotechnical applications, Numericals on shear strength of soils.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: <u>https://nptel.ac.in/courses/105103097</u>

https://archive.nptel.ac.in/courses/105/105/105105168/

 Impartus recording: <u>https://a.impartus.com/ilc/#/globalsearch?q=shear%20strength%20of%20soils</u> <u>&page=1&mode=0000000000</u> <u>https://a.impartus.com/ilc/#/globalsearch?q=shear%20strength%20of%20soils</u> <u>&page=1&mode=0000000000</u>

# **Text Books:**

- 1. V.N.S. Murthy, (2018), "Soil Mechanics and Foundation Engineering", CBS
- 2. Publishers & amp; Distributors, New Delhi.
- 3. Ramamurthy T.N. & Sitharam T.G. (2010), "Geotechnical Engineering", S. Chand & Company, New Delhi.
- 4. Punmia B.C. (2005), "Soil Mechanics and Foundation Engg.", 16<sup>th</sup> Edition,
- 5. Laxmi Publications Co., New Delhi.

#### **References:**

- 1. Alam Singh and Chowdhary G.R. (1994), "Soil Engineering in Theory and Practice" CBS Publishers and Distributors Ltd., New Delhi.
- 2. **Bowles J.E. (1996),** "Foundation Analysis and Design", 5<sup>th</sup> Edition, McGraw Hill Pub. Co., New York.

#### Web links and Video Lectures (e-Resources):

- 1. <u>https://www.youtube.com/watch?v=5kAj4BQXReQ</u>
- 2. https://www.youtube.com/watch?v=Qh6wSfVN45s
- 3. https://www.youtube.com/watch?v=t2eEK3c00Mc
- 4. https://www.youtube.com/watch?v=LCCJL3m4 6A&t=151s
- 5. https://www.youtube.com/watch?v=IJp5diM6ahI
- 6. <u>https://www.youtube.com/watch?v=LCCJL3m4\_6A</u>
- 7. <u>https://www.youtube.com/watch?v=TaPjIvCsfFI</u>
- 8. https://www.youtube.com/watch?v=pM-w cvk1nA&t=307s

#### **Course Outcomes (COs):**

At the end of the course the student will be able to

- 1. Describe the physical properties of soil and their significance in foundation design. (PO-1, 2 & PSO-1)
- 2. Classify the soils, evaluate the permeability of soil and its importance in stability analysis of earthen structures. (PO-1, 2 & PSO-1)
- Analyze the seepage flow and estimate the compaction characteristics. (PO-1, 2, 4 & PSO-1)
- 4. Evaluate the settlement, consolidation characteristics of soil and their significance. (PO-1, 2 & PSO-1)
- 5. Appraise the shear parameters of soils for foundations. (PO-1, 2 & PSO-1)

#### **Course Assessment and Evaluation:**

Continuous Internal Evaluation (CIE): 50 Marks					
Assessment tool	Marks	Course outcomes attained			
Internal test-I	30	CO1, CO2 & CO3			
Internal test-II	30	CO3, CO4 & CO5			
Average of the two internal tests shall be taken for 30 marks					
Other components					
Quiz/Assignment	10	CO1 & CO2			
Quiz/Assignment/Mini project work	10	CO3, CO4 & CO5			
Semester End Examination	100 (Scale	CO1, CO2, CO3, CO4 &			
(SEE)	down to 50)	CO5			

# CONSTRUCTION MATERIALS AND CONCRETE

Subject Code: CV52

Credits: 2:0:1

Contact Hours: 28L+14P

#### Pre requisites: -

Course Coordinator: Dr. M S Nandeesh

#### **Course Content**

#### Unit I

Construction Materials: Engineering Stones, Bricks, Timber, Lime, Cement-Composition of OPC, Types of cement, sand their uses. Pozzalonic materials such as fly ash, meta kaolin, silica fume, rice husk ash and blast furnace slag. Lime and Cement mortar. Desirable properties of Reinforcing steel, structural steel and aluminium. Masonry - Stone and brick. Construction of brick masonry using English and Flemish bond.

- Pedagogy / Course delivery tools: Chalk and talk, PowerPoint Presentation, Videos.
- Links: https://nptel.ac.in
- Lab / Practical Component: To determine the specific gravity and normal consistency of OPC

To determine the setting times of OPC

#### Unit II

Structural Components: Foundations- Classifications & different types, Bearing capacity of soil. Flooring requirements for floor finish and its types. Doors- panelled and flush doors. Different types of Windows, Ventilators. Stairs - requirements of stairs. Dog-legged and open well staircase. Lintel, Chajja, Balcony. Plastering and Pointing, Paints- Purpose, types, ingredients and applications of paints to new and old plastered surfaces, Form Works and Scaffoldings.

- Pedagogy / Course delivery tools: Chalk and talk, PowerPoint Presentation, Videos.
- Links: https://nptel.ac.in
- Lab / Practical Component: To determine the particle size distribution for fine and coarse aggregates

To determine the bulk density and water absorption of fine and coarse aggregates

#### Unit III

Concrete Ingredients and Microstructure: Cement- hydration of cement. Bogue's compound and transition zone in cement paste. Tests on cement-field test and laboratory tests (detailed procedures covered in laboratory). Quality of mixing water. Aggregates – Physical properties of Coarse and Fine aggregate. Sieve analysis, Fineness, grading of aggregates. Structure of aggregate phase, structure of hydrated cement paste, strength-porosity relationship in hydrated cement paste. Manufactured sand its significance and differences. Blended cement and its importance.

- Pedagogy / Course delivery tools: Chalk and talk, PowerPoint Presentation, Videos.
- Links: https://nptel.ac.in
- Lab / Practical Component: To determine the compressive strength of cement

#### Unit IV

Fresh Concrete & Mix Design: Workability - definition, factors affecting workability, measurement of workability by slump, compaction factor, vee-bee and flow tests. Segregation and bleeding. Process of manufacture of concrete-batching, mixing, transporting, placing, compaction and curing of concrete. Admixtures: classification and its uses. Concept of mix design, variables in proportioning, exposure conditions, procedure of mix design as per IS10262-2019 and numerical examples of mix design.

- Pedagogy / Course delivery tools: Chalk and talk, PowerPoint Presentation, Videos.
- https://nptel.ac.in
- Lab / Practical Component: To determine the slump of fresh concrete To determine the compacting factor of fresh concrete

#### Unit V

Hardened Concrete: Factors affecting strength of concrete, w/c ratio, gel/space ratio, maturity concept, effect of aggregate properties, accelerated curing, Aggregate-cement bond strength. Durability-definition and significance. Permeability, sulphate attack, chloride attack and carbonation. Factors contributing to cracks in concrete. Tests on hardened concrete-compressive strength, split tensile strength, flexural strength. (Detailed test procedures to be covered in laboratory).

- Pedagogy / Course delivery tools: Chalk and talk, PowerPoint Presentation, Videos.
- https://nptel.ac.in
- Lab / Practical Component: To determine the compressive strength of concrete cubes

To determine the split tensile strength of concrete cylinder To determine the flexural strength of concrete prisms

#### Text Books:

- 1. Sushil Kumar, "Building Construction", 20<sup>th</sup> Edition, Standard Publishers Distributors, New Delhi.
- 2. S. G. Rangwala, "Building Construction", 34<sup>th</sup> Edition, Charotar Publishing House Pvt. Ltd., Anand.
- 3. M S Shetty and A. K. Jain, "Concrete technology: Theory and Practice", Chand S and Co, New Delhi
- 4. M. L. Gambhir, "Concrete Technology", Tata McGraw Hill, New Delhi

#### **References:**

- 1. A. M. Neville, "Properties of Concrete", ELBS, London
- 2. IS: 10262-2019, "Concrete Mix Proportioning- Guidelines", BIS India
- 3. P. Kumar Mehta and P. J. M. Monteiro, "Concrete: Microstructure, Properties, and Materials", McGraw Hill, India
- 4. B.C. Punmia, "Building Construction", Lakshmi Publications, New Delhi.

#### Course Outcomes (COs):

At the end of the course, students will be able to

- 1. Describe the basic engineering properties of the construction materials and their applications (PO: 1, 2, 3)
- 2. Demonstrate the properties and use of structural components of building materials (PO: 1, 2, 3)
- 3. Describe the ingredients of concrete and its microstructure (PO: 1, 2, 3)
- 4. Demonstrate the fresh properties of concrete and its relevance in mix design (PO: 1, 2, 3, 4, 8 and 10)
- 5. Explain hardened and durability properties of concrete for practical applications (PO: 1, 2, 3, 4, 8 and 10)

#### Web links and video Lectures (e- Resources):

- 1. https://www.youtube.com/watch?v=3TJpTi1sJI8, Consistency test
- 2. https://www.youtube.com/watch?v=yzpWGrh9j6Y, Slump test
- 3. https://www.youtube.com/watch?v=gxjfiRcPcoU, Compaction factor test
- https://www.youtube.com/watch?v=Ln1R1TdBLeQ, Compression test on cubes
- 5. https://www.youtube.com/watch?v=NVibXq8hGnU, water absorption test
- 6. https://www.youtube.com/watch?v=-j6vGQtY09Q, Split tensile strength
- https://swayam.gov.in/nc\_details/NPTEL, Online certification course on Concrete Technology

## List of Experiments to be covered

- 1. To determine the specific gravity and normal consistency of OPC
- 2. To determine the setting times of OPC
- 3. To determine the particle size distribution for fine and coarse aggregates
- 4. To determine the bulk density and water absorption of fine and coarse aggregates
- 5. To determine the compressive strength of cement
- 6. To determine the slump of fresh concrete
- 7. To determine the compacting factor of fresh concrete
- 8. To determine the compressive strength of concrete cubes
- 9. To determine the split tensile strength of concrete cylinder
- 10. To determine the flexural strength of concrete prisms

#### **Course Assessment and Evaluation:**

Continuous Internal Evaluation (CIE): 50 Marks						
Assessment tools: Theory	Marks	Course out comes attained				
Component						
CIE Internal assessment tests –	15	CO1, CO2, CO3 CO4 & CO5				
Average of two						
CIE – CCAs, Any two	10	CO1, CO2, CO3 CO4 & CO5				
Total CIE Theory	25					
Laboratory components						
CIE Practical	15	CO1, CO2, CO3, CO4 & CO5				
CIE practical test	10	CO1, CO2, CO3, CO4 & CO5				
Total CIE Practical	25					
Total CIE	50					
Semester End Examination	100 (Scale	CO1, CO2, CO3, CO4 & CO5				
(SEE)	down to 50)					

# **DESIGN OF REINFORCED CONCRETE ELEMENTS**

Subject Code: CV53

Credits: 2:1:0

Pre requisites: -

Contact Hours: 28L+14T

Course Coordinator: Dr. Anil Kumar R

#### **Course Content**

#### Unit I

Introduction to analysis, design and detailing. Concrete making materials, New generation eco-friendly concrete and steel, IS: 456-2000 specifications on materials, durability and mix design. Introduction to different types of design, Concept of limit state design: Philosophy and principle of limit state design, assumptions, standard distribution of variables, Partial safety factors, Characteristic Load and Strength. Introduction to stress block parameters, Concept of balanced, under and over reinforced sections. Limit state of collapse in flexure of rectangular and flanged sections, Limit state of collapse in shear and torsion.

- Pedagogy: Chalk & talk, PPT
- Links:<u>https://www.brainkart.com/article/Limit-State-Design-Philosophy\_3422/</u> <u>https://www.youtube.com/watch?v=LOvG39NmATY</u> <u>https://www.youtube.com/watch?v=FAZCqCUjT70</u> <u>https://www.youtube.com/watch?v=pIdaC\_I6H\_M&list=PL51300B0778FB57</u> <u>84</u>

#### Unit II

Limit state design of beams: Design of singly and doubly reinforced rectangular and flanged beams. Limit state of shear, Types of shear failures –Design for shear strength, Types and design of shear reinforcement. Limit state of torsion– Torsional shear stress, Reinforcement for Torsion. Detailing as per IS codes of practices.

- Pedagogy: Chalk & talk, PPT
- Links: <u>https://www.youtube.com/watch?v=0fTvE8aSsiE</u> <u>https://www.youtube.com/watch?v=sGvpvYGKEb8</u> <u>https://www.youtube.com/watch?v=JwiHgkC-6Ic</u> <u>https://www.youtube.com/watch?v=iT2pjfYbyZg&list=PL51300B0778FB578</u> <u>4&index=12</u>

#### Unit III

Limit state design of slabs and stairs: Introduction to one-way and two-way slabs for different boundary conditions, Design of one-way cantilever slab, simply supported slab, continuous slab. Design of Two way slabs. Introduction to staircases and design of doglegged stair and open well staircases, Importance of bond, anchorage lap length and development lengths. Detailing as per codes of practices.

- Pedagogy: Chalk & talk, PPT
- Links:<u>https://www.youtube.com/watch?v=6C3trwHjsbE&list=PL51300B0778</u> FB5784&index=16 https://www.youtube.com/watch?v=GgatFNtQrBo&list=PL51300B0778FB578 <u>4&index=17</u> https://www.youtube.com/watch?v=A9JUGWhEW5A&list=PL51300B07FB57 84&index=18 https://www.youtube.com/watch?v=MkFbC74H0mo&list=PL51300B0778FB5 784&index=19 https://www.youtube.com/watch?v=hxakW1miEcM&list=PL51300B0778FB5 784&index=26

#### Unit IV

Serviceability limit states: Introduction to working stress method, Elastic behaviour of rectangular section, Under, Balanced and over reinforced sections. Simple Problems on Flexural strength, Deflection and cracking in beams using IS Code provisions. Deflection and cracking – code provisions, Deflection control in design and problems, Problems on calculations of crack width.

- Pedagogy: Chalk & talk, PPT
- Links: <u>https://www.youtube.com/watch?v=l5RA6XMOtuU</u> <u>https://www.youtube.com/watch?v=BHMN1O0nsy4</u> <u>https://www.youtube.com/watch?v=PRTLATheW-Q</u>

#### Unit V

Limit state of collapse- Analysis and design of columns, design of footings: Design of short axially loaded RC columns with problems, RC Columns with uniaxial moment including Problems, RC Columns with biaxial moments and problems, Design concepts of footing (Limit state), isolated footings with axial load–square and rectangular types. Rectangular Isolated footings with axial load and moment. Detailing as per codes of practices

- Pedagogy: Chalk & talk, PPT
- Links: <u>https://www.youtube.com/watch?v=-DLyAeASwQM\</u>

https://www.youtube.com/watch?v=wJWt0dcgafs&list=PL51300B0778FB578 4&index=19 https://www.youtube.com/watch?v=p6aDP4ycISM&list=PL51300B0778FB57 84&index=20 https://www.youtube.com/watch?v=YbXnWXcbkcc&list=PL51300B0778FB55 784&index=21 https://www.youtube.com/watch?v=gaheNSbhD6w&list=PL51300B0778FB57 84&index=22 https://www.youtube.com/watch?v=8ATp13mOhvg&list=PL51300B0778FB55 784&index=24 https://www.youtube.com/watch?v=tKGeo4IRQho&list=PL51300B0778FB57 84&index=25

#### **Text Books:**

- 1. Unnikrishnan Pillai and Devadas Mennon, "Design of Reinforced Concrete Structures"-Tata Mc Graw Hill Publications. 2020
- 2. Verghese P C, "Limit State Design of Reinforced Concrete", Prentice Hall of India, New Delhi.
- 3. IS Codes: IS: 456-2000, SP16, SP34 and SP26
- 4. ACI and BS codes NBA/NEP requirements

#### **Reference Books:**

- 1. Sinha SN, "Reinforced Concrete Design", Tata Mc Graw Hill Publications.
- 2. Karves R and Shah V L, "Limit State Theory and Design of Reinforced Concrete", Vidyarthi Prakashan, Pune.
- 3. Parkand Paulay, "Reinforced Concrete", John Wiley and Sons.
- 4. Punmia B C, Jain A K and Jain A K, "Reinforced Concrete Design", Lakshmi Publications, New Delhi.

#### **Course Outcomes (COs):**

Students will be able to:

- 1. Comprehend and discuss limit state design concepts of Reinforced Concrete elements and able to derive the expressions for limit state analysis.
- 2. Analyse, design and detail rectangular, Tee and Ell beams as per IS:456-2000 and able to develop professional drawing using autoCAD.
- 3. Analyse, design and detail slabs and stair cases for practical boundary conditions and able to develop professional drawing

- 4. Explain serviceability criteria of flexural members and to estimate the deflections and cracking.
- 5. Analyse, design and detail columns and footings and able to develop professional drawings.

Continuous Internal Evaluation (CIE): 50 Marks					
Assessment tool	Marks	Course outcomes attained			
Internal test-I	30	CO1, CO2 & CO3			
Internal test-II	30	CO3, CO4 & CO5			
Average of the two internal tests shall be taken for 30 marks					
Other components					
Quiz/Assignment	10	CO1 & CO2			
Quiz/Assignment/Mini project	10	CO3, CO4 & CO5			
Semester End Examination	100 (Scale	CO1 CO2 CO3 CO4 & CO5			
(SEE):	down to 50)	CO1, CO2, CO3, CO4 & CO3			

#### **Course Assessment and Evaluation:**

# TRANSPORTATION MODES AND INFRASTRUCTURE

Subject Code: CV54

Credits: 3:0:0

Pre requisites: -

Contact Hours: 42

Course Coordinator: Dr. Vivek R Das

#### **Course Content**

#### Unit I

Introduction to Railway Engineering: Advantages of railways as transportation mode, typical cross sections, suitability of different gauges, Coning of wheels, components of the permanent way- Rails, Sleepers, Ballast and Fixtures-functions, types, requirements, Quantity calculations of railway track components.

- Pedagogy: Chalk & talk, PPT
- Links: https://nptel.ac.in/courses/105107123

#### Unit II

Geometrics of Railway: Gradients, super elevation, cant deficiency, Negative super elevation, speed restrictions on turnouts, design of turn outs, points and crossings.

- Pedagogy: Chalk & talk, PPT
- Links: https://nptel.ac.in/courses/105107123

#### Unit III

Airport Engineering: Features & role of Airways in transportation, Aircraft characteristics, Air transportation planning, site selection, Airport components and diagram, Runway Orientation, basic length and corrected length of runway length, Taxiway-Turning radius, exit taxi way, design factors and elements.

- Pedagogy: Chalk & talk, PPT
- Links: https://nptel.ac.in/courses/105107123

#### Unit IV

Harbour Engineering: Harbours-types & components. Natural phenomenon affecting the design of harbours. Wind, waves, tides & currents. Breakwaters -types, wharf and quays, Jetties and piers. Dry dock and wet docks, spillways & navigational aids.

- Pedagogy: Chalk & talk, PPT
- Links:https://www.youtube.com/watch?v=5UlUHBSMj5U&list=PLmRuqPJhr sb4o5w1O-P\_STCIuiZkXiVWf

#### Unit V

Urban Transportation Systems: System Approach in transport planning. Advantages of mass transportation, general transportation problems in urban centres, interrelationship between land use and transportation, urban road patterns, Transit Capacity. Advanced transportation systems

- Pedagogy: Chalk & talk, PPT
- Links: https://nptel.ac.in/courses/105105204

#### Text Books:

- 1. S.C Saxena and S.P Arora "A Text Book of Railway Engineering", Dhanpat Raj Publications.
- 2. Satish Chandra and MM Agarwal "Railway Engineering", Oxford Press Publications. 14
- 3. Rangawala "Airport Engineering", Charotar Publications.
- 4. R Srinivasan "Harbour dock and tunnel Engineering", Charotar Publications.
- 5. Kadiyali L.R, "Traffic Engineering and Transport Planning", Khanna Publishers, New Delhi.

#### **Reference Books:**

- 1. S.C Saxena "Airport Engineering", Dhanpat Raj Publications.
- 2. SK Khanna, MG Arora and SS Jain "Airport planning and Design",
- 3. Dr. SP Bindra "A Course in Docks and Harbour Engineering", Dhanpat Raj Publications

#### Course Outcomes (COs):

At the end of the course, students will be able to

- 1. Identify different components of railway track and select right materials for construction.
- 2. Compute the various geometric features of railways for a given set of requirements.
- 3. Describe the importance of airway system, characteristics of aircrafts and planning of airport facilities.
- 4. Describe factors affecting design of harbours.
- 5. Describe the problems in urban transportation system. Demonstrate planning of urban transport facilities.

# **Course Assessment and Evaluation:**

Continuous Internal Evaluation: 50 Marks					
Assessment tool	Marks	Course outcomes attained			
Internal test-I	30	CO1, CO2 & CO3			
Internal test-II	30	CO3, CO4 & CO5			
Average of the two internal tests shall be taken for 30 marks					
Other components					
Quiz/Assignment	10	CO1 & CO2			
Quiz/Assignment/Mini project work	10	CO3, CO4 & CO5			
Semester End Examination:	100 (Scale	CO1, CO2, CO3, CO4 & CO5			
	down to 50)				

# MATRIX METHOD OF ANALYSIS

Subject Code: CVE551

Credits: 3:0:0

Pre requisites: Nil

Contact Hours: 42L

Course Coordinator: Dr. Anil Kumar R

# **Course Content**

# Unit I

**Introduction**: Structural systems, Geometrical and material nonlinearities. Static and Kinematic indeterminacy. Concepts of stiffness and flexibility. Flexibility and stiffness matrices of truss and beam elements.

- Pedagogy/Course delivery tools: Chalk and Talk, Presentation
- Link for you tube videos: 1. https://www.youtube.com/watch?v=8shs6UjnFcw https://www.youtube.com/watch?v=n5YOCx8Wc2A https://www.youtube.com/watch?v=lJLSxeBd3LQ

# Unit II

**Element Flexibility Method:** Transformation of system forces to element forces in flexibility method. Assembly of structure flexibility matrix in element flexibility method, Flexibility method applied to trusses and continuous beams.

- Pedagogy/Course delivery tools: Chalk and Talk, Presentation
- Link for you tube videos: https://www.youtube.com/watch?v=j710vnmGMSk https://www.youtube.com/watch?v=b7VEMoVvLMw

# Unit III

**Element Stiffness Method:** Transformation from system forces to element forces in stiffness method, Assembly of structure stiffness matrix in element stiffness method. Stiffness method applied to continuous beams and rigid frames.

- Pedagogy/Course delivery tools: Chalk and Talk, Presentation
- Link for you tube videos: https://www.youtube.com/watch?v=dtEx4npl2dk https://www.youtube.com/watch?v=6uQB5kPfy8Y

# Unit IV

Direct Stiffness method: Local and Global coordinate systems, Stiffness matrices of truss and beam elements in global coordinates, Analysis of beams by Direct Stiffness method.

- Pedagogy/Course delivery tools: Chalk and Talk, Presentation
- Link for you tube videos https://tinyurl.com/ykt27v3s https://tinyurl.com/7kcwy445

#### Unit V

**Storage Techniques:** Half band, skyline storage, Equation solvers, Frontal solvers, Band width consideration, Algorithms and flowcharts, Solution of equations, Uses of commercial packages.

- Pedagogy/Course delivery tools: Chalk and Talk, Presentation
- Link for you tube videos: 1. https://www.youtube.com/watch?v=jk2LILvTzsI https://www.youtube.com/watch?v=ep3X TXlwh0

#### **Text Books:**

- 1. Weaver W and Gere J H, "Matrix Analysis of Framed Structures", CBS Publications, New Delhi
- 2. Rajasekaran S, "Computational Structural Mechanics ", PHI, New Delhi

#### **Reference Books**:

- 1. Pundit and Guptha, "Theory of Structures", Vol II, TMH Publications, New Delhi
- 2. A K Jain, "Advanced Structural Analysis", Nemchand Publications, Roorkee
- 3. CS Reddy, 'Basic Structural Analysis ", TMH Publications, New Delhi

#### Web links:

- 1. https://archive.nptel.ac.in/courses/105/105/105105180/
- 2. https://archive.nptel.ac.in/courses/105/105/105105/09/
- 3. https://www.classcentral.com/course/swayam-matrix-method-of-structuralanalysis-14192

# Course Outcomes (COs):

Students will be able to:

- 1. Describe structural systems and application of the concepts of flexibility and stiffness matrices
- 2. Adopt flexibility matrices to solve problems in trusses, beams, rigid frames and grids
- 3. Adopt stiffness matrices to solve problems in trusses, beams, rigid frames and grids
- 4. Adopt direct stiffness methods to solve problems in trusses, beams, rigid frames and grids
- 5. Describe various storage schemes and standard commercial packages

# **Course Assessment and Evaluation:**

Continuous Internal Evaluation (CIE): 50 Marks					
Assessment tool	Marks	Course outcomes attained			
Internal test-I	30	CO1, CO2 & CO3			
Internal test-II	30	CO3, CO4 & CO5			
Average of the two internal tests shall be taken for 30 marks					
Other components					
Quiz/Assignment	10	CO1 & CO2			
Quiz/Assignment/Mini project	10	CO3 CO4 & CO5			
work	10	CO3, CO4 & CO3			
Semester End Examination	100 (Scale	CO1 CO2 CO3 CO4 & CO5			
(SEE)	down to 50)	CO1, CO2, CO3, CO4 & CO3			

# **IRRIGATION AND HYDRAULICS STRUCTURES**

Subject Code: CVE552	Credits: 3:0:0	
Pre requisites: Fluid Mechanics, Hydraulics, Hydrology	Contact Hours: 42L	
Course Coordinator: Mrs. Shilpa D N and Dr. Santhosh L G		

#### **Course Content**

#### Unit I

#### **Irrigation and Water Requirement of Crops**

Introduction. Irrigation - Definition, Necessity, Benefits and ill-effects of irrigation, Types of irrigation systems, Various irrigation methods. Water Requirement of Crops - Classification of soil water, Soil moisture constants, Depth of water application and Frequency of irrigation-Numerical problems, Crop seasons and Crop Rotation, Crop period and Base period, Duty, Delta, Relationship between Duty and Delta, G.C.A., C.C.A., Intensity of irrigation-Numerical problems, Irrigation Efficiencies. Irrigation requirements of crops (No Numerical problems).

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation, videos
- Links:

https://www.youtube.com/watch?v=5DRdtahH6VY&pp=ygUnbWV0aG9kcyB vZiBpcnJpZ2F0aW9uIGNpdmlsIGVuZ2luZWVyaW5n https://www.youtube.com/watch?v=RPRK7hIVbHg

#### Unit II

#### **Design of Irrigation Canals**

Introduction. Classification of irrigation canals. Procedures for the design of Canals using Kennedy's theory and Lacey's theory, Regime channels, Regime conditions, Cross-Section of regime channel, Lacey's regime equations-Design Problems, Comparison between Kennedy's and Lacey's theory, Drawbacks in Lacey's theory. Longitudinal section of a canal, Computation of Balancing depth, Cross-section of an irrigation canal. Introduction to barrow pit, spoil bank, Berms.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation, videos
- Links: https://youtu.be/OUV8beq8K1g https://youtu.be/JViIENF6TVY

#### Unit III

#### Canal Falls, Cross Regulators, Cross Drainage Works

Canal Regulation: Introduction - Canal fall, Necessity and selection of site for location of canal fall, Types of falls, Hydraulic design principles for Notch type canal fall. Canal Regulators - Cross Regulator, Head Regulator, Functions of Regulators. Cross-Drainage Works - Introduction. Classification of Cross-Drainage Works, Types of Aqueducts (or Syphon Aqueducts), Factors affecting suitability of Types of Aqueducts (or Syphon Aqueducts).

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation, videos
- Links: Canal falls- https://youtu.be/4rvWWtcB3fE
- https://www.youtube.com/watch?v=vzBCYELvvOQ&pp=ygUrZGVzaWduIH ByaW5jaXBsZXMgZm9yIE5vdGNoIHR5cGUgY2FuYWwgZmFsbA%3D%3 D
- Cross Drainage Works- <u>https://youtu.be/687VXDXhVBA</u>

#### Unit IV

#### **Design of Earthen Dams**

Head Works- Introduction, Types of Headworks, Components of Diversion Head Works, Headworks-Earthen Dams, Classification, Types of Earthen dams, Causes of failure of Earthen dams. Theories of Seepage - Design of Impervious floor using Bligh's theory- Design problems

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation, videos
- Links: Headworks: <u>https://youtu.be/mIm13hrBoMs</u>

#### Unit V

#### **Design of Gravity Dams**

Gravity Dam – Introduction, Advantages and disadvantages of gravity dams, Forces acting on a gravity dam, Stability analysis- Numerical Problems, Elementary profile and Practical profile of a gravity dam, Design of dam by Gravity method-Design Problem, Spillways- introduction, factors affecting spillway capacity, types of spillways (only list), Energy dissipators- Introduction, stilling basin type dissipators.

- Pedagogy/Course delivery tools:
- Chalk and talk, Power point presentation, videos
- Links:https://youtu.be/rdaW4pC59MM?list=RDCMUCY-ANi3wxkUSGhAel7T0TGw

#### Text Books:

- 1. K. Subramanya, "Engineering Hydrology", McGraw Hill Education; Fourth edition (2017).
- 2. P. Jaya Rami Reddy, "Hydrology", Laxmi Publications; Third edition (2016).
- 3. P.N Modi, "Irrigation, Water resources and Water Power Engineering", STANDARD BOOK HOUSE; Eleventh edition (2014).

#### **Reference Books:**

- 1. Ray K. Linsley, et.al., "Water Recourses Engineering", McGraw-Hill Publishing Co.; 4th edition (1992).
- 2. Garg S K, "Irrigation Engineering and Hydraulic Structures", Khanna Publishers (1976).
- 3. Punmia B C et.al., "Irrigation and Water Power Engineering", Laxmi Publications, Sixteenth edition (2019).

#### Course Outcomes (COs):

#### Students will be able to:

- 1. State the importance of irrigation, types and methods of irrigation and evaluate water requirements of crops.
- 2. Apply silt theories and design irrigation canals.
- 3. Design various types of canal regulation and Cross-Drainage Works.
- 4. Enumerate various types of Head works and design earthen dams
- 5. Analyze various forces encountered in gravity dams, thereby the design of dams.

Continuous Internal Evaluation (CIE) : 50 Marks			
Assessment tool	Marks	Course outcomes attained	
Internal test-I	30	CO1, CO2 & CO3	
Internal test-II	30	CO3, CO4 & CO5	
Average of the two internal tests shall be taken for 30 marks			
Other components			
Quiz/Assignment	10	CO1 & CO2	
Quiz/Assignment/Mini project	10	CO3, CO4 & CO5	
work			
Semester End Examination	100 (Scale	CO1 CO2 CO3 CO4 & CO5	
(SEE)	down to 50)	01,002,003,004 & 005	

#### **Course Assessment and Evaluation:**

# INDUSTRIAL WASTEWATER TREATMENT

Subject Code: CVE553	Credits: 3:0:0
Pre requisites: Environmental Engg-I & Environmental Engg-II	Contact Hours: 42
Course Coordinator: Mrs. Jyothi. M.R	

#### **Course Content**

#### Unit I

#### Industrial waste and Environment

Water usage in Industry, Difference between domestic and industrial wastewater. Parameters of pollution: Inorganic salts, Acids and Alkalis, Organic matter, Suspended solids, Floating solids and liquids, Hot discharges, color, toxic chemicals, microorganisms and foam producing matter. Pollution of receiving body of water. Environmental standards for industrial effluents as per Central Pollution Control Board..

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links: https://youtu.be/SRvRFY-c5-U?list=PL4SPMn8HFBYBhLHBY8D7iCNek9sWGWPCX https://youtu.be/QO5X0iaq2S8?list=PL4SPMn8HFBYBhLHBY8D7iCNek9s WGWPCX
- NPTEL Links: https://youtu.be/8FjhsODW1q4?list=PLLy\_2iUCG87Cr\_rs9sS1zSaR62imd0u B https://youtu.be/Ar04qG1P8Es?list=PLLy\_2iUCG87Cr\_rs9sS1zSaR62imd0u
  - В

#### Unit II

#### Industrial wastewater treatment

Theories and Practices: Volume Reduction: classifying wastes; conserving wastewater; changing production to decrease wastes; reusing both industrial and municipal effluents as raw water supplies and eliminating batch or slug discharges of process wastes. Concentration Reduction: process changes, equipment modifications, segregation of wastes, equalization of wastes, by-product recovery and proportioning wastes. Pre-treatment of Industrial wastewater –Neutralization: Mixing of wastes and chemical treatment. Equalization and Proportioning: objectives and methods.
- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation, videos
- Links: <u>https://youtu.be/rdaW4pC59MM?list=RDCMUCY-</u> <u>ANi3wxkUSGhAel7T0TGw</u>
- NPTEL Links: https://www.youtube.com/watch?v=rdaW4pC59MM <u>https://www.youtube.com/watch?v=rdaW4pC59MM&list=RDCMUCY-</u> ANi3wxkUSGhAel7T0TGw&start radio=1&rv=rdaW4pC59MM&t=3

## Unit III

## **Effluent Sampling**

Significance of sampling, Grab and composite sampling. Removal of suspended solids: Sedimentation- Theory and design of circular sedimentation tank. Flotation-Theory and methods. Screening- theory and methods. Removal of colloidal particles-chemical coagulation and adsorption. Removal of Inorganic Dissolved Solids-Evaporation, Ion exchange and Reverse Osmosis.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links: https://youtu.be/rdaW4pC59MM?list=RDCMUCY-ANi3wxkUSGhAel7T0TGw
- NPTEL Links: https://www.youtube.com/watch?v=ciPFC3Y2rkg https://www.youtube.com/watch?v=rdaW4pC59MM&list=RDCMUCY-ANi3wxkUSGhAel7T0TGw&start\_radio=1&rv=rdaW4pC59MM&t=3

## Unit IV

# **Removal of organic Dissolved Solids**

Flowchart indicating Lagooning, Activated-sludge treatment, Trickling filtration, anaerobic digestion, Rotating Biological Contactor (Theory and methods- No design). Treatment of sludge- Anaerobic and Aerobic Digestion, vacuum filtration and Drying Beds. Manufacturing process: flow sheet with sources of wastewater, characteristics of waste and treatment of the following industrial effluents. Dairy industry, Sugar Mill, Paper and pulp Industry, Distillery industry and Plating industry.

- Pedagogy/Course delivery tools: Chalk and talk, Conventional water treatment plant visit, invited lectures from industry people, Power Point Presentation
- Links: https://youtu.be/R075TPSwMkE?list=RDCMUCY-ANi3wxkUSGhAel7T0TGw
- NPTEL Links:

https://www.youtube.com/watch?v=ciPFC3Y2rkg https://www.youtube.com/watch?v=rdaW4pC59MM&list=RDCMUCY-ANi3wxkUSGhAel7T0TGw&start\_radio=1&rv=rdaW4pC59MM&t=3

## Unit V

## Case studies of design of ETP

Dairy industry, Sugar Mill, Paper and pulp Industry, Distillery industry and Plating industry.

- Pedagogy/Course delivery tools: Chalk and talk, invited lectures from industry people, Powerpoint Presentation, video.
- Links: https://youtu.be/b2qOEJMvBZw?list=RDCMUCY-ANi3wxkUSGhAel7T0TGw
- NPTEL Links: https://www.youtube.com/watch?v=ciPFC3Y2rkg https://www.youtube.com/watch?v=rdaW4pC59MM&list=RDCMUCY-ANi3wxkUSGhAel7T0TGw&start radio=1&rv=rdaW4pC59MM&t=3

## **Text Books:**

1. Industrial Waste Treatment Contemporary Practice and Vision for the Future By Nelson Leonard Nemerow, Elsevier, 2007, ISBN-13: 978-0-12-372493-9.

## **Reference Books:**

- Waste Water Treatment: Rational Methods Of Design And Industrial Practices, 3/E, By M N Rao, Oxford & IBH Publishing Company Pvt. Ltd. (2007), ISBN-13: 978-8120417120
- 2. Industrial water pollution control, by W.Wesley Eckenfelder, Jr. ,Third Edition, McGraw- Hill, IESBN 0 07 116275.5, 2000.
- 3. Pollution Control in Process Industries by S P Mahajan, McGraw Hill Education (2017), ISBN-13: 978-0074517727

## Web links and video Lectures (e- Resources):

- https://youtu.be/SRvRFY-c5-U?list=PL4SPMn8HFBYBhLHBY8D7iCNek9sWGWPCX
- https://youtu.be/QO5X0iaq2S8?list=PL4SPMn8HFBYBhLHBY8D7iCNek9s WGWPCX https://www.youtube.com/watch?v=HlBYCtJ9\_Cw
- 3. https://www.youtube.com/watch?v=ciPFC3Y2rkg
- 4. <u>https://youtu.be/b2qOEJMvBZw?list=RDCMUCY-</u> <u>ANi3wxkUSGhAel7T0TGw</u>

### **Course Outcomes (COs):**

At the end of the course, the students will be able to:

- 1. Describe the nature of industrial wastewater and summarize the pollution of streams.
- 2. Illustrate the waste reduction techniques and pretreatment.
- 3. Demonstrate the sampling techniques and primary treatment.
- 4. Outline the organic treatment of industrial wastewater.
- 5. Provide wastewater management plan in industrial setup.

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	Marks	Course outcomes attained
Internal Test-I	30	CO1, CO2 and CO3
Internal Test-II	30	CO3 and CO4
Average of the two internal tests will be taken for 30 marks		
Other components:		
MCQ, Case study/group	20	CO1 CO2 CO3 CO4 & CO5
activity with report writing	20	co1, co2, co3, co4 <b>a</b> co3
Semester End Examination	100 (Scale	CO1 CO2 CO3 CO4 & CO5
(SEE)	down to 50)	CO1, CO2, CO3, CO4 & CO3

TRAFFIC ENGINEERING		
Credits: 3:0:0		
Contact Hours: 42L		
Course Coordinator: Dr. Vivek R Das		

### **Course Content**

#### Unit I

**Traffic Characteristics, road user characteristics** – human factors including reaction time and vehicular characteristics affecting road design and traffic flow. Traffic Stream Parameters, Speed, Flow Density, Derived Characteristics, Time-Space Diagram

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: https://nptel.ac.in/courses/105101008

### Unit II

**Fundamental relations of traffic flow**, Traffic Stream models -, Shock wave, Car following models, Lane changing models, Vehicle arrival models, PCU values, Interrupted and Uninterrupted flow

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: https://nptel.ac.in/courses/105101008

## Unit III

**Traffic studies** - data collection, analysis and interpretation of results of classified traffic volume, spot speed, speed and delay, origin and destination. Moving observer method, parking studies, Boarding and alighting survey. Sampling in traffic studies – sampling techniques, sampling theory, accuracy and sample size.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: https://nptel.ac.in/courses/105101008

## Unit IV

**Highway Capacity** - Level of service, factors influencing roadway capacity, capacity of roads at various levels of service, Urban streets, Two lane highways, Multi lane highways Freeway Operations. Design features of expressways and different types of Urban Streets using HCM. **Traffic regulations and control** - Regulation on vehicles, drivers and traffic flow, Traffic control devices – Types & objectives of markings, signs, signals and islands, delineators.

- Pedagogy / Course delivery tools: Chalk and talk, Power point Presentation
- Links: https://nptel.ac.in/courses/105101008

## Unit V

Fuel Consumption and Emission – Types of vehicular emissions, Fuel Consumption models, Congestion studies – Measurement of congestion, Counter measures, Pedestrian Studies –

Pedestrian flow characteristics, Design principles of pedestrian facilities Design of on - street and off-street parking facilities, pedestrian facilities, bus bays, safety devices

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: https://nptel.ac.in/courses/105101008

## Text Books:

- 1. Kadiyali L.R. "Traffic Engineering and Transportation Planning"-Khanna Publication, New Delhi
- 2. Salter RJ and Hounsell NB, "Highway, Traffic Analysis and Design"-Macmillan Press Ltd., London.
- 3. Matson T M, Smith W S , Hurd F W, "Traffic Engineering, Mc graw Hill Book Co, NY , USA.
- 4. Drew D R ," Traffic Flow Theory and Control", McGraw Hill Book Co, NY, USA.
- 5. Wohl and Martin, "Traffic System Analysis of Engineers and Planners"-Mcgraw Hill Book Co, New York, USA.

## **References:**

- 1. Pignataro, "Traffic Engineering", John wiley& sons.
- 2. Nicholas J Garber, Lester A Hoel, "Traffic & Highway Engineering"- Third edition, Bill Stenquist.
- 3. IRC: SP:41-1994, IRC SP:31-1992, IRC 43-1994, Indian Roads Congress
- 4. MoRTH "Type Designs for Intersections on National Highways"-Indian Roads Congress
- 5. MORTH "Manual for Road Safety in Road Design"-Indian Roads Congress
- 6. IRC 3-1983,9-1972,62-1976,64-1990,65-1976,66-1976,67-2001,69-1977,70-1977,73-1980,79-1981,80-1981,86-
- 1983,92-1985,93-1985,99-1988,102-1988,103-1988,106-1990,110-1996 Indian Roads Congress Khanna and Justo, "Highway Engineering"- Nem Chand and Bros., Roorkee

#### Web links and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses/105101008

### **Course Outcomes (COs):**

At the end of the course the student will be able to

- 1. Define various traffic and road user characteristics (PO 1,2 PSO1)
- 2. Classify various types of traffic surveys and understand it's methodology (PO 1,2 PSO1)
- 3. Illustrate the fundamentals of traffic flow theory and it's regulations and control (PO 1,2 PSO1)
- 4. Analyze and design of signalized intersections by various methods (PO1,2 & PSO1)
- 5. Design and appraise a safe and efficient traffic system (PO 3,7 & 9 PSO1)

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	Marks	Course outcomes attained
Internal test-I	30	CO1, CO2 & CO3
Internal test-II	30	CO3, CO4 & CO5
Average of the two internal tests shall be taken for 30 marks		
Other components		
Quiz/Assignment	10	CO1 & CO2
Quiz/Assignment/Mini project	10	CO3 CO4 & CO5
work	10	
Semester End Examination	100 (Scale	CO1 $CO2$ $CO3$ $CO4$ & $CO5$
(SEE):	down to 50)	co1, co2, co3, co4 & co3

# **BUILDING PLANNING & SERVICES**

Subject Code: CVE555

Pre requisites: Nil

Credits: 3:0:0 Contact Hours: 42

Course Coordinator: Dr. Anil Kumar R

## **Course Content**

## Unit I

Basic concepts in the Development of Construction Plans - Choice of Technology Resource Requirements for Work Activities - Coding Systems and Construction Method - Defining Work Tasks - Defining Precedence Relationships Among Activities - Estimating Activity Durations - Estimation

- Pedagogy: Chalk & talk, PPT
- Links: <u>https://gillilandcm.com/2019/03/26/what-is-construction-project-planning/</u> <u>https://www.brainkart.com/article/Choice-of-Technology-and-Construction-</u> Method 3520/

## Unit II

Drawing of Building Elements- Drawing of various elements of buildings like various types of footing, open foundation, raft, grillage, pile and well foundation, Drawing of frames of doors, window, various types of door, window and ventilator, lintels and arches, stairs and staircase, trusses, flooring, roofs etc

- Pedagogy: Chalk & talk, PPT
- Links: <u>https://dailycivil.com/types-footings-used-building-construction/</u> <u>https://byjusexamprep.com/types-of-footings-i</u>

## Unit III

Building Planning- Classification of buildings, Provisions of National Building Codes and Rules, Building bye-laws, open area, Setbacks, FAR terminology, Design and drawing of Building, Design concepts and philosophies, Preparing sketch plans and working drawings of various types of buildings like residential building, institutional buildings and commercial buildings, site plans.

- Pedagogy: Chalk & talk, PPT
- Links: <u>https://www.lceted.com/2021/08/classification-of-buildings.html</u> <u>https://atozbuilding.in/2020/05/building-construction-types-buildings-planning-height.html</u> <u>https://dailycivil.com/types-of-buildings/</u>

### **Unit IV**

Building Services- Introduction of Building Services like water supply, sewerage and drainage systems, sanitary fittings and fixtures, plumbing systems, principles of internal & external drainage systems, principles of electrification of buildings. intelligent buildings, elevators & escalators their standards.

- Pedagogy: Chalk & talk, PPT
- Links .

https://www.google.com/url?sa=t&rct=i&g=&esrc=s&source=web&cd=&cad= ria&uact=8&ved=2ahUKEwiugoa6oc AhXIUGwGHbACB 80FnoECCOO AO&url=https%3A%2F%2Fsist.sathvabama.ac.in%2Fsist\_coursematerial%2F uploads%2FSARA5103.pdf&usg=AOvVaw23JgeWNDnsDe19WGt9FOFo&o pi=89978449

https://www.designingbuildings.co.uk/wiki/Types of building services

## Unit V

Air-conditioning systems, types, installation and maintenance costs. Fire fighting systems, building safety and security systems. Illumination, artificial lighting, day lighting. laws and principles of illumination. Electric light sources, brief description, Characteristics, starting circuits and application of incandescent and discharge lamps. Design of lighting systems, flood lighting, relevant IS codes. Energy conservation in buildings, Building Technology.

- Pedagogy: Chalk & talk, PPT •
- Links: https://welterheating.com/types-air-conditioners/ https://kimbroair.com/blog/different-components-air-conditionerhendersonville-tn https://sustainabilityworkshop.venturewell.org/buildings/electric-lightsources.html https://www.vedantu.com/physics/light-sources

## **Text Books:**

- 1. A Text-Book of Building Construction, S.P.Bindra and S.P.Arora, Dhanpat Rai Publications
- 2. Building Materials and Construction, Jena and Sahu, Mc. Graw Hill.
- 3. Materials for Civil and Construction Engineers, Mamlouk and Zaniewski, Pearson

## **Reference Books:**

- 1. Building Materials and Building Construction, by P C Verghese
- 2. Building Construction, by B. C. Punmia, , Laxmi Publicaton

### **Course Outcomes (COs):**

At the end of the course, students will be able to

- 1. Understand the basic concepts of building plans and construction components of building.
- 2. Illustrate of various Building Elements.
- 3. Understand the Classification of buildings as per Provisions of National Building Codes
- 4. Illustrate the Building Services like water supply, sewerage and drainage systems, sanitary fittings and fixtures.
- 5. Illustrate the air conditioning systems, energy conservative technologies.

Continuous Internal Evaluation (CIE) : 50 Marks		
Assessment tool	Marks	Course outcomes attained
Internal test-I	30	CO1, CO2 & CO3
Internal test-II	30	CO3, CO4 & CO5
Average of the two internal tests shall be taken for 30 marks		
Other components		
Quiz/Assignment	10	CO1 & CO2
Quiz/Assignment/Mini project	10	CO3 CO4 & CO5
work	10	005,004 & 005
Semester End Examination	100 (Scale	CO1 CO2 CO3 CO4 & CO5
(SEE)	down to 50)	001, 002, 003, 004 & 005

# ENVIRONMENTAL ENGINEERING LABORATORY

Subject Code: CVL56	Credits: 0:0:1
Pre requisites: Environmental – II & Env II	Contact Hours: 14P
Course Coordinator: Mrs. Jyothi. M.R	

- 1. Determination of pH, Alkalinity and Acidity
- 2. Determination of Chlorides, available chlorine in bleaching powder and residual chlorine.
- 3. Determination of Turbidity and Jar Test for Optimum Dose of alum.
- 4. Determination of Dissolved Oxygen and BOD.
- 5. Determination of COD
- 6. Determination of Iron.
- 7. Determination of Solids in Sewage: Total Solids, Suspended Solids, Dissolved Solids, Volatile Solids, Fixed Solids and Settleable Solids.
- 8. Determination of particulates in air using high volume air sampler
- 9. Determination of noise levels in the locality
- 10. Determination of Nitrates
- 11. Determination of Fluoride
- 12. Demonstration of Sodium and Potassium. (Using Virtual Labs)

## Text Books:

- 1. Garg. S.K, (2011) Environmental Engineering, Vols. I and II, Khanna Publishers, New Delhi.
- 2. Punmia. B.C, (2011) Environmental Engineering Vol. I and II, Laxmi Publication (P) Ltd, New Delhi.

## **Reference Books:**

- 1. Dr R B Kotaiah & N Kumara Swamy "Environmental Engineering Laboratory Manual", Charotar Publishing House, 1994.
- 2. E W Rice, R B Baird et.al, "Standard Methods for the examination of water and waste water, 22<sup>nd</sup> Edition" American Water Works Association [2012].
- 3. Clair N Sawyer, Perry L McCarty "Chemistry for Environmental Engineering and Science", Tata Mc Graw-Hill edition 2003.
- 4. Manual on sewerage and Sewage Treatment, (2010) CPHEEO, Ministry of Urban Development, New Delhi.
- Metcalf and Eddy Inc., (2004) "Wastewater Engineering Treatment and Reuse", 4<sup>th</sup> Edition, Tata McGraw Hill, India.

6. "Standard Methods for the Examination of Water and Wastewater", 21st Edition, Published by American Public Health Association (APHA), American Water Works Association (AWWA) and Water Environment Federation (WEF), 2005.

### IS Codes:

1. Bureau of Indian Standards: 10500 - 2012, 3025-58: 2006, 10044-1981

### Web Links:

- 1. Link for water quality and quantity: <u>https://www.youtube.com/watch?v=yqlUsWOi3XI</u>
- Link for wastewater characteristics : https://www.youtube.com/watch?v=bBNUEMgPMXQ

## **Course Outcomes (COs):**

At the end of the course, students will be able to

- 1. Analyze the quality of water and sewage sample.
- 2. Recommend suitability of tested water sample as per the Indian standards for drinking/ wastewater sample for discharge into water bodies.
- 3. Identify and choose the water source for water supply schemes.
- 4. Determine air and noise pollution levels in the surrounding environment.
- 5. Demonstrate working of sewage treatment process

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	Marks	Course outcomes addressed
Weekly evaluation of laboratory manuals/records after the conduction of every experiment.	30	CO1, CO2, CO3, CO4 & CO5
Practical test	20	CO1, CO2, CO3, CO4 & CO5
Semester End Evaluation: 50		
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4 & CO5

# BUILDING CONSTRUCTION LABORATORY

Subject Code: CVL57 Credits: 0.0.1 Pre requisites: Contact Hours:

## **Course Coordinator: Smt. Nagashree B**

#### DISPLAY EXPERIMENTS

- 1. Display and demonstrate Tools and equipment used in general construction practices.
- Display and demonstrate Materials in construction (cement and masonry 2 blocks) - List of field / lab tests required for selecting the materials for construction
- 3. Masonry Construction -
  - Masonry wall Construction
- 4. Demonstration of different thickness of wall- one brick (9", i.e., 230mm) and half brick wall (4.5" .i.e., 115mm). Masonry units - Concrete block masonry wall, stone masonry, Aerated blocks masonry, Porotherm block masonry etc.
  - Demonstrations of bonds in brick masonry •
- 5. Demonstration of laying of flooring Different types of flooring with materials
- 6. Formwork- Demonstration of Materials used in formwork and different types of formworks
- 7. Barbending- Demonstration of different types of reinforcement which includes Reinforcing mild steel, HYSD bars of different strengths, structural steel and it's classification, steel tendons, FRP bars
- 8. Concepts in reinforcement detailing -Demonstration of different types of cover blocks, Cracking of bars in reinforcement, Provision of Extra steel
- 9. Display of Fibres used in concrete
- 10. Different types and grades of sand, aggregates and admixtures
- 11. Demonstration of plumbing and electrical components, fixtures and fittings used in construction.
- 12. Other materials like paver blocks and paints, deck sheets, Chicken mesh

## EXPERIMENTS FOR CONDUCTION

- 1. Evaluation of micro structure of cement by using X Ray Diffractometer (XRD), Fourier Transformed Infrared Radiation (FTIR) & Thermo Gravimetric Analysis (TGA).
- 2. Evaluation of tensile strength of structural steel sections ISMB/ ISA/ ISMC of grades 250 & 300 MPa.

- 3. Evaluation of Poison's ratio of structural steel sections
- Test on Water absorption of Bricks, Solid Concrete blocks, Paver Blocks, floor tiles as per IS 1077: 1992, 2185-1 (2005), 15658-2006 & 13630-1 to 15 (2006) codal provisions respectively.
- 5. Strength evaluation of Masonry wall (Brick/ Blocks) asper SP 20(1991)
- 6. Evaluation of compression strength of structural light weight concrete as per IS 456-2000 codal provision.
- 7. Evaluation of water absorption of structural light weight concrete as per IS 1124-1974 Codal provision.
- 8. Evaluation of density of structural light weight concrete as per IS3590-1966 Codal provision.
- 9. Pull out test of HYSD bars In a Concrete/ RCC sample as per IS 2770-1 (1967)
- 10. Tests for Zoning of fine aggregates (Natural/ M Sand) as per IS 383: 1970
- 11. Evaluating Hydraulic strength of water pipes and sewer pipes as per IS 4984-199

## Text Books:

- 1. Sushil Kumar, "Building Construction", Standard Publishers Distributors, New Delh
- 2. S .G Rangwala, "Building Construction Engineering materials Book Stall", Anand
- 3. M S Shetty, "Concrete technology", Chand S and Co.
- 4. Gambhir B L, "Concrete Technology", Tata McGraw Hill, New Delhi

# Course Outcome (COs):

Students will be able to:

- 1. Identify different construction materials and tools used in construction
- 2. Implement different masonry unit construction and flooring construction
- 3. Understand specifications for laying of floor tiles
- 4. Appreciate the need of interface with PHE and electrical conduits/fittings etc...

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	Marks	Course outcomes addressed
Weekly evaluation of laboratory manuals/records after the conduction of every experiment.	30	CO1, CO2, CO3, CO4 & CO5
Practical test	20	CO1, CO2, CO3, CO4 & CO5
Semester End Evaluation: 50		
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4 & CO5

# RESEARCH METHODOLOGY AND INTELLECTUAL PROPERTY RIGHTS

Subject Code: AL58 Pre requisites: Nil Credits: 3:0:0

**Contact Hours: 42** 

**Course Coordinator:** 

### **Course Content**

### Unit I

### **Research Methodology**

**Introduction:** Meaning of Research, Objectives of Research, Types of Research, Ethics in Research, Types of Research Misconduct.

Literature Review and Technical Reading, New and Existing Knowledge, Analysis and Synthesis of Prior Art, Bibliographic Databases, Conceptualizing Research, Critical and Creative Reading.

**Citations:** Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge flow through Citations, Acknowledgments, and Attributions.

- Pedagogy: Chalk and Talk, PowerPoint Presentations
- Links: <u>https://onlinecourses.nptel.ac.in/noc22\_ge08/preview</u>

#### Unit II

**Research Design:** Need for Research Design, Important Concepts Related to Research Design: Dependent and Independent Variables, Extraneous Variable, Variable, Common Control, Confounded Relationship, Research Hypothesis, Experimental and Control Groups, Treatments.

**Experimental Designs:** Introduction to Randomised Block Design, Complete Randomised Design, Latin Square Design, and Factorial Design.

- Pedagogy: Chalk and Talk, PowerPoint Presentations
- Links: <u>https://onlinecourses.nptel.ac.in/noc22\_ge08/preview</u>

## Unit III

Method of Data Collection: Primary and Secondary Data Collection.

**Sampling Design:** Sampling fundamentals, Measurement, and Scaling Techniques, Criteria of Selecting a Sampling Procedure, Characteristics of a Good Sample Design, and Types of Sample Design.

**Data Analysis:** Testing of Hypotheses: Null Hypothesis, Alternative Hypothesis, Type I and Type II Errors, Level of Significance. Procedure for Hypothesis Testing: Mean, Variance, Proportions. Chi-square Test, Analysis of Variance (One Way ANOVA), and Covariance (ANOCOVA)

- Pedagogy: Chalk and Talk, PowerPoint Presentations
- Links: <u>https://onlinecourses.nptel.ac.in/noc23\_ge36/preview</u>

#### Unit IV

## **Intellectual Property Rights**

**Introduction to IPR:** Different forms of IPR, Role of IPR in Research and Development. TRIPS Agreement, Patent Cooperation Treaty (PCT).

**Patents:** Brief history of Patents-Indian and Global Scenario, Principles Underlying Patent Law, Types of Patent Applications in India, Procedure for Obtaining a Patent. Non Patentable Inventions. Rights Conferred to a Patentee, Basmati Rice Patent Case.

- Pedagogy: Chalk and Talk, PowerPoint Presentations
- Links: <u>https://archive.nptel.ac.in/courses/110/105/110105139/</u>

#### Unit V

**Design:** What is a Design? Essential Requirements for a Registrable Design, Procedure of Registration of a Design,

**Trademarks:** Essentials of a Trademark, Registration, and Protection of Trademarks, Rights Conferred by Registration of Trademarks, Infringements, Types of Reliefs, Case Studies.

**Copyrights:** Characteristics of Copyrights, Rights Conferred by Registration of Copyrights, Registration of Copyrights, Infringements, Remedies against Infringement of Copyrights, Case studies

- Pedagogy: Chalk and Talk, PowerPoint Presentations
- Links: https://archive.nptel.ac.in/courses/110/105/110105139/

## Textbooks:

- 1. C. R Kothari, Gourav Garg, Research Methodology Methods and Techniques. New Age International Publishers.
- 2. Dr. B L Wadehra Law relating to Intellectual property. Universal Law Publishing Co.
- Dipankar Deb, Rajeeb Dey, Valentina E. Balas "Engineering Research Methodology", ISSN 1868-4394 ISSN 1868-4408 (electronic), Intelligent Systems Reference Library, ISBN 978-981-13-2946-3 ISBN 978-981-13-2947-0 (eBook), <u>https://doi.org/10.1007/978-981-13-2947-0</u>.

## **Reference Books:**

1. David V. Thiel "Research Methods for Engineers" Cambridge University Press, 978-1-107-03488-4

## Course Outcomes (COs):

At the end of the course, the student will be able to:

- 1. Possess the knowledge of research and conduct a literature review. (PO-8, PO-10, PO-12)
- 2. Apply the knowledge of research design and design of experiments. (PO-4, PO-8, PO 10, PO-12)
- 3. Analyse data collection methods, analysis, and sampling design. (PO-4, PO-8, PO-10, PO-12)
- 4. Understand the global and Indian scenarios of patents and patent applications. (PO-8, PO-10, PO-12)
- 5. Acquire the requirements of registration and infringements related to trademarks, copyrights, and designs. (PO-8, PO-10, PO-12)

Continuous Internal Evaluation (CIE): 50 Marks				
Assessment tool	Marks	Course outcome attained		
Internal test - 1	30	CO1, CO2, CO3		
Internal test - 2	30	CO4, CO5		
The average of the two internal tests will be taken for 30 marks				
Other Components				
Assignment	10	CO1, CO2		
Quiz	10	CO3, CO4, CO5		
Semester End Examination (SEE)	100	CO1, CO2, CO3, CO4, CO5		

ABILITY ENHANCEMENT COURSE		
Subject Code: AEC510	Credits: 3:0:0	
Pre requisites: Nil Contact Hours: 42		
Course Coordinator: Any Department		

Ability Enhancement Courses (AEC) are the generic skill courses which are basic and needed by all to pursue any career. These courses are designed to help students enhance their skills in communication, language, and personality development. They also promote a deeper understanding of subjects like social sciences and ethics, culture and human behaviour, human rights and the law.

Every student shall register for AEC course under the supervision of his/her proctor. For III, IV & V semester, the student shall select the Ability Enhancement Course online such that the selected course does not overlap with any professional core/ elective course offered by the parent department of the student. After selection, the registration of the course has to be done by the student at his/her parent department.

ENVIRONMENTAL STUDIES		
Subject Code: HS59	Credits: 0:0:0	
Pre requisites: Nil Contact Hours: 14L		
Course Coordinator: Dr. H U Raghavendra & Jyothi M R		

#### **Course Content**

#### Unit I

#### **Environment, Ecology and Biodiversity**

Definition, scope and importance. Multidisciplinary nature of Environmental studies. Food chain and food web. Energy flow and material cycling in ecosystem. Biodiversity and threats to biodiversity. Concept of sustainable development: Definition, objectives and applications.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos, Models
- Link: https://youtu.be/I\_bnGkviWOU https://youtu.be/Ar04qG1P8Es

#### Unit II

#### Natural resources

Forest resources: Ecological importance of forests. Water resources: Global water resources distribution. Mineral resources: Environmental effects of extracting and processing Mineral resources. Food resources: Effects of modern agriculture. Land resources: Soil erosion and Desertification.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos
- Link: https://youtu.be/vsXv3anIBSU https://youtu.be/1rOVPqaUyv8

#### Unit III

#### **Energy Sources**

Growing energy needs. Conventional and non-conventional / Renewable and Nonrenewable energy sources. Bio energy-Ethanol and Bio mass energy. Energy of the future – Hydrogen fuel cells and Nuclear enegry. Environmental Impact Assessment (EIA): Definition, Objectives and benefits. Step by step procedure of conducting EIA.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Animations, Models
- Link: https://youtu.be/mh51mAUexK4 https://youtu.be/XS-eXqppf w

## Unit IV

### **Environmental Pollution**

Definition, Causes, Effects and control measures of Water pollution, Air pollution and Soil/ land pollution. Management of Municipal solid Waste and treatment methods of municipal solid waste.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos
- Link: https://youtu.be/NRoFvz8Ugeo https://youtu.be/DAQapF-F4Vw

## Unit V

## **Environmental protection**

Global warming and Climate change, Acid rain, Ozone layer depletion. Salient features of Environmental Protection Act, Air & Water Acts. Functions of Central and State Pollution Control Boards.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Open source softwares
- Link: https://youtu.be/iV-BvYwl4Y8 https://youtu.be/BYqLRGawoH0

#### **Text Books:**

• S M Prakash – Environmental Studies, Elite Publishers, 2007.

## **Reference Books:**

• **P. Venugopala Rao** – Principles of Environmental Science & Engineering Prentice Hall of India, 1<sup>st</sup> edition, 2006.

## Web links and video Lectures (e- Resources):

- 1. https://youtu.be/I\_bnGkviWOU
- 2. https://youtu.be/vsXv3anIBSU
- 3. https://youtu.be/mh51mAUexK4
- 4. https://youtu.be/NRoFvz8Ugeo
- 5. https://youtu.be/iV-BvYwl4Y8

## **Course Outcomes (COs):**

At the end of the course, the student will be able to:

- 1. Describe the importance of environmental studies, sustainable development and biodiversity (PO-1, 7)
- Explain the importance and conservation of impacts of natural resources(PO-1, 7)
- 3. Distinguish the energy sources and identify the alternative energy sources for sustainable development(PO-1, 7)
- 4. Identify the causes, effects and control measures of pollution in developmental activities (PO-1, 7)
- 5. Outline the current environmental issues and the role of the agencies for environmental protection (PO-1, 7)

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	Marks	Course outcomes attained
Internal Test-I	30	CO1, CO2 & CO3
Internal Test-II	30	CO4 & CO5
Average of the two internal test shall be taken for 30 marks		
Other components		
Assignment – MCQ, Objectives	10	CO1 & CO2
Assignment – Quiz, Group presentation	10	CO3 & CO4
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4 & CO5

# VI Semester

# MANAGEMENT & ENTREPRENEURSHIP

Subject Code: AL61

Credits: 3:0:0

Pre requisites: Nil

Contact Hours: 42

Course Coordinator: Dr. M Rajesh / Dr. Siddharthakar

## **Course Content**

## Unit I

Introduction to Management: Definition of Management, Its nature and purpose,

Contributions of F.W. Taylor and Henry Fayol to management theory, Functions of managers.

**Planning:** Types of plans, Steps in planning, the planning process, Management By Objectives (MBO)

**Organizing:** The nature and purpose of organizing, Formal and informal organization. Organization levels and Span of management, Principle of span of management, the structure and process of organizing

- Pedagogy: Chalk board, power point presentations
- Links: https://onlinecourses.nptel.ac.in/noc23\_mg33/preview https://www.digimat.in/nptel/courses/video/110107150/L01.html

## Unit –II

Staffing: Situational factors affecting staffing.

Leading: Human factors in managing, definition of leadership, Ingredients of leadership

**Controlling:** Basic control process, Critical control points and standards, Control as a feedback system, Feed forward control, Requirements for effective controls.

- Pedagogy: Chalk board, power point presentations
- Links: https://nptel.ac.in/courses/110107150

## Unit III

**Introduction to Entrepreneurship:** The Foundations of Entrepreneurship: What is an Entrepreneurship?, The benefits of Entrepreneurship, The potential drawbacks of Entrepreneurship; Inside the Entrepreneurial Mind: From Ideas to Reality: Creativity, Innovation and Entrepreneurship, Creative Thinking, Barriers to Creativity

- Pedagogy: Chalk board, power point presentations
- Links: https://www.youtube.com/watch?v=Hgj\_kRrvbhQ&list=PL7oBzLzHZ1wXW3 mtolxV5nIGn48NLKwrb

## Unit IV

**The Entrepreneurial Journey:** Crafting a Business Plan: The benefits of creating a business plan, The elements of a business plan; Forms of Business Ownership and Buying an Existing Business: Sole proprietorships and partnership.

- **Pedagogy:** Chalk board, power point presentations
- Links: https://www.youtube.com/watch?v=Tzzfd6168jk&list=PLyqSpQzTE6M8EGZ bmNUuUM7Vh2GkdbB1R

## Unit V

**Launching the Business:** Franchising and the Entrepreneur: Types of Franchising, The benefits of buying a Franchise; E-Commerce and the Entrepreneur: Factors to consider before launching into E-commerce, Ten Myths of E-Commerce.

- Pedagogy: Chalk board, power point presentations
- Links: https://www.youtube.com/watch?v=5RMqxtMwejM&list=PLyqSpQzTE6M9z MKj PSm81k9U8NjaVJkR

## **Text Books:**

- 1. Harold Koontz, H. Weihrich, and A.R. Aryasri, Principles of Management, Tata McGraw-Hill, New Delhi, 2004.
- 2. Essentials of Entrepreneurship and Small Business Management Norman Scarborough & Jeffrey Cornwall (Pearson, 2016)

## **References:**

- 1. Innovation & Entrepreneurship Peter Drucker (Harper, 2006)
- 2. Entrepreneurship: The Art, Science, and Process for Success Charles Bamford & Garry Bruton (McGraw-Hill, 2015)
- Managent and Enterpreneuship-NVR Naidu, T Krishna Rao, I.K. International Publishing House Pvt. Ltd.@ 2008
- 4. Poornima M Charantimath, Entrepreneurship Development and Small Business Enterprises, Pearson Education, 2006.

### **Course Outcomes (COs):**

At the end of the course, student will be able to

- 1. Plan and organize for the manpower in the given type of organization (PO: 6,9,11)
- 2. Use staffing Leading and controlling function for the given organization. (PO: 6,8,9,10)
- 3. Understand the fundamentals of entrepreneurship with the goal of fulfilling the requirements of the industries and holding the responsibilities towards the society. (PO-6,7,8)
- 4. Design a basic business plan by considering case studies and show the involvement of ownership in Business. (PO-3,7,8,11)
- 5. Start a new small business with the help of E-Commerce and the current available technologies. (PO-5,11)

Continuous Internal Evaluation (CIE) : 50 Marks		
Assessment tool	Marks	Course outcomes attained
Internal test-I	30	CO1, CO2 & CO3
Internal test-II	30	CO3, CO4 & CO5
Average of the two internal tests shall be taken for 30 marks		
Other components		
Quiz/Assignment	10	CO1 & CO2
Quiz/Assignment/Mini project	10	CO3 CO4 & CO5
work	10	005,004 & 005
Semester End Examination	100 (Scale	CO1 CO2 CO3 CO4 & CO5
(SEE)	down to 50)	CO1, CO2, CO3, CO4 & CO3

# DESIGN OF STRUCTURAL STEEL ELEMENTS

Subject Code: CV62

Credits: 2:1:0

Pre requisites: Nil

Contact Hours: 28L+14T

Course Coordinator: Dr Mourougane R

## **Course Content**

## Unit I

**Bolted Connection:** Introduction, Design Philosophies, Limit State Method, Concepts in design of connections, codal provisions and usage of HSFG bolts. Transfer of forces in bolted connections. Failure of bolted connections, simple and eccentric bolted connections, , Beam to beam to column connections Introduction to stiffened and unstiffened connections (concepts only).

- Pedagogy: Chalk & talk, PPT
- Links: <u>https://www.digimat.in/nptel/courses/video/105105162/L01.html</u> <u>https://www.digimat.in/nptel/courses/video/105105162/L40.html</u> <u>https://m.youtube.com/watch?v=FeAlg1loe8U</u> <u>https://www.nptelvideos.com/civil\_engineering/design\_of\_steel\_structures.php</u>

## Unit II

**Welded Connections:** Concepts in design of connections, Codal provisions, types of welds, Defects in welds, simple and eccentric welded connections, Beam to beam and beam to column connections.

- Pedagogy: Chalk & talk, PPT
- Links
   https://www.google.com/search?q=Design%20of%20welded%20connection%20nptel&tbm=vid
   https://www.slideshare.net/AshishVivekSukh/welded-connections-in-steel-structures-limit-state-design-of-steel-structures
   http://ecoursesonline.iasri.res.in/mod/page/view.php?id=127486

# Unit III

**Tension Members:** Introduction, Types of sections, Grades of steel, Codal provision, shear lag and block shear, Analysis & Design of tension members with different cross sections, Lug angles (concept only).

- Pedagogy: Chalk & talk, PPT
- Links

https://www.apsed.in/post/design-of-tension-members-in-steel-structures-asper-is-800-2007 https://www.slideshare.net/sabnabaiju/design-of-tension-members https://www.studocu.com/en-us/document/university-of-hawaii-atmanoa/environmental-engineering/lect-5-7-tension-members-ppt/11623747

## Unit IV

**Compression Members:** Codal provisions, Slenderness ratio, Analysis and design of simple compression members (angles and I-Sections), built –up cross section Lacings and battens, Column splices, Column bases and Gusseted bases (Bolted and welded connections)

- Pedagogy: Chalk & talk, PPT
- Links

https://theconstructor.org/structural-engg/design-of-steel-compressionmembers/4896/ http://ecoursesonline.iasri.res.in/mod/page/view.php?id=2498

# Unit V

**Flexural Members:** Codal provision, Lateral buckling, Web buckling and crippling, Analysis of laterally restrained and unrestrained beams. Design of laterally restrained and unrestrained simple beams and their connections.

- Pedagogy: Chalk & talk, PPT
- Links

https://www.youtube.com/watch?v=nd3WRss4y\_w https://www.google.com/search?q=design%20of%20beams%20in%20steel%2 Ostructures%20nptel&tbm=vid https://www.google.com/search?q=Design%20of%20bolted%20connection%2 Oas%20per%20IS%20800&tbm=vid

# Text Books:

- 1. Subramanian .N, "Design of Steel Structures", Oxford University Press, New Delhi
- 2. K.S. Duggal, "Design of Steel Structures", Tata Mcgraw Hill, New Delhi

#### **Reference Books:**

- 1. Gaylord and Gaylord, "Design of Steel Structures", Mcgraw Hill Publications, New York.
- 2. Relevant IS Codes: IS800, 2007, "SP:6 (Part I) Structural Engineering Hand Book", BIS, New Delhi.

## Course Outcomes (COs):

Students will be able to:

- 1. Design of steel elements with different types of bolted connections.
- 2. Design of welded connections between different elements.
- 3. Design of tension members with different cross sections.
- 4. Design of compression members with different cross sections and column bases.
- 5. Design of beams for all types of boundary conditions.

Continuous Internal Evaluation (CIE) : 50 Marks			
Assessment Tool	Marks	Course outcomes addressed	
Internal test-I	30	CO1, CO2 & CO3	
Internal test-II	30	CO3, CO4 & CO5	
Average of the two internal tests shall be taken for 30 marks.			
Other components			
Quiz	10	CO1, CO2 & CO3	
Assignment	10	CO3, CO4 & CO5	
Semester End Examination	100 (Scale	CO1 CO2 CO3 CO4&CO5	
(SEE)	down to 50)	01,002,003,004&005	

# PRINCIPLES OF BRIDGE ENGINEERING

Subject Code: CVE631	Credits: 3:0:0
Pre requisites: RC Elements	Contact Hours:
Course Coordinator: Mr. Raje Gowda	

### **Course Content**

### Unit I

**Introduction**: Definition, classification of bridges, components of bridge, Site Selection for Bridges, Hydraulic design for linear waterway & economical span.

- Pedagogy/Course delivery tools: Chalk and talk, invited lectures from industry people, Powerpoint Presentation, video.
- Links: https://www.youtube.com/watch?v=klw2Sb6U\_Ik&t=2009s

## Unit II

**RCC Box culvert:** Introduction, Behavior of Box girder bridges, Design of box culvert subjected to class AA tracked vehicle and class AA wheeled vehicle.

- Pedagogy/Course delivery tools: Chalk and talk, invited lectures from industry people, Powerpoint Presentation, video.
- Links: https://www.youtube.com/watch?v=tVrp4M9HoxY

#### Unit III

**RCC Slab Culvert**: Introduction, Behavior of slab culvert, Design and detailing of slab culvert subjected to 70R (T) vehicle, 70R (w) vehicle and Class A loading.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links: <u>https://www.youtube.com/watch?v=trXqga2z1J4</u>

## Unit IV

**T-Beam Bridge**: Introduction, Behavior of T-beam bridge, Design and detailing of slab panel, cross girder, main girder using COURBON'S Method, subjected to 70R (T) vehicle.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links: <u>https://www.youtube.com/watch?v=klw2Sb6U\_Ik&t=2009s</u>

## Unit V

Substructure, Foundations, Bearings, Joints and Appurtenances: Definition of pier and abutment behaviour of pier and abutment, loads to be considered on pier and

abutment, types of foundations for pier and abutment and loads to be considered on them, Importance of bridge bearings, sketches of different types of bearings. Articulation - details.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links: <u>https://www.youtube.com/watch?v=v8UwdPqS3FI</u> https://www.youtube.com/watch?v=2-0mRsaAgCk

#### Text Books:

- 1. Johnson D Victor, "Essentials of Bridge Engineering", Oxford & IBH Publishing Co New Delhi.
- 2. Krishna Raju N, "Design of Bridges", Oxford & IBH Publishing Co New Delhi.

#### **Reference Books:**

- 1. SP Bindra, Dhanpat Rai & Sons, "Principles and Practice of Bridge Engineering", New Delhi.
- 2. IRC 6–2000 Standard Specifications and Code of Practice for Road Bridges Section II Loadsand Stresses, The Indian Road Congress New Delhi.
- 3. IRC-21, IS456 (2000), SP-16, SP-34.

#### **Course Outcomes (COs):**

Students will be able to

- 1. Demonstrate the components of bridge and define the load flow mechanism. (PO-1, 2 & PSO-1)
- Describe the concept of planning, loads and investigation for bridges. (PO-1, 2 & PSO-1)
- 3. To design slab culverts as per IRC specifications. (PO-1, 2 & PSO-1)
- 4. To design T-beam bridges as per IRC specifications. (PO-1, 2 & PSO-1)
- 5. Identify the causes of failure of bridges due to faulty design, poor quality of materials and construction methods. (PO-1, 2 & PSO-1)

Course	Assessment	and	Evaluation:
Course	11330331110110	anu	L'aluation.

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	Marks	Course outcomes addressed
Internal test-I	30	CO1, CO2 & CO3
Internal test-II	30	CO3, CO4 & CO5
Average of the two internal tests shall be taken for 30 marks.		
Other components		
Quiz	10	CO1, CO2 & CO3
Assignment	10	CO3, CO4 & CO5
Semester End Examination	100 (Scale	CO1 CO2 CO3 CO4 & CO5
(SEE)	down to 50)	CO1, CO2, CO3, CO4 & CO3

# **GROUND IMPROVEMENT TECHNIQUES**

Subject Code: CVE632	Credits: 3:0:0
Pre requisites: Geotechnical Engineering-1	Contact Hours: 42
Course Coordinator: Dr. N Srilatha	

#### **Course Content**

#### Unit I

**Introduction:** Need and objectives of ground improvement, Factors to be considered in the selection of best soil improvement technique. Classification of ground improvement techniques - economic considerations and suitability.

**Mechanical and Hydraulic Modification:** Principle of densification, mechanical modifications - shallow compaction, Deep compaction methods - In-situ densification of cohesive and cohesionless soils - Effect of compaction on properties of soil. Objectives of Hydraulic modification, methods of dewatering systems - open sumps and ditches, well point system, deep well system, vacuum dewatering and Electro-Osmosis method. Hydraulic modification by Preloading technique, vertical drains, sand wicks and prefabricated vertical drains. Design of vertical drains.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: https://nptel.ac.in/courses/105108075
- Video Links: https://www.youtube.com/watch?v=fbrBqep6IhE

https://www.youtube.com/watch?v=bRQAMVJY7uA

#### Unit II

**Physical and Chemical Modification:** Introduction on modification using admixtures - Lime, cement, bitumen, stabilization using municipal solid waste and industrial wastes. Using chemicals - calcium chloride, lignin. Lime piles, modification by deep grouting, thermal modification methods.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: https://nptel.ac.in/courses/105108075

#### Unit III

**Modification by Inclusions and Confinement:** Concept of Soil reinforcement -Types of reinforcing materials - Advantages and disadvantages of strip reinforcement -Functions and applications of various Geosynthetic materials. Mechanism, Advantages and Practical applications of Reinforced earth -Components of Reinforced Earth. Design principles of Reinforced soil structures - Failure modes in Reinforced soil structures.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: https://nptel.ac.in/courses/105108075

### Unit IV

**In–Situ Ground Reinforcement:** Soil nailing - Objectives - Advantages - Components of soil nail wall - Types and construction procedure of soil nail wall. Ground anchorage - objectives and applications, Uplift capacity of anchors. Crib walls - applications - stability aspects in designing crib walls. Gabions and Mattresses - advantages and applications. Rock bolts - Types - Applications - Functions - Bolting principles.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: https://nptel.ac.in/courses/105108075
- Video Links: https://www.youtube.com/watch?v= bynP8npA2X0

https://www.youtube.com/watch?v= CE0NiWmqW2U

## Unit V

**Other Miscellaneous Methods:** Micro Piles - Types – Advantages - Limitations - Applications. Diaphragm walls - Applications. Touch piles - Advantages - Design procedure. Soil Liners - Types - Applications. Sources and type of ground contamination - Impact of contamination on geo-environment. Remediation of contaminated sites.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: https://nptel.ac.in/courses/105108075
- Video Links: https://www.youtube.com/watch?v=wUlQyiHfex0 https://www.youtube.com/watch?v=UF9FLUioZv8

## **Text Books:**

- 1. "Ground Improvement techniques", Dr. P. Purushotham Raju, University Science Press, 1999.
- Manfred R. Hausmann, "Engineering principles of ground modification", McGraw–Hill Publishing Co. 1990.

## **Reference Books:**

1. Robert M. Koerner: Construction and Geotechnical Methods in Foundation Engg, McGraw Hill.

2. Ingles O.G. and Metcalf J.B., "Soil Stabilization – Principles and practice", Butterworths, London, 1972.

### Web links and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses/105108075

## Course Outcomes (COs):

At the end of the course, students will be able to

- 1. Identify the problems associated with the existing ground condition.
- 2. Select and implement soil stabilization techniques based on field conditions.
- 3. Acquire knowledge on soil reinforcement techniques.
- 4. Apply in-situ reinforcement techniques.
- 5. Demonstrate the ground improvement techniques such as micro piles and application of soil liners.

Continuous Internal Evaluation (CIE) : 50 Marks		
Assessment tool	Marks	Course outcomes attained
Internal test-I	30	CO1, CO2 & CO3
Internal test-II	30	CO3, CO4 & CO5
Average of the two internal tests shall be taken for 30 marks		
Other components		
Quiz/Assignment	10	CO1 & CO2
Quiz/Assignment/Mini project	10	CO3 CO4 & CO5
work	10	005,004 & 005
Semester End Examination	100 (Scale	CO1 CO2 CO3 CO4 & CO5
(SEE)	down to 50)	co1, co2, co3, co4 & co3

ENVIRONMENTAL IMPACT ASSESSMENT		
Subject Code: CVE633	Credits: 3:0:0	
Pre requisites: Environmental Engg-I & Environmental Engg-II	Contact Hours: 42L	
Course Coordinator: Mrs. Jyothi. M.R		

## **Course Content**

## Unit I

## Introduction to EIA

Definition of EIA, Need for EIA, EIS, FONSI, Utility of EIA, Scope of EIA, Step by step procedure for conducting EIA, REIA, CEIA, Limitations of EIA, Frame work of EIA, EIA Guidelines for developmental projects.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links: https://youtu.be/8vymfIfip2w?list=PLLy\_2iUCG87CkrNdXME16BCptwGx1fl 67 https://youtu.be/E\_oRwSRdocO2list=PLLy\_2iUCG87CkrNdXME16BCptwGx

https://youtu.be/E\_oRwSRdgcQ?list=PLLy\_2iUCG87CkrNdXME16BCptwGx 1f167

• NPTEL Links: https://www.youtube.com/watch?v=WIqeZH\_0jqQ https://www.youtube.com/watch?v=4pZ1V0\_kkNY

## Unit-II

## **Developmental projects**

Description of affected environment with factors and indices, Methodologies of EIA – Adhoc method, Checklist method, Matrices method, Network method and Overlay method.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation, videos
- Links: https://youtu.be/E\_oRwSRdgcQ?list=PLLy\_2iUCG87CkrNdXME16BCptwGx 1fl67
   https://worta.be/e\_oRwSRdgcQ?list=PLLy\_2iUCG87CkrNdXME16BCptwGx

https://youtu.be/cnVH8xVYsqw?list=RDCMUCY-

ANi3wxkUSGhAel7T0TGw

• NPTEL Links: https://youtu.be/cnVH8xVYsqw?list=RDCMUCY-ANi3wxkUSGhAel7T0TGw

### Unit-III

## Assessment and Prediction of Impacts

Assessment and prediction of impacts on attributes- Air environment, Soil environment, Noise environment.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links: https://www.youtube.com/watch?v=tCSjMoIn7I8 https://www.youtube.com/watch?v=hDQa797i7qU&list=RDLVtCSjMoIn7I8& index=3

https://youtu.be/Vq\_bD40UsmI

• NPTEL Links: https://youtu.be/tCSjMoIn7I8?list=RDLVtCSjMoIn7I8

## Unit-IV

### **Assessment and Prediction of Impacts**

Assessment and prediction of impacts on attributes - Water and Groundwater Environment and Socio-Economic and Human Health Impacts. Public participation in environmental decision making, objectives of public participation and public participation techniques. Practical consideration in preparing in EIA and EIS

- Pedagogy/Course delivery tools: Chalk and talk, Conventional water treatment plant visit, invited lectures from industry people, Power Point Presentation
- Links: https://www.youtube.com/watch?v=HlBYCtJ9\_Cw https://www.youtube.com/watch?v=vc6oEybFgwY https://www.youtube.com/watch?v=KGdHD7mH0PE
- NPTEL Links: https://www.youtube.com/watch?v=u-VSu1YolBw

## Unit-V

## **EIA for Projects**

EIA for Water Resource Project, Highway Project, Iron ore Mining Project, Metro Project, Multistoried Building Project.

- Pedagogy/Course delivery tools: Chalk and talk, invited lectures from industry people, Powerpoint Presentation, video.
- Links: https://www.youtube.com/watch?v=HlBYCtJ9\_Cw https://www.youtube.com/watch?v=vc6oEybFgwY https://www.youtube.com/watch?v=KGdHD7mH0PE
- NPTEL Links: https://www.youtube.com/watch?v=u-VSu1YolBw

## **Text Books:**

- 1. Y. Anjaneyulu and Valli Manickam, "Environment Assessment Methodologies", B.S Publications, Hyderabad, 2007.
- 2. R.K Jain et.al Van Nostrand, "Environmental Impact Analysis" Reinhold Company, 1977.

### **Reference Books:**

- 1. Larry W Canter, "Environmental Impact Assessment" –McGraw Hill International Editions, 1996.
- 2. Guidelines for EIA of Developmental Projects, Minister of Environment and Forests, GOI.

## Web links and video Lectures (e- Resources):

- https://youtu.be/8vymfIfip2w?list=PLLy\_2iUCG87CkrNdXME16BCptwGx1fl
   67
- https://youtu.be/E\_oRwSRdgcQ?list=PLLy\_2iUCG87CkrNdXME16BCptwGx 1fl67
- 3. https://www.youtube.com/watch?v=HlBYCtJ9 Cw
- 4. https://www.youtube.com/watch?v=KGdHD7mH0PE
- 5. https://www.youtube.com/watch?v=vc6oEybFgwY

### **Course Outcomes (COs):**

At the end of the course, the students will be able to:

- 1. Ability to describe the fundamental concepts of EIA.
- 2. Ability to identify various attributes and methods of EIA.
- 3. Ability to apply prediction and assessment methods to EIA of air, water and noise environment.
- 4. Ability to assess the impacts on soil & ground water, Socio-economic and human health impacts and explain techniques of public participation in EIA.
- 5. Ability to apply suitable method of EIA for developmental projects.

Continuous Internal Evaluation (CIE) : 50 Marks			
Assessment Tool	Marks	Course outcomes addressed	
Internal test-I	30	CO1, CO2 & CO3	
Internal test-II	30	CO3, CO4 & CO5	
Average of the two internal tests shall be taken for 30 marks.			
Other components			
Quiz	10	CO1, CO2 & CO3	
Assignment	10	CO3, CO4 & CO5	
Semester End Examination	100 (Scale	CO1 CO2 CO3 CO4&CO5	
(SEE)	down to 50)	CO1, CO2, CO3, CO4& CO3	
# PAVEMENT MANAGEMENT SYSTEM

Subject Code: CVE634

Credits: 3:0:0

Pre requisites: -

Contact Hours: 42L

Course Coordinator: Dr. Vivek R Das

## **Course Content**

## Unit I

**Introduction:** Components & principles of pavement management systems, network and project level PMS, data requirements, Pavement management analysis. Pavement Performance Evaluation: general concepts, serviceability, pavement distress survey systems, Determination of PCI, PSR and PSI.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: https://nptel.ac.in/courses/105105107

# Unit II

## Structural and functional evaluation of pavements:

Structural evaluation of flexible pavements by NDT, Rebound deflection method, Analysis of data, interpretation and applications. Functional deterioration of pavements, causes and effects, unevenness and skid resistence, roughness measurement, profilometers, bump integrator, MERLIN, slope variance, Quarter car simulation.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: https://nptel.ac.in/courses/105105107

# Unit III

**Pavement Performance Prediction:** Concepts, modeling techniques, regression and straight-line interpolation. Structural condition deterioration models, mechanistic and empirical models, HDM and other models. Functional condition deterioration models, unevenness prediction models and other models.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: https://nptel.ac.in/courses/105105107

# Unit IV

**Ranking and Optimization Methodologies:** Recent developments, sample size selection, economic optimization of pavement maintenance and rehabilitation.

**Design alternatives and Selection:** Design objectives and constraints, physical design inputs, alternate pavement design strategies and economic evaluation.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: https://nptel.ac.in/courses/105105107

## Unit V

**Expert systems and Pavement Management**: role of computers in pavement management, applications of expert systems for managing pavements, expert system for pavement evaluation and rehabilitation.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: https://nptel.ac.in/courses/105105107

## **Text Books:**

- 1. Ralph Hass, Ronald Hudson and Zanieswki, "Modern Pavement management"-Krieger Publications.
- 2. W. Ronald Hudson, Ralph Haas and Waheed Uddin, 'Infrastructure Management'- Mc Graw Hill

## **References:**

- 1. Proceedings of North American Conference on Managing Pavement.
- 2. Proceedings of International Conference on Structural Design of Asphalt Pavements.
- 3. NCHRP, TRR and TRB Special Reports.
- 4. Freddy L Roberts, Prithvi S Kandhal et al, "Hot Mix Asphalt Materials, mixture design and construction"- (2nd Edition), National Asphalt Pavement Association Research and Education Foundation, Maryland, USA.

## Web links and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses/105105107

# Course Outcomes (COs):

At the end of the course the student will be able to

- 1. Develop a framework for efficient pavement management system (PO 1,2,&3, PSO1)
- 2. Investigate pavement performance in the field (PO 1,2,&3,PSO1)
- 3. Design pavement distress survey forms for field data collection (PO 1,2,3 PSO1)
- 4. Perform pavement performance prediction modeling (PO 1,2,&3 PSO1)
- 5. Understand the application of expert system for pavement management. (PO 1,2,,3 &7 PSO1)

Continuous Internal Evaluation (CIE) : 50 Marks			
Assessment Tool	Marks	Course outcomes addressed	
Internal test-I	30	CO1, CO2 & CO3	
Internal test-II	30 CO3, CO4 & CO5		
Average of the two internal tests shall be taken for 30 marks.			
Other components	Marks Course outcomes addressed		
Quiz	10	CO1, CO2 & CO3	
Assignment	10	CO3, CO4 & CO5	
Semester End Examination	100 (Scale	CO1 CO2 CO3 CO4&CO5	
(SEE)	down to 50)	001, 002, 005, 004&005	

APPLIED HYDRAULICS		
Subject Code: CVE635	Credits: 3:0:0	
Pre requisites: Fluid Mechanics	Contact Hours: 42L	
Course Coordinator: Mrs. Shilpa D N and Dr. Santhosh L G		

#### **Course Content**

#### Unit I

**Boundary Layer Theory and Drag & Lift:** Introduction. Laminar and Turbulent flows. Boundary Layer- definition, thickness of B.L, Boundary Layer along a long thin plate and its characteristics, Prandtl's Boundary layer equations, Laminar boundary layer, Turbulent boundary layer. Laminar sub-layer, Separation of boundary layer, methods of controlling boundary layer. Flow around submerged objects: Introduction. Drag and Lift - definitions, types of drag, dimensional analysis of drag and lift, drag on a sphere, cylinder, flat plate and airfoil, Lift on a circular cylinder and airfoil.

- Pedagogy/Course delivery tools: Chalk and talk, invited lectures from industry people, Powerpoint Presentation, video.
- Links: <u>https://youtu.be/9njAGk\_DcFg</u> <u>https://youtu.be/j9MYPXkd3Bk</u>

#### Unit II

**Energy and Momentum Principles in Open Channel Flow:** Introduction, classification of flow in open channels, types of channels, velocity distribution in channel section, pressure distribution in open channel, Energy and Momentum principles, description of specific energy curve, channel transitions, Metering flumes – Venturi flume, Standing wave flume.

- Pedagogy/Course delivery tools:Chalk and talk, invited lectures from industry people, Power point Presentation, video.
- Links:<u>https://www.youtube.com/watch?v=bfaM06Ds7NI&pp=ygU1RW5lcmd</u> 5IGFuZCBNb21lbnR1bSBQcmluY2lwbGVzIGluIE9wZW4gQ2hhbm5lbCBG bG93OiA%3D

## Unit III

**Gradually Varied Flow in Open Channel:** Introduction. Dynamic equations of Gradually Varied Flow, characteristics of flow profiles, Control sections, analysis of flow profiles- Gradually Varied Flow computations, practical applications.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links: <u>https://youtu.be/S9k8bO8QTDo</u>

## Unit IV

**Rapidly Varied Flow in Open Channels:** Introduction. Hydraulic Jump -Momentum equation for the Jump, classification of jumps, characteristics of jump in a rectangular channel, Hydraulic jump as an energy dissipater, location of the jump. Rapidly Varied Flow computations, Flow over spillways and weirs.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links:<u>https://www.youtube.com/watch?v=u50EMhG9LsE&pp=ygUmUmFwa</u> WRseSBWYXJpZWQgRmxvdyBpbiBPcGVuIENoYW5uZWxzOiA%3D

## Unit V

**Unsteady Flow in Open Channel Flow:** Introduction, dynamic equation for unsteady flow, Monoclinical rising wave, Wave propagation, Surges in open channels, Flood Routing – Channel routing, Muskingum method.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links:<u>https://www.youtube.com/watch?v=kQnWoMdPWDU&pp=ygUkVW5z</u> <u>dGVhZHkgRmxvdyBpbiBPcGVuIENoYW5uZWwgRmxvdzog</u>

# **Text Books:**

- 1. P.N. Modi & S.M.Seth, "Hydraulics & Fluid Mechanics Including Hydraulics Machines", Standard Book House New Delhi, 22nd edition (2017)
- K. Subramanya, "Flow in Open Channel Flow", McGraw-Hill; Fifth edition (2019)

# **Reference Books:**

- VenTeChow, "Open Channel Hydraulics", McGraw Publishing Company Ltd. New York., (2001)
- Chaudhry, M Hanif, "Open-Channel Flow", Springer, 2nd Edition (2008)

# Course Outcomes (COs):

Students will be able to

At the end of the course, students will be able to

- 1. Describe the boundary layer formation and estimate the drag and lift forces acting on it. (PO-1,2,3)
- 2. Apply Energy and Momentum principles in Open Channel Flow. (PO-1,2,3)
- 3. Describe and analyze Gradually Varied Flow in Open Channel. (PO-1,2,3)

- 4. Analyze Gradually Varied Flow in Open Channel and describe flow over spillways. (PO-1,2,3)
- 5. Describe Unsteady Flow in Open Channel and Flood routing (PO-1,2,3)

Continuous Internal Evaluation (CIE) : 50 Marks			
Assessment Tool	Marks	Course outcomes addressed	
Internal test-I	30	CO1, CO2 & CO3	
Internal test-II	30	CO3, CO4 & CO5	
Average of the two internal tests shall be taken for 30 marks.			
Other components			
Quiz	10	CO1, CO2 & CO3	
Assignment	10	CO3, CO4 & CO5	
Semester End Examination	100 (Scale	CO1 CO2 CO3 CO4&CO5	
(SEE)	down to 50)	01, 002, 003, 004&003	

# ADVANCED DESIGN OF CONCRETE STRUCTURES

Subject Code: CVE641	Credits: 2:1:0
Pre requisites: RC Elements	Contact Hours: 28L+14T
Course Coordinator: Raie Gowda	

#### **Course Content**

#### Unit I

**Introduction**: Retaining walls: Design of Cantilever retaining wall and Counter fort retaining wall.

- Pedagogy/Course delivery tools: Chalk and talk, invited lectures from industry people, Powerpoint Presentation, video.
- Links: <u>https://www.youtube.com/watch?v=klw2Sb6U\_lk&t=2009s</u>

## Unit II

Footings: Design of Raft (slab base) and combined footing ..

- Pedagogy/Course delivery tools: Chalk and talk, invited lectures from industry people, Powerpoint Presentation, video.
- Links: <u>https://www.youtube.com/watch?v=tVrp4M9HoxY</u>

#### Unit III

Water Tanks: Design of circular water tanks resting on ground Rigid base. Design of Circular, Square, Rectangular rigid base water tanks, Introduction to Flexible base water tanks.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links: <u>https://www.youtube.com/watch?v=trXqga2z1J4</u>

## Unit IV

Bunkers and Silos: Design of bunkers, silos using Janssen's Theory and Airy's Theory.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links: <u>https://www.youtube.com/watch?v=klw2Sb6U\_Ik&t=2009s</u>

## Unit V

Design of Flat Slabs and Ribbed Slabs

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links: <u>https://www.youtube.com/watch?v=v8UwdPqS3FI</u> <u>https://www.youtube.com/watch?v=2-0mRsaAgCk</u>

### Text Books:

- 1. Johnson D Victor, "Essentials of Bridge Engineering", Oxford & IBH Publishing Co New Delhi.
- 2. Krishna Raju N, "Design of Bridges", Oxford & IBH Publishing Co New Delhi.

#### **Reference Books:**

- 1. SP Bindra, Dhanpat Rai & Sons, "Principles and Practice of Bridge Engineering", New Delhi.
- 2. IRC 6–2000 Standard Specifications and Code of Practice for Road Bridges Section II Loadsand Stresses, The Indian Road Congress New Delhi.
- 3. IRC-21, IS456 (2000), SP-16, SP-34.

## **Course Outcomes (COs):**

Students will be able to

- 1. Demonstrate the components of bridge and define the load flow mechanism. (PO-1, 2 & PSO-1)
- Describe the concept of planning, loads and investigation for bridges. (PO-1, 2 & PSO-1)
- 3. To design slab culverts as per IRC specifications. (PO-1, 2 & PSO-1)
- 4. To design T-beam bridges as per IRC specifications. (PO-1, 2 & PSO-1)
- 5. Identify the causes of failure of bridges due to faulty design, poor quality of materials and construction methods. (PO-1, 2 & PSO-1)

Continuous Internal Evaluation (CIE): 50 Marks			
Assessment Tool	Marks	Course outcomes addressed	
Internal test-I	30	CO1, CO2 & CO3	
Internal test-II	30	CO3, CO4 & CO5	
Average of the two internal tests shall be taken for 30 marks.			
Other components			
Quiz / Assignment	10	CO1, CO2 & CO3	
Assignment	10	CO3, CO4 & CO5	
Semester End Examination	100 (Scale	CO1 CO2 CO3 CO4&CO5	
(SEE)	down to 50)	001, 002, 005, 004&005	

<b>DESIGN OF PSC STRUCTURE</b>		
Subject Code: CVE642	Credits: 3:0:0	
Pre requisites: -	Contact Hours: 42L	
Course Coordinator: Mr. Santhosh D		

#### **Course Content**

#### Unit I

Materials, Basic Principles of Pre - Stressing & Analysis of Sections for Flexure: High strength concrete and steel, Stress-Strain characteristics and properties, Pretensioning and Post-tensioning systems with end anchorages, comparison of behavior of reinforced concrete and pre stressed concrete, stresses in concrete due to pre-stress and loads for different types of cross sections, stresses in steel due to loads, Cable profiles, Load balancing concept, Centre of Thrust.

- Pedagogy/Course delivery tools: Chalk and talk, Powerpoint Presentation
- Links: https://nptel.ac.in/courses/105106117
  - https://archive.nptel.ac.in/courses/105/106/105106117/
- Impartus recording: http://a.impartus.com/ilc/w/v/VvhX

#### Unit II

Losses of Pre-Stress & Deflections: Losses in Pre stress, Loss of Pre stress due to Elastic shortening, Friction, Anchorage slip, Creep of concrete, Shrinkage of concrete and Relaxation of steel, Total Loss. Deflections of pre-stressed members, short term and long term deflections, Elastic deflections under transfer loads and due to different cable profiles. Deflections limits as per IS 1343. Effect of creep on deflection, Methods of reducing deflection. Limit state of serviceability and control of deflections.

- Pedagogy/Course delivery tools: Chalk and talk, Powerpoint Presentation
- Links: https://nptel.ac.in/courses/105106117

https://archive.nptel.ac.in/courses/105/106/105106117/

• Impartus recording: http://a.impartus.com/ilc/w/v/Vvh4

# Unit III

**Limit State of Collapse**: Flexure and Shear - IS code recommendations, calculation of Ultimate flexural strength of sections. Calculation of principal tensile stress, shear resistance of sections, shear reinforcement.

- Pedagogy/Course delivery tools: Chalk and talk, Powerpoint Presentation
- Links: https://archive.nptel.ac.in/courses/105/106/105106117/

#### Unit IV

**Design of End Blocks**: Transmission of prestress in pre-tensioned members, transmission length, Anchorage stress in post-tensioned members. Bearing stress and bursting tensile force, stresses in end blocks, IS code method, provision for the design of end block reinforcement

- Pedagogy/Course delivery tools: Chalk and talk, Powerpoint Presentation
- Links: https://archive.nptel.ac.in/courses/105/106/105106117/

## Unit V

**Design of Beams and slabs**: Design of pre-tensioned and post-tensioned sections. Permissible stress, design of pre - stressing force and eccentricity, limiting zone of pre-stressing force, cable profile. Design of slabs

- Pedagogy/Course delivery tools: Chalk and talk, Powerpoint Presentation
- Links: https://nptel.ac.in/courses/105106117 https://archive.nptel.ac.in/courses/105/105/105105168/

# Text Books:

- 1. Krishna Raju N, "Pre stressed Concrete", Tata Mc Graw Hill, New Delhi.
- 2. Rajagopalan N, "Pre stressed Concrete", Narosa Publishing House, New Delhi.
- 3. IS Code: IS1343 (2012) Indian Standard code of practice for Pre stressed concrete, BIS, New Delhi.

# **References:**

- 1. Lin T Y and Burns N H, "Design of Pre stressed Concrete Structures", John Wiley and Sons, New York.
- 2. **Pundit G S and Gupta S P,** "Pre stressed Concrete", C B S Publishers, New Delhi.

# Web links and Video Lectures (e-Resources):

- 1. https://youtu.be/4KYPltsNAWs
- 2. https://youtu.be/Vdx2dNGsuEM
- 3. https://youtu.be/2pfHyPy3R\_w
- 4. https://youtu.be/egoXjG5n8Ik
- 5. https://youtu.be/5G-bqqJbfVQ

- 6. https://youtu.be/xztDNgsY13Q
- 7. https://youtu.be/BIJTWBlguHs
- 8. https://youtu.be/nKUiEjUhXw4
- 9. https://youtu.be/HQtsnWHHO6c
- 10. https://youtu.be/IHWEHikKH Q
- 11. https://nptel.ac.in/courses/105106117

### **Course Outcomes (COs):**

At the end of the course the student will be able to

- 1. Understand the requirement of PSC member for present scenario and analysis of stresses of PSC elements for transfer and at working condition.(PO-1, 2 & PSO-1)
- 2. Understand the efficiency of design of PSC after studying losses and deflection of PSC elements. (PO-1, 2 & PSO-1)
- 3. Evaluate the ultimate flexural and shear strength for design requirements. (PO-1, 2 & PSO-1)
- 4. Analyze and design of end block as per I.S code. (PO-1, 2, 3 & PSO-1)
- 5. Design the beams and slabs sections for different requirement. (PO-1, 2, 3 & PSO-1)

Continuous Internal Evaluation (CIE): 50 Marks			
Assessment Tool	Marks	Course outcomes addressed	
Internal test-I	30	CO1, CO2 & CO3	
Internal test-II	30 CO3, CO4 & CO5		
Average of the two internal tests shall be taken for 30 marks.			
Other components			
Quiz	10	CO1, CO2 & CO3	
Assignment	10	CO3, CO4 & CO5	
Semester End Examination	100 (Scale	CO1 CO2 CO3 CO4&CO5	
(SEE)	down to 50)	01,002,003,004&005	

SOLID WASTE MANAGEMENT			
Subject Code: CVE643	Credits: 3:0:0		
Pre requisites: Nil	Contact Hours: 42L		
Course Coordinator: Mrs. Jyothi. M.R & Dr. Addagada Lavanya			

#### **Course Content**

#### Unit I

**Introduction to Solid Wastes:** Definition of solid wastes, classification and characteristics of solid wastes, Municipal Solid Waste (Management and Handling) Rules, Biomedical Waste Handling Rules and Recycled Plastic usage Rules.

- Pedagogy/Course delivery tools: Chalk and talk, invited lectures from industry people, Powerpoint Presentation, video.
- Links: https://www.youtube.com/watch?v=HE-4UJncOQ0

#### Unit II

**Collection of Solid Waste:** Systems of collection of solid wastes, transfer stations, collection equipments, route optimization techniques and numerical problems on route optimization, processing techniques of solid wastes (principle of operation and function only).

- Pedagogy/Course delivery tools: Chalk and talk, invited lectures from industry people, Powerpoint Presentation, video.
- Links: https://www.youtube.com/watch?v=NaGbBEU5OfQ

#### Unit III

**Composting:** Composting, factors affecting composting process, aerobic and anaerobic composting, Indore and Bangalore method of composting, mechanical composting process, vermicomposting.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links:https://www.unep.org/news-and-stories/story/how-composting-canreduce-our-impact-planet

## Unit IV

Landfills: Sanitary landfilling, trench method, area method, ramp method and pit method, factors considered for a landfill site selection, cell design, leachate collection systems, control of gas movement and gas recovery systems.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links: https://www.youtube.com/watch?v=Wzo5sv4IrIw

### Unit V

**Incineration:** Incineration process, factors affecting incineration process, air pollution prevention in incinerators, pyrolysis process, plastic waste, biomedical waste and its Impact on health, industrial solid waste recycling and recovery-electronic industry, sugar industry and thermal power plants.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links: https://www.youtube.com/watch?v=J2HTEJhns\_c

## Text Books:

- 1. George Tchobanoglous et.al., "Integrated Solid Waste Management", Mc-Graw-Hill, Inc. New York, 1993.
- 2. Howard S.Peavy et.al., "Environmental Engineering", Mc-Graw-Hill Book Company, New York, 1985.

#### **Reference Books:**

- 1. A.D. Bhide and B.B. Sudareshan, "Solid Waste management in Developing Countries", NEERI, Nagpur 1983.
- 2. S.K Garg "Environmental Engineering (Vol II)" Khanna Publishers, New Delhi 2009.
- 3. Robert A. Corbit, "Standard Handbook of Environmental Engineering", Mcgraw Hill Inc, New Delhi, 1990.
- 4. P. Aarne Vesilind, William Worrel and Reinhart, "Solid Waste Engineering", Thomson Brooks, Cole.
- 5. Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Govt. of India, 2000.
- 6. Management and Handling Rules for Municipal Solid Waste and Biomedical Waste and Plastic Waste, MOEF publications.

## Course Outcome (COs):

At the end of the course, students will be able to

- Describe the components of solid waste management and the laws governing it. (PO - 1, 2 & PSO-1)
- 2. Prioritize the solid waste processing methods and analyze collection systems to propose optimized route2s for waste collection. (PO 1, 2 & PSO-1)
- 3. Implement and control the composting process for treatment of organic fraction

of solid waste. (PO - 1, 2 & PSO-1)

- 4. Design of sanitary landfills and control their conditions of operation and maintenance. (PO 1, 2 & PSO-1)
- 5. Evaluate the conditions of operation and maintenance of incinerators. Identify the waste recovery systems and impacts of plastic waste on environment. (PO 1, 2 & PSO-1)

Course	Assessment	and	Evaluation	•
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Continuous Internal Evaluation (CIE) : 50 Marks			
Assessment Tool	Marks	Course outcomes addressed	
Internal test-I	30	CO1, CO2 & CO3	
Internal test-II	30 CO3, CO4 & CO5		
Average of the two internal tests shall be taken for 30 marks.			
Other components			
Quiz / Assignment	10	CO1, CO2 & CO3	
Assignment	10	CO3, CO4 & CO5	
Semester End Examination	100 (Scale	CO1 CO2 CO3 CO4&CO5	
(SEE)	down to 50)	CO1, CO2, CO3, CO4aCO3	

<b>URBAN TRANSPORT PLANNING</b>			
Subject Code: CVE644	Credits: 3:0:0		
Pre requisites: -	Contact Hours: 42L		
Course Coordinator: Mr. Charan Prasad M			

## **Course Content**

## Unit I

Scope of Urban Transport Planning: Interdependence of land use and transportation system. Land use transportation Models. Approach to transport planning, Stages in transport planning. Fore cast of future conditions and plan synthesis. System Approach in Transport Planning

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos, Models
- Link: <u>https://archive.nptel.ac.in/courses/105/107/105107067/</u> <u>https://archive.nptel.ac.in/courses/105/106/105106058/</u> <u>https://nptel.ac.in/courses/105105204</u>

## Unit II

Various Transportation Surveys & Inventories of transport facilities: Trip generation: trip purpose, factors affecting trip generation and attraction– category analysis– Analysis/ Numerical Problems.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos, Models
- Link: <u>https://archive.nptel.ac.in/courses/105/107/105107067/</u> <u>https://archive.nptel.ac.in/courses/105/106/105106058/</u> <u>https://nptel.ac.in/courses/105105204</u>

## Unit III

Trip distribution: Growth Factor Method, Synthetic Methods- Fratar and Furness Methods, Gravity model, Analysis/ Numerical Problems.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos, Models
- Link: https://www.civil.iitb.ac.in/tvm/nptel/204\_lnTse/web/web.html https://archive.nptel.ac.in/courses/105/105/105208/

#### Unit IV

Factors affecting Modal Split Analysis: Characteristics of modal split, model split in Urban transport planning-problems. Trip assignment, assignment techniques, traffic forecasting, Analysis/ Numerical Problems

- Link: https://www.civil.iitb.ac.in/tvm/nptel/204 lnTse/web/web.html
- https://archive.nptel.ac.in/courses/105/105/105105208/

#### Unit V

Public Transport and Intermediate Public Transport in Indian Cities: Intermodal transportation and coordination of different modes of transport, role of metro rail. Urban transport planning for small and medium cities. Difficulties in transport planning, computer application in transportation planning.

 Link: <u>https://archive.nptel.ac.in/courses/105/107/105107067/</u> <u>https://archive.nptel.ac.in/courses/105/106/105106058/</u> <u>https://nptel.ac.in/courses/105105204</u>

#### Text Books:

- 1. Kadiyali, LR, "Traffic Engineering and Transport Planning", Khanna Publishers.
- 2. Subash C Saxena, "A Course in Traffic Planning and Design", Dhanapat Rai & Sons, Delhi, 1989.

## **Reference Books:**

- 1. Jothi Kristey & Lal, "Introduction to Transportation Engineering", PHI, New Delhi.
- 2. Huchinson. AG, "Urban and Regional Models in Geography and Planning", John Wiley and Sons, London.

## **Course Outcomes (COs):**

At the end of the course, students will be able to

- 1. Describe land use pattern, transportation needs and forecast present conditions for the development of feasible urban transport system. (PO1,2,3 PSO1,2)
- 2. Generate transportation inventories and solutions for the trip generation and attraction. (PO1,2,3 PSO1,2)
- 3. Demonstrate trip distribution us in various trip distribution models. (PO1,2,3 PSO1,2)
- 4. To characterize the modals split on various travel modes and assign the trips generated. (PO1,2,3 PSO1,2)

5. To characterize the transportation means for various categories to cities and apply the latest computer for transportation planning. (PO1,2,3 PSO1,2)

Continuous Internal Evaluation (CIE) : 50 Marks			
Assessment Tool	Marks Course outcomes address		
Internal test-I	30	CO1, CO2 & CO3	
Internal test-II	30	CO3, CO4 & CO5	
Average of the two internal tests shall be taken for 30 marks.			
Other components			
Quiz / Assignment	10	CO1, CO2 & CO3	
Assignment	10	CO3, CO4 & CO5	
Semester End Examination	100 (Scale	CO1 CO2 CO3 CO4 & CO5	
(SEE)	down to 50)	01, 002, 005, 004 & 005	

# **DESIGN OF FORMWORK & SCAFFOLDING**

Subject Code: CVE645

Credits: 3:0:0

Pre requisites: -

Course Coordinator: Mr Harish M.L.

#### **Course Content**

#### Unit I

Form Materials and Pressures on Formwork: Lumber – Types – Finish – Sheathing boards - Working stresses – Repetitive member stress – Plywood – Types and grades – Textured surfaces and strength – Reconstituted wood – Steel – Aluminium Form lining materials – Hardware and fasteners – Nails in Plywood – Bolts lag screw and connectors – Bolt loads. Pressures on Formwork - Concrete density – Height of discharge – Temperature – Rates of Placing – Consistency of concrete – Live loads and wind pressure – Vibration Hydrostatic Adjustment for nonstandard condition.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links:https://www.youtube.com/watch?v=JWJKTmptRpI&ab\_channel=CivilE ngineeringDepartment\_LJIET

#### Unit II

Shores and Form Design: Simple wood stresses Slenderness ratio. Allowable loads. Tubular steel shores & Patented shores. Site Preparation-Size and spacing. Steel Tower Frames. Safety practices. Horizontal shoring for multi-levels. More concentrated shore loads. T-heads, Twotier wood shores, Ellis shores, Day tonsure grip, Baker Roos shores, Safway Symons shores, Beaver Advance shores, Dead shores, Raking and Flying shores. Basic simplification. Beam formulas–Allowable stresses

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links:https://www.youtube.com/watch?v=JWJKTmptRpI&ab\_channel=CivilE ngineeringDepartment\_LJIET

## Unit III

**Planning, Site Equipment and Plant for Formwork:** Overall Planning – Detailed Planning – Standard units – Corner units – Schedule for column formwork – Formwork elements – Planning at Tender stage – Development of basic system – Planning for maximum reuse – Economical form construction – Planning examples – Crane size, effective scheduling estimate – Recheck plan details – Detailing the forms. Crane arrangement – Site layout plan – Transporting plant – Formwork beams – Formwork ties – Wales – Scaffold frames - Form accessories – Vertical transport table formwork. Design of formwork, Wooden Ballies and its limitations

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: https://www.youtube.com/watch?v=JWJKTmptRpI&ab\_channel= Civil Engineering Department\_LJIET

#### Unit IV

**Deflection, Bending & Lateral Stability:** Shear, Bearing – Examples in wall forms – Slab forms – Beam form – Ties, Anchors and Hangers – Column forms – Examples in each. CPWD specifications, construction practices, IS codal requirements, stripping time.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: https://www.youtube.com/watch?v=JWJKTmptRpI&ab\_channel= CivilEngineeringDepartment LJIET /

#### Unit V

## Dome Forms, Tunnel Forms, Slip Form Sand Safety Practices for Scaffolds:

Shells of translation and revolution - Hemispherical – Parabolic - Barrel vaults – Hypar Shells – Conoidal Shells - Folded plates – Shell form design – Building the form – Placing concrete – Strength requirements – Tunnel forming components – Curb and Invert forms. Arch and Wall forms & Telescopic forms. Concrete placement methods – Cut and Cover construction – Continuous Advancing slope method & Bulk head method. General design considerations influence of placing equipment. Tolerances. Form construction for Shafts. Slipforms – Principles, Types, Advantage & Functions of various components. Planning of Slipform operations – Desirable characteristics of concrete. Common problems faced. Safety in slip forms - Special structures built with Slipform Technique & Codal provisions. Types of scaffolds – Putlog and Independent scaffold, Single pole scaffolds, fixing ties, Spacing of ties, Plan Bracing, Knots & Safety nets.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: https://www.youtube.com/watch?v=JWJKTmptRpI&ab\_channel= CivilEngineeringDepartment\_LJIET

## Text Books:

- 1. Robert L. Peurifoy and Garold D. Oberlender, "Formwork for Concrete Structures", Third Edition McGraw-Hill, 1996.
- 2. Hurd, M.K., "Formwork for Concrete", Special Publication No.4 Sixth Edition, American Concrete Institute, Detroit, 1995.

#### **References:**

- 1. Michael. P. Hurst, "Formwork", Construction Press, London and New York, 1997.
- 2. Austin, C.K., "Formwork for Concrete", Cleaver-Hume Press Ltd., London, 1996.
- 3. Tudor Dinescu and Constantin Radulescu, "Slip form Techniques", Abacus Press, Turn Bridge Wells, Kent, 1992.
- 4. "Guide for Concrete Formwork", American Concrete Institute Detroit, Michigan, 1996.
- 5. "Safety Requirements for Scaffolding", American National Standards Institute, New York, 1994.

#### Web links and Video Lectures (e-Resources):

1. https://www.youtube.com/watch?v=JWJKTmptRpI&ab\_channel=CivilEnginee ringDepartment\_LJIET

## **Course Outcomes (COs):**

At the end of the course the student will be able to

- 1. Describe various types of materials and forces acting on formwork. (PO-1, 2 & PSO-1)
- 2. Analyze and design the shores and formwork. (PO-1, 2 & PSO-1)
- 3. Provide detailed planning for scaffolding. (PO-1, 2 & PSO-1)
- 4. Analyze the deflection of formwork. (PO-1, 2 & PSO-1)
- 5. Analyze and design of various types of shells. (PO-1, 2 & PSO-1)

Continuous Internal Evaluation (CIE) : 50 Marks			
Assessment Tool	Marks Course outcomes address		
Internal test-I	30	CO1, CO2 & CO3	
Internal test-II	30 CO3, CO4 & CO5		
Average of the two internal tests shall be taken for 30 marks.			
Other components			
Quiz / Assignment	10	CO1, CO2 & CO3	
Assignment	10	CO3, CO4 & CO5	
Semester End Examination	100 (Scale	CO1 CO2 CO3 CO4 & CO5	
(SEE)	down to 50)	CO1, CO2, CO3, CO4 & CO3	

# GEOTECHNICAL ENGINEERING LABORATORY

Subject Code: CVL65	Credits: 0:0:1	
Pre requisites: Geotechnical Engineering-1	<b>Contact Hours: 14P</b>	
Course Coordinator: Dr. J. Sumalatha & Dr. N. Srilatha		

- 1. Determination of Specific gravity and moisture content
- 2. Grain size analysis of soil sample (sieve analysis)
- 3. In situ density by core cutter and sand replacement methods
- 4. Relative Density of sands
- 5. Consistency limits Liquid limit (by Casagrande's, Plastic limit & Shrinkage limit and Cone Penetration methods)
- 6. Standard proctor Compaction Test.
- 7. Coefficient of permeability by constant and variable head methods.
- 8. Determination of shear strength parameters using Unconfined compression test.
- 9. Determination of shear strength parameters using Direct shear test Consolidation test.
- 10. Determination of shear strength parameters using Triaxial Compression test.
- 11. Demonstration of Consolidation test Determination of compression index and coefficient of consolidation.
- 12. Demonstration of Hydrometer test, Modified Proctor's test & Proctor's needle.
- 13. Demonstration of Plate load test.

# **Text Books:**

- 1. Punmia B.C. (2005), "Soil Mechanics and Foundation Engg.", 16<sup>th</sup> Edition, Laxmi Publications Co., New Delhi.
- 2. Alam Singh and Chowdhary G.R., "Soil Engineering in Theory and Practice" CBS Publishers and Distributors Ltd., New Delhi
- 3. Gopal Ranjan and Rao A.S.R. (2000), "Basic and Applied Soil Mechanics", New Age International (P) Ltd., New Delhi.

## **Reference Books:**

- 1. Bowles J.E. (1996), 'Foundation Analysis and Design'' 5th Edition, McGraw Hill Pub. Co. New York.
- 2. BIS Codes of Practice: IS 2720

## Web links and Video Lectures (e-Resources):

- 1. Link for Specific gravity and moisture content\_ https://www.youtube.com/watch?v=nfv8zDJXlt0 https://www.youtube.com/watch?v=N2J-tvEeI4c
- 2. Link for Grain size analysis of soil sample https://www.voutube.com/watch?v=CAezS3mPzOc.
- 3. Link for In situ density by core cutter and sand replacement method https://www.youtube.com/watch?v=C10dklH12W0
- Link for Relative Density of sands <u>https://www.youtube.com/watch?v=ZRpZHPwy4ks</u>
- Link for Consistency limits <u>https://www.youtube.com/watch?v=QcBrSKwnDRY</u> https://www.youtube.com/watch?v=qAqIkktaqKM
- 6. Link for Standard proctor Compaction Test https://www.youtube.com/watch?v=AP-lvZqLDYM.
- 7. Link for Coefficient of permeability by constant and variable head methods <u>https://www.youtube.com/watch?v=68cmPG\_Pyow</u> https://www.youtube.com/watch?v=c7IiNzsSGZY
- Link for Shear strength parameters using Unconfined compression test <u>https://www.youtube.com/watch?v=M4TNKwuSnAk</u>
- 9. Link for Shear strength parameters using Direct shear test Consolidation test <u>https://www.youtube.com/watch?v=x18whfs8oCA</u>
- 10. Link for Shear strength parameters using Triaxial Compression test. <u>https://www.youtube.com/watch?v=LUNg4dN2EB0</u>
- 11. Link for Consolidation test <u>https://www.youtube.com/watch?v=kFWYrD9sG7c</u>
- 12. Link for Hydrometer test, Modified Proctor's test & Proctor's needle <u>https://www.youtube.com/watch?v=TT0gbVJSuTw</u> <u>https://www.youtube.com/watch?v=tqHNK67IgG4</u> <u>https://www.youtube.com/watch?v=ZGCzJYQ1fGU</u>
- 13. Link for Plate load test <u>https://www.youtube.com/watch?v=QuE4tEK-5iY</u> <u>https://www.youtube.com/watch?v=hBZhBijnVLY</u> <u>https://www.youtube.com/watch?v=PF2rGiyEFnU</u>

### **Course Outcomes (COs):**

At the end of the course, the students will be able to: Student will be able

- 1. To determine the index properties of soils. (PO- 1,3,4,9,10,12).
- 2. Classify different soils based on their gradation and plasticity characteristics. (PO- 1,2,3,4,9,10,12)
- 3. To determine the field density of cohesive and cohesion less soils. (PO-1,2,3,4,8,9,10,12)
- 4. To determine the permeability of different types of soils. (PO-1,2,3,4,8,9,10,12)
- 5. To evaluate shear strength of different types of soils. (PO- 1,2,3,4,8,9,10,12)

Continuous Internal Evaluation (CIE) : 50 Marks			
Assessment Tool	Marks	<b>Course Outcomes addressed</b>	
Weekly evaluation of laboratory manuals/records after the conduction of every experiment.	30	CO1, CO2, CO3, CO4 & CO5	
Practical test	20	CO1, CO2, CO3, CO4 & CO5	
Semester End Evaluation: 50			
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4 & CO5	

# DETAILING OF STRUCTURAL ELEMENTS LAB

Subject Code: CVL66

Credits: 0:0:1

# Pre requisites: Nil

Contact Hours · 14P

# Course Coordinator: Mr Nandeesh M S

# Part-A - RCC Elements

- 1. Beams: Simply supported, Cantilever and Continuous
- 2. Slabs: One-way, Two-way and One-way Continuous
- 3. Foundations: Isolated & Combined Footing (Beam & Slab type)
- 4. Staircase: Doglegged
- 5. Retaining wall: Cantilever Type & Counterfort Type
- 6. Water Tanks: Circular and Rectangular in Plan (Rigid and Flexible Base)

# Part–B – Steel Elements

- 1. Beam to Beam connection: Bolted and Welded
- 2. Beam to Column connection: Bolted and Welded
- 3. Column Bracket connection: Bolted and Welded
- 4. Built–up Columns with Lacings & Battens
- 5. Column bases and Gusseted bases with bolted & welded connections
- 6. Column Splices

# **Text Books:**

- 1. N. Krishnaraju "Structural Design & Drawing Reinforced Concrete & Steel", University Press.
- 2. Krishnamurthy "Structural Design and Drawing (Concrete Structures)", CBS publishers, New Delhi. Tata Mc Graw publishers.
- 3. IS Codes: SP-34, SP-16, SP-6 (1,2), IS456 (2000), IS800(2007).

# **Reference Books:**

- 1. B.C. Punmia "Reinforced Concrete Structures" Laxmi Publishing Co.
- 2. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi.
- 3. S.K. Duggal, "Design of Steel Structures", Tata McGraw Hill, New Delhi.

## Web Links:

- 1. Link for working with AutoCAD: <u>https://youtu.be/cmR9cfWJRUU</u>
- 2. Link for Design of RC Members https://archive.nptel.ac.in/courses/105/105/105105105/
- 3. Link for Design of Steel Structures https://archive.nptel.ac.in/courses/105/105/105105162/

### **Course Outcomes (COs):**

At the end of the course, students will be able to

- 1. To detail the RC members as per SP 34. (PO- 1,5)
- 2. Detail the reinforcement of different types of foundation systems. (PO- 1,5,6)
- 3. Detail the reinforcement of retaining wall and water tank as per codal provisions. (PO- 1,5,6)
- 4. Detail the different connection in steel members. (PO- 1,5,6)
- 5. Detail the built-up column with lacing and batten system, column bases & column splices. (PO- 1,5,6)

Continuous Internal Evaluation (CIE): 50 Marks			
Assessment Tool	Marks Course Outcomes address		
Weekly evaluation of laboratory manuals/records after the conduction of every experiment.	30	CO1, CO2, CO3, CO4 & CO5	
Practical test	20	CO1, CO2, CO3, CO4 & CO5	
Semester End Evaluation: 50			
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4 & CO5	

EXTENSIVE SURVEY CAMP		
Subject Code: CVP67	Credits: 0:0:3	
Pre requisites: Geo-informatics & Digital	Geo-informatics & Digital	
Surveying Contact Hours: 42P		
Course Coordinator: Dr. H U Raghavendra & Dr. Santhosh L G		

#### **Course Content**

An extensive survey training involving investigation and design of the following projects. The student shall submit a project report consisting of designs and drawings.

- 1) **Preliminary studies** using Remote Sensing and GIS tools, GPS. Watershed Delineation using Digital Elevation Model satellite images.
- 2) General instructions: Reconnaissance of the sites.
- 3) New Tank Project: The work shall consist of
  - i) Alignment of center line of the proposed bund, longitudinal and cross sections of the center line.
  - ii) Capacity Contour surveys.
  - iii) Details at Waste weir and sluice points.
- 4) New Canal Project: The work shall consist of
  - i) Alignment of center line of the proposed canal, longitudinal and cross sections along the center line.
  - ii) Design of canal regulations work and cross-drainage work.
- 5) Restoration of an Existing Tank: The work shall consist of:
  - i) Alignment of centre line of the existing bund, Longitudinal and Cross sections along the Centre Line
  - ii) Capacity surveys, Details at sluice and waste weir
- 6) Water Supply and Sanitary Project: Examination of sources of water supply, Calculation of quantity of water required based on existing and projected population. Preparation of village map by any suitable method of surveying (like plane tabling), location of sites for ground level and overhead tanks underground drainage system surveys for laying the sewers.

- 7) Highway Project: Preliminary and detailed investigations to align a new road (min. 1 to 1.5 km stretch) between two obligatory points. The investigations shall consist of topographic surveying of strip of land for considering alternate routes and for final alignment. Report should justify the selected alignment with details of all geometric designs for traffic and design speed assumed. Drawing shall include key plan initial alignment, final alignment, longitudinal section along final alignment, typical cross sections of road. (Drawing should be preferably done using AutoCAD).
- Pedagogy/ Course delivery tools: Chalk and Talk, Power point presentations, Videos, Models
- Link: Surveying: https://youtu.be/chhuq\_t40rY
- Link: Higher Surveying: https://nptel.ac.in
- Link: Drones: <u>https://https://www.equinoxsdrones.com/blog/10-</u> major-pros-cons-ofunmanned-aerial-vehicle-uav-drone
- Link: Quantity survey: https://youtu.be/TnaAQ4-a7JI
- Link: Image interpretation: https://youtu.be/X8jirWMSDOI,

https://https://www.youtube.com/watch?v=GF27RMbck0g

- Link: Remote Sensing: https://youtu.be/eABubdXSYO8
- Link: GIS: https://youtu.be/vJAQHA5XQWI
- Link: Applications of RS& GIS: https://youtu.be/SVa66vO08So

#### **Text Books:**

- 1. G S Srivastava Introduction to Geoinformatics, McGraw Hill Education, 2014.
- S K Duggal Surveying Vol I, Tata McGraw Hill publishing company Ltd, New Delhi, 4<sup>th</sup> edition, 2013.

#### **Reference Books:**

- 1. **Punmia B C** Surveying Vol. 1 & 2, Standard book house, Laxmi Publications Pvt. Ltd., New Delhi, 2005.
- 2. S K Roy Fundamental of Surveying, Prentice Hall of India, New Delhi, 2008.
- 3. **Charles D. Ghilani** Elementary Surveying: an introduction to geomatics, Prentice Hall, 13<sup>th</sup> edition, 2012.
- 4. A M Chandra Higher Surveying, New Age International, 2005.
- 5. **K V G Gokhale**–Principles of Engineering Geology, B S Publication, Hyderabad, 2011.
- 6. J R Jensen –Introductory digital image processing: a remote sensing perspective, Prentice Hall, 2<sup>nd</sup> edition, 1996.

 T M Lillesand & R W Kiefer – Remote sensing and image interpretation, John Wiley & Sons, 4<sup>th</sup> edition, 2000.

#### Web links and Video Lectures (e-Resources):

- 1. https://a.impartus.com/ilc/#/video/id/590602
- 2. https://a.impartus.com/ilc/#/video/id/2027011
- 3. https://a.impartus.com/ilc/#/video/id/2066396

#### **Course Outcomes (COs):**

At the end of the course, the student will be able to:

- 1. The components of a proposed new tank. (PO-3, 5, 9, 10, 11, 12)
- 2. Canal cross-sections, canal regulation and cross drainage works. (PO-3, 5, 9, 10, 11, 12)
- 3. Redesign of the tank bund, surplus weir and increase in the reservoir capacity. (PO-3, 4, 5, 7, 9, 10, 11, 12)
- 4. Comprehensive water supply and sewage system for a specified community. (PO-2, 3, 4, 5, 6, 7, 9, 10, 11, 12)
- 5. Alignment and re-alignment of Roads. (PO-3, 5, 9, 10, 11, 12)

#### **Course Assessment and Evaluation:**

Continuous Internal Evaluation (CIE): 50 Marks			
Evaluation Type	Maximum Marks	Minimum Passing Marks	Course out comes attained
CIE Internal assessment Field work carried out	20	8	CO1, CO2, CO3, CO4, CO5
Preparation of CAD drawings and report submission, test and viva-voce	30	12	CO1, CO2, CO3, CO4, CO5
Semester End Evaluation (SEE): 50 Marks			
Standard examination, Viva- voce	50	20	CO1, CO2, CO3, CO4, CO5
CIE+SEE	100	40*	

Note: \* Overall 40% is to scored by the candidate for the passing the course