



RAMAIAH
Institute of Technology

CURRICULUM

Academic Year 2026 – 2027

III & IV SEMESTER
B.E. CIVIL ENGINEERING
Batch- 2025

RAMAIAH INSTITUTE OF TECHNOLOGY
(Autonomous Institute, Affiliated to VTU)
Bangalore – 560054

About the Institute:

Dr. M. S. Ramaiah a philanthropist, founded 'Gokula Education Foundation' in 1962 with an objective of serving the society. M S Ramaiah 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 18 UG programs and 15 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) & Visvesvaraya 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 (TEQIP), an initiative of the Government of India. The institute has 380 competent faculty out of which 70% 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.

The Entrepreneurship Development Cell (EDC) and "Ramaiah Evolute" have been set up on campus to incubate startups. 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, M S Ramaiah Institute of Technology has achieved 75th rank among 1584 top Engineering Institutions & 31st Rank among 131 Schools of Architecture in India for the year 2025.

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 1983 of the institute with an intake of 10 students. The UG and PG programs have been accredited by NBA for three years 2021-2024 and 2024-2027 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 24 research scholars to pursue their degree from this research centre and 30 scholars have completed PhD degree. The areas of research include Structural Engineering, Transportation Engineering, Geotechnical 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 socio- economic 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 by adopting state-of-the-art technical knowledge through effective learning processes with research ambience in producing global quality ethical civil engineers, for the development of sustainable society.

MISSION OF THE DEPARTMENT

1. To transform the young minds into employable professionals by providing contemporary technical knowledge and appropriate professional skills through suitable teaching learning process.
2. To provide rigorous training, acquaint the students with necessary skills and leadership qualities along with ethical values to address the complex and multi-faceted civil engineering problems.
3. 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.

PEO2: To pursue higher education and show intellectual curiosity for lifelong learning.

PEO3: To communicate effectively to work in multi-disciplinary environments embedded with ethical values and social responsibilities.

Knowledge and Attitude Profile (WK)

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

PROGRAM OUTCOMES (POs):

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7)

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

PO10: Project management and finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-long learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

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 2025-29

Semester Course Category	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Total Credits
Applied Science Course (ASC)	08	08	03	--	--	--	--	--	19
Engineering Science Course (ESC)	10	09	--	--	--	--	--	--	19
Humanities, Social Sciences and Management Course (HSMC)	01	02	--	--	03	-	03	--	09
Ability Enhancement Course (AEC)	01	01	01	01	01	--	--	--	05
Universal Human Values (UHV)	--	--	02	--	--	--	--	--	02
Professional Core Course (PCC)	--	--	11	12	11	11	04	--	49
Professional Core Course (IC)	--	--	04	04	04	--	04	--	16
Professional Elective Course (PEC)	--	--	--	03	03	03	03	--	12
Open Elective Course (OEC)	--	--	--	--	--	03	03	--	06
Internship (INT)	--	--	--	✓	--	--	--	04	04
Mini Project / Project Work (PW)	--	--	--	--	--	04	02	12	18
Skill Development Course (SDC)	--	--	--	--	--	01	--	--	01
Non Credit Mandatory Course (NCMC)	--	--	--	--	✓	--	--	✓	--
Total Credits	20	20	21	20	22	22	19	16	160

**B.E. CIVIL ENGINEERING
SCHEME OF TEACHING
BATCH-2025**

III SEMESTER

Sl. No.	Subject Code	Subject	Teaching Department	Category	Credits				Total contact hours /week			
					L	T	P	Total	L	T	P	S
1	CV31	Applied Mathematics for Civil Engineers	Maths	ASC	2	1	0	3	2	2	0	2
2	CV32	Geo-informatics and Digital Surveying	Civil	PCC(IC)	3	0	1	4	3	0	2	3
3	CV33	Strength of Materials	Civil	PCC	2	1	0	3	2	2	0	2
4	CV34	Fluid Mechanics & Hydraulics	Civil	PCC	2	1	0	3	2	2	0	2
5	CV35	Water Supply Engineering	Civil	PCC	3	0	0	3	3	0	0	3
6	UHV36	Universal Human Values		UHV	2	0	0	2	2	0	0	2
7	CVAEC37	Smart Urban Infrastructure Ability Enhancement Course- III		AEC	1	0	0	1	1	0	0	1
8	CVL38	Building Planning and Drawing Laboratory		PCC	0	0	1	1	0	0	2	0
9	CVL39	Materials Testing Laboratory		PCC	0	0	1	1	0	0	2	0
Total					15	3	3	21	15	6	6	15
10	PE69	Physical Education		NCMC	All students have to register compulsorily for any one of the courses with the concerned coordinator (Yoga Teacher/ Physical Education Director/ NSS Coordinator) in the beginning of the III semester. Attending the registered course from III to VI semesters. Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree.							
	YO69	Yoga										
	NS69	NSS										
11	AM31	Additional Mathematics - I *		NCMC	0	0	0	0	-			

Nomenclature: **ASC:** Applied Science Course, **IC:** Integrated Course (Practical Integrated with Theory Course), **PCC:** Professional Core Course, **UHV:** Universal Human Value Course, **AEC:** Ability Enhancement Course, **NCMC:** Non-credit Mandatory Course

Credit Definition:

- **1 credit = 1 hour/week of lecture (L)**
- **1 credit = 2 hours/week of tutorial (T)**
- **1 credit = 2 hours/week of practical(P)**
- **1 credit = 1 hour/week of Self Learning Hours (S)**

The Program Core Course(IC) is an Integrated course, combining theory with practical components.

- Theory sessions shall be conducted for 3 hours per week, while the practical sessions shall be conducted for 2 hours per week.
- Theory components shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).
- The practical component shall be assessed only through CIE (No SEE).
- However, questions from the practical component of the Integrated course (IC) can be included in the SEE question paper.

The Non Credit Mandatory Course, Physical Education (Sport and Athletics)/Yoga/National Service Scheme (NSS):

1. Student shall select any one of the NCMC's namely, Physical Education (Sport and Athletics)/Yoga/ NSS prescribed for four semesters and shall attend the course from the III semester to VI semester to complete all the formalities of the course and earn requisite CIE score. The Pass/Fail shall be reflected in the VI semester grade card.
2. The above mentioned NCMC's shall not be considered for vertical progression as well as for the calculation of SGPA/CGPA but completion of the courses shall be mandatory for the award of degree.

3. CIE marks will be allotted by the concerned course teacher based on attendance and performance in the practice sessions/field every semester (III to VI) for 100 marks and marks scored by the student are scaled down to 100 in the VI semester.
4. In case, any student fails to secure the minimum 40% of the prescribed marks, he/she shall be deemed to have secured 'F' grade.

*** Lateral Entry Students:**

The Non-Credit Mandatory Course, Additional Mathematics I: is prescribed for III Semester Lateral Entry Diploma students admitted to III Semester of BE Program. The student shall register for this course along with other III semester courses. 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. In case student fails to register for the said course/ falls short of attendance, he/she will repeat the course whenever it is offered next. Additional Mathematics I shall have CIE component only and no SEE component. This Course shall not be considered for vertical progression, but completion of the course shall be mandatory for the award of the degree.

Lateral Entry Students:

The Non-Credit Mandatory Course, Inter/Intra Institutional Internship: All the students admitted under lateral entry category shall have to undergo a mandatory Internship of 02 weeks during the intervening vacation of III and IV semesters. Summer Internship shall include Inter / Intra Institutional activities. A Viva-voce examination shall be conducted during IV semester based on which a student will be declared pass or fail. The internship shall be considered as a head of passing for the award of degree. Those, who do not take up / complete the internship shall be declared fail and shall have to complete internship requirements during subsequent semesters.

Lateral Entry Students:

AICTE Activity Points Requirement for BE Programs: As per AICTE guidelines (refer Chapter 6 – *AICTE Activity Point Program, Model Internship Guidelines*), in addition to academic requirements, students must earn a specified number of **Activity Points** to be eligible for the award of the degree. The points to be earned is:

1. **Regular students** admitted to a 4-year degree program must earn **100 Activity Points**.
2. **Lateral entry students** (joining from the second year) must earn **75 Activity Points**.
3. **Students transferred** from other universities directly into the V semester must earn **50 Activity Points** from the date of entry into VTU.

These Activity Points are non-credit and will not be considered for the SGPA/CGPA or be used for vertical progression. However, earning Activity Points is mandatory for the award of the degree, and the points earned will be reflected on the eighth semester Grade Card. If a student completes all the semesters (eight or six) at the end of the program but fails to earn the required Activity Points, the VIII semester Grade Card will be withheld until the requirement is fulfilled. Also, the degree will be awarded only after the Grade Card has been released. The hours spent earning the activity points will not be counted for regular attendance requirements. Students can accumulate these points at any time during their program period, including weekends, holidays, and vacations, starting from the year of admission, provided they meet the minimum hours of engagement prescribed for each activity by AICTE.

**B.E. IN CIVIL ENGINEERING
SCHEME OF TEACHING
BATCH-2025**

IV SEMESTER

Sl. No.	Subject Code	Subject	Teaching Department	Category	Credits				Total contact hours /week			
					L	T	P	Total	L	T	P	S
1	CV41	Construction Materials and Technology	Civil	PCC(IC)	3	0	1	4	3	0	2	3
2	CV42	Hydrology and Irrigation Engineering	Civil	PCC	2	1	0	3	2	2	0	2
3	CV43	Structural Analysis - I	Civil	PCC	2	1	0	3	2	2	0	2
4	CV44	Waste Water Engineering and Management	Civil	PCC	3	0	0	3	3	0	0	3
5	CVE45x	Program Elective Course – 1	Civil	PEC	3	0	0	3	3	0	0	3
6	CVAEC46	Introduction to Building Information Modelling Ability Enhancement Course - IV	Civil	AEC	1	0	0	1	1	0	0	1
7	CVL47	Environmental Engineering Laboratory	Civil	PCC	0	0	1	1	0	0	2	0
8	CVL48	Surveying Practice Laboratory	Civil	PCC	0	0	1	1	0	0	2	0
9	CVL49	Fluid Mechanics Laboratory	Civil	PCC	0	0	1	1	0	0	2	0
	Total				14	2	4	20	14	4	8	14
10	INT410	Inter/ Intra Institutional Internship		NCCMC	0	0	0	0	-			
11	AM41	Additional Mathematics II *		NCCMC	0	0	0	0	-			

Program Elective Course – 1

Sl. No	Sub Code	Subject
1	CVE451	Urban Transport Planning
2	CVE452	Solid Waste Management
3	CVE453	Rural Development
4	CVE454	Green Building Materials And Sustainable Technologies
5	CVE455	Land Use Planning And Disaster Risk Mitigation
6	CVE456	Statistics Probability & Optimization

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The Program Core Course(IC) is an Integrated course, combining theory with practical components.

- Theory sessions shall be conducted for 3 hours per week, while the practical sessions shall be conducted for 2 hours per week.
- Theory components shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).

- The practical component shall be assessed only through CIE (No SEE).
- However, questions from the practical component of the Integrated course (IC) can be included in the SEE question paper.

*** Lateral Entry Students:**

The Non-Credit Mandatory Course, Additional Mathematics II: is prescribed for IV Semester Lateral Entry Diploma students admitted to III Semester of BE Program. The student shall register for this course along with other IV semester courses. 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. In case student fails to register for the said course/ falls short of attendance, he/she will repeat the course whenever it is offered next. Additional Mathematics II shall have CIE component only and no SEE component. This Course shall not be considered for vertical progression, but completion of the course shall be mandatory for the award of the degree.

Lateral Entry Students:

The Non-Credit Mandatory Course, Inter/Intra Institutional Internship: All the students admitted under lateral entry category shall have to undergo a mandatory Internship of 02 weeks during the intervening vacation of III and IV semesters. Summer Internship shall include Inter / Intra Institutional activities. A Viva-voce examination shall be conducted during IV semester based on which a student will be declared pass or fail. The internship shall be considered as a head of passing for the award of degree. Those, who do not take up / complete the internship shall be declared fail and shall have to complete internship requirements during subsequent semesters.

Lateral Entry Students:

AICTE Activity Points Requirement for BE Programs: As per AICTE guidelines (refer Chapter 6 – *AICTE Activity Point Program, Model Internship Guidelines*), in addition to academic requirements, students must earn a specified number of **Activity Points** to be eligible for the award of the degree. The points to be earned is:

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These Activity Points are non-credit and will not be considered for the SGPA/CGPA or be used for vertical progression. However, earning Activity Points is mandatory for the award of the degree, and the points earned will be reflected on the eighth semester Grade Card. If a student completes all the semesters (eight or six) at the end of the program but fails to earn the required Activity Points, the VIII semester Grade Card will be withheld until the requirement is fulfilled. Also, the degree will be awarded only after the Grade Card has been released. The hours spent earning the activity points will not be counted for regular attendance requirements. Students can accumulate these points at any time during their program period, including weekends, holidays, and vacations, starting from the year of admission, provided they meet the minimum hours of engagement prescribed for each activity by AICTE.

III SEMESTER

APPLIED MATHEMATICS FOR CIVIL ENGINEERS

Course Code: CV31	Credits: 2:1:0
Pre – requisites: Differential Calculus and Linear Algebra	Contact Hours: 30L+30T+30S
Course Coordinator: Dr. Dinesh .P.A & Dr. Manidipa Pal	

Course Content

Unit I

Correlation & Regression: Curve fitting by the method of least squares, fitting linear, quadratic and geometric curves, correlation, regression and multiple regression.

- Pedagogy/Course delivery tools: ➤ Chalk and talk, PowerPoint Presentation, Videos
- Links: ➤ <https://nptel.ac.in/courses/111107119>
- Impartus recording: ➤ <https://a.impartus.com/ilc/#/course/3111313/1447>

Unit II

Probability distributions: Discrete and continuous random variables, probability mass function, probability density function, Binomial, Poisson, Exponential and Normal distribution.

- Pedagogy/Course delivery tools: ➤ Chalk and talk, PowerPoint Presentation, Videos
- Links: ➤ <https://nptel.ac.in/courses/111107119>
- Impartus recording: ➤ <https://a.impartus.com/ilc/#/course/96127/452>
➤ <https://a.impartus.com/ilc/#/course/96151/1112>

Unit III

Laplace Transform: Definition, Laplace transform of elementary functions, properties of the Laplace transform, evaluation of integrals using Laplace transform.

Applications of Laplace Transform: Unit–step and unit–impulse function, inverse Laplace transform, solution of linear differential equations using Laplace transform, Engineering applications.

- Pedagogy/Course delivery tools: ➤ Chalk and talk, PowerPoint Presentation, Videos
- Links: ➤ <https://nptel.ac.in/courses/111105134>
➤ <https://nptel.ac.in/courses/111105035>
- Impartus recording: ➤ <https://a.impartus.com/ilc/#/course/59742/295>

Unit IV

Fourier Series: Introduction to series, Periodic functions, Dirichlet's conditions, Fourier series of periodic functions of period 2π and arbitrary period, Practical harmonic analysis.

- Pedagogy/Course delivery ➤ Chalk and talk, PowerPoint Presentation, Videos tools:
- Links: ➤ <https://nptel.ac.in/courses/111107119>
- Impartus recording: ➤ <https://a.impartus.com/ilc/#/course/2975585/1331>
➤ <https://a.impartus.com/ilc/#/course/619570/1030>
➤ <https://a.impartus.com/ilc/#/course/107622/533>

Unit V

Solution of PDE's using Finite difference method: Classification of second order PDE, Solution of one dimensional heat equation using Schmidt method, one-dimensional wave equation using explicit method. Solution of two-dimensional Laplace equation and Poisson equation.

- Pedagogy/Course delivery ➤ Chalk and talk tools:
- Links: ➤ <https://nptel.ac.in/courses/111107107>
- Impartus recording: ➤ <https://a.impartus.com/ilc/#/course/290290/703>
➤ <https://a.impartus.com/ilc/#/course/171951/703>
➤ <https://a.impartus.com/ilc/#/course/2975585/1331>
➤ <https://a.impartus.com/ilc/#/course/132243/636>

Text Books:

1. **Michel Greenberg**-Advanced Engineering Mathematics, Pearson Publishers, 2nd edition, 2013.
2. **Erwin Kreyszig** -Advanced Engineering Mathematics, Wiley publication, 10th edition, 2015

Reference Books:

1. **Glyn James & Phil Dyke** – Advanced Modern Engineering Mathematics, Pearson Education, 5th edition, 2018.
2. **Srimanta Pal & Subobh C Bhunia** - Engineering Mathematics, Oxford University Press, 3rd Reprint, 2016.
3. **B. S. Grewal**- Higher Engineering Mathematics, Khanna Publishers, 45th edition, 2024.

Course Outcomes (COs):

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

1. Fit a least squares curve to a given data, analyse the given discrete random data and its probability distribution. **(PO–1,2 & PSO–1)**
2. Fit a suitable continuous probability distribution function and analyse the given data **(PO–1,2 & PSO–1, 2)**
3. Determine Laplace transform of standard functions and solve the initial and boundary value problem using Laplace transforms. **(PO–1,2 & PSO–1, 2)**
4. Construct the Fourier series expansion of functions/tabulated data. (PO–1,2 & PSO–1)
5. Classify second-order partial differential equations and apply appropriate numerical methods for their solutions, further developing computational skills to model and analyze physical systems governed by these equations. (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 & CO3
Quiz/Assignment	10	CO3, CO4 & CO5
Semester End Examination (SEE)	100 (Scale down to 50)	CO1, CO2, CO3, CO4 & CO5

GEO-INFORMATICS & DIGITAL SURVEYING	
Course Code: CV32	Credits: 3:0:1
Pre – requisites: Nil	Contact Hours: 45L+30P+45S
Course Coordinator: Dr. Santhosh L G	

Course Content

Unit I

Geo-informatics: Definition and necessity. **Surveying:** Definition, necessity and uses. Primary divisions and classifications of surveying. Methods of linear measurements – Direct, optical, electronic, indirect and satellite-based methods. **Leveling survey:** Introduction, terminologies. Different types of benchmarks. Instruments - Dumpy level, automatic level, and levelling staff. Classifications of leveling survey. Profile and cross-section survey with applications. Numerical problems on calculation of reduced levels using plane of collimation method. **Contours:** Introduction, terminologies, characteristics of contours, and applications. Introduction to topographic maps by survey of India.

- Pedagogy/ Course delivery tools: Chalk and Talk, Power point presentations, Videos, Models
- Link: Surveying: https://youtu.be/cAXa2Tc5sbk?list=PL3MO67NH2XxL_js8K-gyg_Yo8lWITwQQd
Generation of Contour map: <https://youtu.be/n0jwJSVxJMM>
Generation of profile maps: <https://youtu.be/5hcgDisFvUw?si=kzRrFsqKjdf1sGA>
- Lab Session: i) Generation of Profile maps and ii) Generation of contour maps using CAD software.

Unit II

Theodolite survey: Introduction, terminologies and uses. **Area and Volume estimation:** Introduction, estimation of area - trapezoidal and Simpsons 1/3rd rule methods, estimation of volume - trapezoidal and prismoidal rule, and spot level methods, estimation of storage capacity of reservoir using contour method.

Curves: Introduction, necessity and types of curves, **Simple Circular Curve:** Elements of circular curve, curve setting by Rankine's method of deflection angles (no derivation), Numerical problems. **Compound Curves:** Elements of a compound curve, numerical problems. Reverse and transition curves – Introduction, necessity, advantages and limitations.

- Pedagogy/ Course delivery tools: Chalk and Talk, Power point presentations,

Videos, Models

- Link: Theodolite survey: <https://www.youtube.com/watch?v=6d4mERJFPpI>
Quantity survey: <https://youtu.be/TnaAQ4-a7JI>
Curves: <https://youtu.be/RRhP3yOz1yE?si=7EmHmoMsUBa-luTw>
Compound Curves: https://youtu.be/yxtRDvdTF_w
- Lab Session: i) Area measurement using digital planimeter and ii) Preparation of cross sections of terrain using contour maps.

Unit III

Remote Sensing - Introduction, brief history, components of remote sensing, ideal remote sensing system. Interaction of EMR with atmosphere and Earth surface features. Satellite orbits, sensors & platforms. Advantages and disadvantages of remote sensing.

LiDAR Survey: Introduction, basic principle, components, working process, and applications.

- Pedagogy/ Course delivery tools: Chalk and Talk, Power point presentations, Videos, Models
- Link: Remote Sensing: <https://youtu.be/eABubdXSYO8>
Lidar survey: https://youtu.be/FDi4dW_FlxY?si=cQOKXoDtj_sDKBPq
- Lab Session: i) Download and visualize satellite data and ii) Information extraction from topographic maps through digitization.

Unit IV

Digital Image Preprocessing (DIP): Digital Image: Introduction, characteristics of an image, types of resolutions with examples, advantages and disadvantages of digital images. **DIP:** Introduction, stages in DIP, Satellite image classification —supervised, unsupervised, machine learning/deep learning, and visual interpretation methods. Process of accuracy assessment of image classification.

GPS: Introduction working operations of GPS system, advantages and disadvantages, applications of GPS in Surveying. **Drones:** Introduction to Drones, functional components of a drone, advantages and disadvantages of drones for surveying.

- Pedagogy/ Course delivery tools: Chalk and Talk, Power point presentations, Videos, Models
- Link: DIP: https://youtu.be/DVay2AHnHvk?si=uzPOY_pexMTFcbe4
GPS: <https://youtu.be/I1KCZCyNWbA?si=Ng6eEZKfcH8rts5a>
Drones: https://youtu.be/dAIAyAi_zog?si=fQ3gHpnBnNNngI8f
- Lab Session: i) Delineation of watershed, drainage network using DEM and ii) Generation of hill shade, aspect, contour and slope maps using DEM.

Unit V

Geographic Information System (GIS): Introduction, components, functions. Data types and structures, Data analysis tools – Proximity and overlay operation tools. Overview of GIS software – commercial and open-source software. Various Data sources.

Applications of RS, GIS and GPS: Land Use Land Cover Mapping, Watershed and water resource Management, Agriculture and Forestry, Natural Disaster Management (Forest fire, landslide, floods and droughts).

- Pedagogy/ Course delivery tools: Chalk and Talk, Power point presentations, Videos, Models
- Link: GIS: <https://youtu.be/vJAQHA5XQWI>
Applications of RS & GIS: <https://youtu.be/SVa66vO08So>
- Lab Session: i) Land Use Land Cover Mapping and ii) LULC Change analysis using Bhoonidhi Web-portal

Overall lab component list:

1. Generation of Profile maps using CAD software
2. Generation of contour maps using CAD software
3. Area computation using digital planimeter
4. Preparation of cross sections of terrain using contour maps
5. Download and visualize satellite data
6. Information extraction from topographic maps through digitization
7. Delineation of watershed, drainage network using DEM
8. Generation of Hill shade, aspect, contour and slope maps from DEM
9. Land Use Land Cover Mapping
10. LULC Change analysis using Bhoonidhi Web-portal

Text Books:

1. **G S Srivastava** – Introduction to Geoinformatics, McGraw Hill Education, 2014.
2. **S K Duggal** – Surveying – Vol I, Tata McGraw Hill publishing company Ltd, NewDelhi, 4th edition, 2013.
3. **Punmia B C** – Surveying Vol. 1 & 2, Standard book house, Laxmi Publications Pvt. Ltd., New Delhi, 2005.
4. **Anji, M. Reddy** - Text Book of Remote Sensing and Geographical Information Systems, BS Publications. 5th Edition. 2014

Reference Books:

1. **S K Roy** – Fundamental of Surveying, Prentice Hall of India, New Delhi, 2008.

2. **Charles D. Ghilani** - Elementary Surveying: an introduction to geomatics, Prentice Hall, 13th edition, 2012.
3. **A M Chandra** – Higher Surveying, New Age International, 2005.
4. **J R Jensen** –Introductory digital image processing: a remote sensing perspective, Prentice Hall, 2nd edition, 1996.
5. **T M Lillesand & R W Kiefer** – Remote sensing and image interpretation, John Wiley & Sons, 4th edition, 2000.

Web links and Video Lectures (e-Resources):

- Surveying: https://youtu.be/cAXa2Tc5sbk?list=PL3MO67NH2XxL_jS8K-gyg_Yo8lWITwQQd
- Generation of Contour map: <https://youtu.be/n0jwJSVxJMM>
- Generation of profile maps: <https://youtu.be/5hcgDisFvUw?si=kzRrFsqKjjdf1sGA>
- Theodolite survey: <https://www.youtube.com/watch?v=6d4mERJFPpI>
- Quantity survey: <https://youtu.be/TnaAQ4-a7JI>
- Curves: <https://youtu.be/RRhP3yQz1yE?si=7EmHmoMsUBa-1uTw>
- Compound Curves: https://youtu.be/yxtRDvdTF_w
- Remote Sensing: <https://youtu.be/eABubdXSyo8>
- Lidar survey: https://youtu.be/FDi4dW_FlxY?si=cQOKXoDtj_sDKBPq
- DIP: https://youtu.be/DVay2AHnHvk?si=uzPOY_pexMTFcBE4
- GPS: <https://youtu.be/I1KCZCyNWbA?si=Ng6eEZKfcH8rts5a>
- Drones: https://youtu.be/dAlAYAi_zog?si=fQ3gHpnBnNNngI8f
- GIS: <https://youtu.be/vJAQHA5XQWI>
- Applications of RS & GIS: <https://youtu.be/SVa66vO08So>

Course Outcomes (COs):

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

1. Apply basic surveying techniques for measurement, leveling, map generation and interpretation. (PO-1, 2,3,4 5,11)
2. Comprehend theodolite surveying, estimate/measure area and volume, and solve problems related to curve setting in engineering surveying (PO-1, 2,3,4 5,11)
3. Understand principles of remote sensing and LiDAR for data acquisition, visualize satellite data and extract information using GIS software (PO-1,2,3,4 5,6,7,11)
4. Understand digital image processing, GPS, and drone technologies for image analysis and create various terrain surface maps using GIS software (PO-1,2,3,4 5,6,7,11)

5. Describe GIS techniques and tools for spatial data analysis for real-world applications like LULC change detection (PO-1,2,3,4 5,6,7,11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	Marks	Course Outcomes addressed
Internal Assessment-I	30	CO1, CO2, CO3 (1 st half of Unit3)
Internal Assessment-II	30	CO3 (2 nd half of Unit3), CO4 & CO5
Average of the two internal tests will be taken for 30 marks		
Other Components		
Lab – Experimental work and Record writing	15	CO1, CO2, CO3, CO4 & CO5
Lab Test	05	CO1, CO2, CO3, CO4 & CO5
Semester End Evaluation (SEE)		
Course end examination(Answer one question from each unit – internal choice)	100 (Scale down to 50)	CO1, CO2, CO3, CO4, CO5

STRENGTH OF MATERIALS	
Course Code: CV33	Credits: 2:1:0
Pre – requisites: Nil	Contact Hours: 30L+30T+30S
Course Coordinator: Dr. Nagashree B	

Course Content

Unit I

Simple Stresses and Strains

Introduction, properties of materials, Stress, Strain, Hook's law, Poisson's Ratio, Stress - Strain diagram for ferrous and non-ferrous metals, principles of superposition, total elongation of tapering bars of circular and rectangular cross sections. Elongation due to self-weight, composite section, volumetric strain-expression for volumetric strain, elastic constants, relationship among elastic constants, thermal stresses.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links: <https://www.youtube.com/watch?v=aQf6Q8t1FQE>,
<https://www.youtube.com/watch?v=YkdQB0JnJD4>
- NPTEL Links: <https://archive.nptel.ac.in/courses/105/105/105105108>;
<https://youtu.be/GkFgysZC4Vc>;

Unit II

Compound Stresses

Introduction –State of stress at point, stress components on inclined planes – general two-dimensional stress system - Principal planes and stresses - Mohr's Circle of stresses. Thin cylinders subjected to pressure, change in length, diameter and volume.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links: <https://www.youtube.com/watch?v=DH3546mSCM>
<https://www.youtube.com/watch?v=xqrVFypkbAA>
<https://www.youtube.com/watch?v=EU8kMQJEn0I>
- NPTEL Links: <https://archive.nptel.ac.in/courses/105/105/105105108/>
<https://youtu.be/EyIEenmUUfU>;<https://youtu.be/nb9zS3fD3Vo>

Unit III

Shear Force and Bending Moment in Beams

Introduction - types of beams, supports and loadings - Shear force & Bending moment, sign conventions - relationship between loading, shear force and bending moment - SFD and BMD with salient values for cantilever beams, simply supported beams and overhanging beams for point loads, UDL, UVL and Couple.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links: <https://www.youtube.com/watch?v=C-FEVzI8oe8>
<https://www.youtube.com/watch?v=gYjWWjVMmoU>
- NPTEL Links: <https://archive.nptel.ac.in/courses/105/105/105105108/>
<https://youtu.be/ITuWnrl3aKI>;

Unit IV

Bending and Shear Stress in Beams

Introduction - Bending stress in beam - assumptions in simple bending theory - derivation of Bernoulli's equation for simple bending - Section modulus Flexural rigidity - expression for shear stress in beam - shear stress distribution for rectangular, 'I' and 'T' sections.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links: <https://www.youtube.com/watch?v=f08Y39UiC-o>,
<https://www.youtube.com/watch?v=XIKzYy2d9BU>
- NPTEL Links: <https://archive.nptel.ac.in/courses/105/105/105105108/>
<https://youtu.be/sP34uzn7diA>;
- Torsion: <https://youtu.be/IQB0bJRCRxo>

Unit V

Deflection of Prismatic Beams & Elastic Stability of Columns Introduction - definitions of slope, deflection - Elastic curve derivation of differential equation for flexure - slope and deflection using Macaulay's method for simply supported and cantilever beams subjected to point loads and UDL. Elastic stability of columns- Introduction - short and long columns - Euler's theory on columns - effective length slenderness ratio - radius of gyration, buckling load - assumptions, derivations of Euler's Buckling load for different end conditions - limitations of Euler's theory - Rankine's formula

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links: <https://www.youtube.com/watch?v=MvBqCeZllpQ> ,
<https://www.youtube.com/watch?v=21G7LA2DcGQ>;
- NPTEL Links: <https://archive.nptel.ac.in/courses/105/105/105105108/>
- Deflection of Beams: <https://youtu.be/GUOKSExdjq8>;
<https://youtu.be/vi0tjfDSjNY>;
- Elastic Stability of Columns: https://youtu.be/ZSQ_5lRj5gI;
<https://youtu.be/3By6vS5xY6s>;

Text Books:

1. **Basavarajaiah and Mahadevappa**, “Strength of Materials”, CBS Publishers, NewDelhi.
2. **R S Khurmi & N Khurmi**, “Strength of Materials”, S Chand Publishers, NewDelhi.
3. **Srinath L S, Prakash Desayi, Srinivasa Murthy N, S. Anantha Ramu**, “Strengthof Materials”, MacMillan, India, New Delhi.
4. **S. Ramamrutham and R Narayanan**, “Strength of Materials”, Dhanpat RaiPublishing Co Pvt Ltd

Reference Books:

1. **Timoshenko and Young**, “Elements of Strength of Materials” Affiliated East-West Press.
2. **James M. Gere**, “Mechanics of Materials” - (5th Edition), Thomson Learning.
3. **Beer & Johnston**, “Mechanics of Materials”, TATA McGraw Hill.
4. **E P Popov**, “Mechanics of Solids”, Prentice Hall of India.

Web links and Video Lectures (e-Resources):

1. <https://youtu.be/iNG4bLMyeFA>;
2. <https://youtu.be/iJTHPgYAqvQ>;
3. <https://youtu.be/0dvefHDSgeE>;
4. <https://youtu.be/dwqrOqo2sHA>;
5. <https://youtu.be/96GKa2AKeeE>;
6. https://youtu.be/vR5z5N_fC5U;
7. <https://youtu.be/mpH0KHWzF8c>;
8. <https://youtu.be/SZCCWZCpPjY>;
9. <https://youtu.be/pXcDvpNt1lU>;
10. <https://youtu.be/vo9uEnasXrQ>;
11. https://youtu.be/7Lda4Bi5g_M;
12. <https://youtu.be/9Mm5YJkma-0>;
13. <https://youtu.be/q7G0RMtrKr8>;
14. https://youtu.be/Xa_qcL0laO0;

Course Outcomes (COs):

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

1. Evaluate the engineering properties of the materials and compile to analyze their structural behavior under axial and shear loading. (PO-1,2)
2. Analyze the behavior of structural elements subjected to compound stresses. (PO-1,2)
3. Evaluate the shear and flexure forces in determinate beams for various combinations of loads and supporting conditions. (PO-1,2,3)
4. Analyze the bending, shear stresses and torsional across various beam sections. (PO-1,2,3)
5. Determine deflection in beams and stability of the compression members. (PO-1,2,3)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	Marks	Course Outcomes addressed
Internal Assessment-I	30	CO1, CO2, CO3 (1 st half of Unit3)
Internal Assessment-II	30	CO3 (2 nd half of Unit3), CO4 & CO5
Average of the two internal tests will be taken for 30 marks		
Other Components		
Assignment	10	CO1, CO2, CO3 (1 st half of Unit3)
Activity based learning/Quiz/Assignment/Mini Project	10	CO3 (2 nd half of Unit3), CO4 & CO5
Semester End Evaluation (SEE)		
Course end examination(Answer one question from each unit – internal choice)	100 (Scale down to 50)	CO1, CO2, CO3, CO4, CO5

FLUID MECHANICS & HYDRAULICS	
Course Code: CV34	Credits: 2:1:0
Pre – requisites: Nil	Contact Hours: 30L++30T+30S
Course Coordinator: Mrs. Shilpa D N and Dr. Santhosh L G	

Course Content

Unit I

Fluid Properties, Fluid Pressure and Hydrostatics

Fluid Mechanics- Definition, Basics of Fluid properties. Newton’s law of viscosity, Classification of fluids. **Fluid Pressure and measurement** - Atmospheric, Absolute, Gauge and Vacuum pressure, Pascal’s Law and Hydrostatic Law- Numerical problems. Manometers– Piezometer, U-Tube and Differential U-Tube manometers (no inverted or single column monometers) -Numerical problems. Concept of Mechanical Pressure gauges with Bourdon’s Pressure gauge. **Hydrostatics**- Total pressure and Centre of pressure on plane vertical, inclined surfaces– Derivation and Numerical problems. Introduction to Buoyancy and Flotation- Archimedes principle, Buoyant force and Centre of buoyancy (No problems)

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation, videos
- Links: Fluid Properties Problems: <https://a.impartus.com/ilc/#/video/id/665099>
- Links: Manometers -<https://a.impartus.com/ilc/#/video/id/671030>

Unit II

Fluid Kinematics and Dynamics

Fluid Kinematics- Definition, classification of fluid flow. Principle of Conservation of Mass - Continuity equation in Cartesian coordinates and One-Dimensional flow– Numerical problems. **Fluid Dynamics**- Equations of motion, Euler’s equation and Bernoulli’s equation of motion– Numerical problems. Bernoulli’s equation for real fluid– Numerical problems. Principle of Conservation of Momentum - Impulse-momentum equation.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation, videos
- Links: <https://a.impartus.com/ilc/#/video/id/705351>
- Links: <https://a.impartus.com/ilc/#/video/id/717150>

Unit III

Flow through Pipes

Flow through Pipes: Introduction, Reynolds experiment and Description of flow in it. Laminar flow - Relation between shear and pressure gradients, Basics of Boundary Layer Theory - Thickness of boundary layer, Laminar Boundary layer, Turbulent Boundary layer and Laminar sub-layer. Separation of Boundary layer, **Drag and Lift** – Introduction. Losses in pipe flow- Derivation of expressions for Major loss of energy due to friction. Minor Losses (No Derivation). Pipes in series, Compound pipe, Equivalent pipe, Pipes in parallel, Basics of Branched pipes. Concept of Hydraulic Gradient Line and Total Energy Line (No problems). Introduction to Water hammer in pipes- Definition, Causes and Factors affecting Water Hammering (No problems).

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation, videos
- Links: <https://www.youtube.com/watch?v=xT5Ow63BK7I>
- Links: <https://a.impartus.com/ilc/#/video/id/535276>

Unit IV

Applications of Bernoulli's and Impulse-Momentum equation in Hydraulics

Introduction to Flow Measurement devices - Definition and Classification of Orifices and Mouth pieces, Venturimeter and Orifice meter, Notches and Weirs. Vena-contracta, End contraction, Simple Numerical problems on Horizontal Venturimeter. Derivation of flow through Rectangular notch/sharp crested weir along with problems. Triangular, Trapezoidal and Cipolletti notch/sharp crested weir (No derivation, Only problems). Introduction to Pitot tubes.

Impact of jet on vanes- Force exerted by fluid jet on stationary and moving (flat normal, inclined and symmetrical curved impinging at centre) Derivation and Numerical Problems. **Hydraulic Machines** - Introduction. Turbines - components and layout of Hydroelectric power plant, classifications of turbines, **Pumps** - Centrifugal pumps, Components and working of pumps, Priming, Introduction to Submersible pumps.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation, videos
- Links: <https://a.impartus.com/ilc/#/video/id/735816>
- Links: <https://www.youtube.com/watch?v=X9FAAMBmZwG&list=PLKeIsF8hXMu7R6YKg2eIodWSfRr76JfbD&index=4>

Unit V

Open Channel Flow, Dimensional Analysis and Model Studies

Open Channel Flow: Introduction. Types of open channels. Classification of Open Channel flow. Uniform flow in channels - Chezy's formula (Derivation and Numerical

Problems), Manning's formula (No Derivation). Most economical channel sections – Derivation and Numerical Problems (only rectangular section). Concepts of Specific energy & Critical flow - Specific energy curve. R.V.F. - Concept of Hydraulic jump in rectangular channels. **Dimensional Analysis and Model Studies:** Introduction. Units and dimensions. Dimensional Homogeneity. Dimensional Analysis using Raleigh's method: Numerical Problems. Model studies. Similitude - Geometric, Kinematic and Dynamic similarities. Force ratio & Dimensionless numbers (No problems). Types of models - Undistorted models and distorted models.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation, Videos.
- Links: <https://a.impartus.com/ilc/#/video/id/547529>
- Links: Model Studies- <https://www.youtube.com/watch?v=OdldY3RLw24>

Text Books:

1. **P. N. Modi & S. M. Seth-** Hydraulics and Fluid Mechanics, Standard Book House, 22nd edition, 2019.
2. **R. K. Bansal-** Fluid Mechanics and Hydraulic Machines, Laxmi Publications (P)Ltd., 11th edition, 2019.
3. **C. S. P. Ojha, P. N. Chandramouli, and R. Berndtsson-** Fluid Mechanics and Machinery, Oxford University Press, 2010.

Reference Books:

1. **Streeter, Wylie and Bedford-** Fluid Mechanics, Tata McGraw Hill
2. **Subramanya. K-** Fluid Mechanics Through Problems, Tata McGraw Hill
3. **S. K. Som & G. Biswas-** Introduction to Fluid Mechanics and Fluid Machines Tata McGraw Hill

Web links and Video Lectures (e-Resources):

1. <https://a.impartus.com/ilc/#/video/id/605161>
2. <https://www.youtube.com/watch?v=IJSUeEqGNY0&list=PLwdnzlV3ogoV-ATGY2ptuLS9mwLFOJoDw>
3. <https://a.impartus.com/ilc/#/video/id/716833>
4. <https://www.youtube.com/watch?v=zDvLZCm1eG0>
5. <https://a.impartus.com/ilc/#/video/id/6246533>
6. <https://www.youtube.com/watch?v=JpnzRs4gpxM>
7. <https://www.youtube.com/watch?v=9jAZ2eWy-Q4>

Course Outcomes (COs):

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

1. Describe fluid properties and determine fluid pressure and hydrostatic forces acting on submerged bodies. (PO-1,2)
2. Apply fundamental principles of physics to fluid flow. (PO-1,2,3)
3. Comprehend Boundary layer theory of fluid flow and analyze flow through pipes. (PO-1,2,3,4)
4. Comprehend the various flow measurement devices and hydraulic machines and analyze impact of jet on vanes (PO-1,2,3,4)
5. Analyze uniform flow through open channel and apprehend the concepts of dimensional analysis and model studies. (PO-1,2,3,4)

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, CO3, CO4 & CO5
Self Study Component	10	CO1, CO2, CO3, CO4 & CO5
Semester End Examination (SEE)	100 (Scale down to 50)	CO1, CO2, CO3, CO4 & CO5

WATER SUPPLY ENGINEERING	
Course Code: CV35	Credits: 3:0:0
Pre – requisites: Nil	Contact Hours: 45L+45S
Course Coordinator: Dr. A. Lavanya	

Course Content

Unit I

Water Requirement

Necessity of water supply and role of engineers. Methods of population forecasting- Arithmetical, Geometrical and Incremental increase method. Water requirements for domestic purpose, industrial use, institutional and commercial use, fire demand- estimation by various empirical formulae, public purpose, losses. Per capita demand and factors affecting it. Variation in rate of water demand, peak factor and design period. Concepts of safe water, wholesome water, potable water and palatable water, NBC guidelines for water requirement.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links: Need for water supply, population forecast
- <https://www.youtube.com/watch?v=pLjVZ-L389U>
- <https://www.youtube.com/watch?v=iraonis64HY>
- NPTEL Links: <https://www.youtube.com/watch?v=YteigN81-Sw>
- <https://www.youtube.com/watch?v=by30mw6U-JQ>

Unit II

Sources and Conveyance of Water

Surface sources - lakes, streams, rivers. Impounded Reservoirs. Underground sources - Infiltration Galleries, Infiltration Wells and Springs. Intake and conveyance of water - types of intakes i) Reservoir intake ii) River intake iii) Canal intake, conveyance of water - open channels and pipes. Pipe materials - HDPE pipes, steel pipes, concrete pipes, pre-stressed concrete pipes, merits and demerits. Pipe Joints - Spigot and Socket joint, Flange joint, Universal pipe joint, Expansion joint, Flexible joint, various stages of pipe laying and its testing. Pipe corrosion and remedial measures. Pipe fittings, types of valves, testing of pipelines. Concept of water distribution analysis software (Water Gem Software).

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation, videos
- Links: sources of water and its conveyance
https://www.youtube.com/watch?v=1LGq_AgU17Q

- NPTEL Links: -<https://www.youtube.com/watch?v=YteigN81-Sw>

Unit III

Quality and Quantity of Water

Sampling- objectives, methods and preservation techniques. Impurities of water - organic and inorganic classification and examination of water. Physical - temperature, colour, turbidity, taste and odour. Chemical - pH value, Total Solids, Hardness, Chlorides, Iron and Manganese, Fluoride, Nitrates and Heavy metals like Hg, Cd, Ar and Dissolved Oxygen. Bacteriological - E-coli, Most Probable Number (MPN), Quality standards for domestic purpose as per BIS, WHO and CPHEEO.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links: -water quality and quantity
<https://www.youtube.com/watch?v=yqlUsWOi3XI>
- NPTEL Links: -<https://www.youtube.com/watch?v=YteigN81-Sw>

Unit IV

Treatment of Water

Flow diagram of different units of treatment, brief description of constructional details, working and operation of following units- screening, aeration- objective, types of aerators, sedimentation- plain sedimentation, sedimentation with coagulation (design), flocculation, filtration- theory of filtration, Rapid sand filters, design of filtration units and pressure filters (no design), disinfection of water, chlorination, description of lime soda, zeolite process, RO membranes and elements, ozonation and UV treatment of water.

- Pedagogy/Course delivery tools: Chalk and talk, Conventional water treatment plant visit, invited lectures from industry people, Power Point Presentation
- Links: -unit process of the water treatment plant
https://www.youtube.com/watch?v=1LGq_AgU17Q
- <https://www.youtube.com/watch?v=KsVfshmK0Ak>
- NPTEL Links: -<https://www.youtube.com/watch?v=YteigN81-Sw>

Unit V

Distribution System and Water Conservation

General requirements, systems of distribution, methods of supply, maintenance of pressure in distribution systems, storage, layout of distribution system. Water supply arrangements in buildings: pipe materials - plastic pipes, High Density Polythene Pipes, merits and demerits. Connections from water main to buildings, supply system within the building (overhead tanks and Hydro pneumatic systems) water supply fittings & relevant codes of practice - their description and uses, water main, service pipes, supply pipe, distribution pipe, domestic storage tank, stop cock, ferrule, goose neck, watertap, water conservation: conservation of rain water, roof water harvesting, recharging of ground water, Star rating for water conveyance components.

- Pedagogy/Course delivery tools: Chalk and talk, invited lectures from industry people, Power point Presentation, video.
- Links: -distribution system and conveyance
https://www.youtube.com/watch?v=1LGq_AgU17Q
<https://www.youtube.com/watch?v=CZnNucQmjkA>
- NPTEL Links: <https://www.youtube.com/watch?v=YteigN81-Sw>

Text Books:

1. **Garg, S.K.**, “Environmental Engineering Vols. I and II”, Khanna Publishers, New Delhi, New Delhi 2010
2. **Punmia B C**, “Environmental Engineering Vol. I”, Laxmi Publication (P) Ltd., Delhi. 2011
3. **Mark. J Hammer**, Water and Waste Technology, John Wiley and Sons Inc., New York, 2008

Reference Books:

1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi.
2. **Panchdhari. A.C.**, “Water Supply and Sanitary Installations”, New Age International Publishers, New Delhi.
3. **Howard. S. Peavy, Donald. R. Rowe, G. Tchobanoglous** Environmental Engineering, McGraw Hill International Edition, New York 2000
4. CPHEEO Manual on Water Supply and Treatment, Ministry of urban Development, Government of India, New Delhi.
5. SP 35 (1987): Handbook on Water Supply and Drainage (with Special Emphasis on Plumbing) [CED 24: Public Health Engineering].

Web links and video Lectures (e- Resources):

1. <https://www.youtube.com/watch?v=YteigN81-Sw>
2. <https://www.youtube.com/watch?v=by30mw6U-JQ>
3. <https://www.youtube.com/watch?v=YteigN81-Sw>
4. <https://www.youtube.com/watch?v=KsVfshmK0Ak>
5. <https://www.youtube.com/watch?v=CZnNucQmjkA>

Course Outcomes (COs):

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

1. Forecast population and to estimate water demand for a community. (PO- 1,2)
2. Identify sources of water, analyze the water for its suitability and convey. (PO-1,2,3)
3. Evaluate water quality and its suitability for drinking. (PO-1,2,3)
4. Demonstrate different methods of treatment of raw water, also design water treatment units to meet the water quality standards. (1,2,3)
5. Plan water supply distribution systems and plumbing of buildings as per bye-laws.(PO- 1,2,3)

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/Miniproject	10	CO1 & CO2
Quiz/Assignment/Mini project work	10	CO3, CO4 & CO5
Semester End Examination (SEE):	100 (Scale down to 50)	CO1, CO2, CO3, CO4, CO5

UNIVERSAL HUMAN VALUES	
Course Code: UHV36	Credits: 2:0:0
Pre – requisites: Nil	Contact Hours: 30L+30S
Course Coordinator: Dr. Lakshmikanth. S	

Course Content

Course Objectives:

This introductory course input is intended

- To help the students appreciate the essential difference between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature
- Thus, this course is intended to provide a much-needed orientational input in value education to the young enquiring minds.

Unit I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education (6 Lectures)

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self-Exploration–what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels

- Pedagogy / Course delivery tools: Chalk and talk, Power point presentation, Videos.
- Lab component / Practical Topics: Links: Holistic Development and Role of Education
- Survey/polls for self-exploration: <https://youtu.be/sGZtTPe-lhQ>

Unit II

Understanding Harmony in the Human Being - Harmony in Myself (6 Lectures)

1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
2. Understanding the needs of Self ('I') and 'Body' - *Sukh* and *Suvidha*
3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
4. Understanding the characteristics and activities of 'I' and harmony in 'I'
5. Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail
6. Programs to ensure *Sanyam* and *Swasthya*

Practice Exercises and Case Studies will be taken up in Practice Sessions.

- Pedagogy / Course delivery tools: Chalk and talk, Power point presentation, Videos.
- Lab component / Practical Topics: Links: Harmony in Human Being- Self and Body
- Links: Harmony in Human Being- Self Links: Harmony between Self and Body Prosperity- <https://youtu.be/0ERSMkRPQBM>
- Survey and polls for self-exploration: https://youtu.be/aJ_BU2OgpKs

Unit III

Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship (6 Lectures)

1. Understanding Harmony in the family – the basic unit of human interaction
2. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship
3. Understanding the meaning of Vishwas; Difference between intention and competence
4. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship
5. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals

6. Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family

Practice Exercises and Case Studies will be taken up in Practice Sessions.

- Pedagogy / Course delivery tools: Chalk and talk, Power point presentation, Videos.
- Lab component / Practical Topics: Survey and polls for self-exploration
- Links: Harmony in Family- Trust: <https://youtu.be/F2KVV4WNnS8>
- Links: Harmony in family- Respect: https://youtu.be/iLqNRPUv0_8
- Links: Harmony in family- Other Feeling Justice: <https://youtu.be/TcYJB7reKnM>
- Links: Harmony in the Society: <https://youtu.be/BkWgFinrnPw>

Unit IV

Understanding Harmony in the Nature and Existence – Whole existence As Co-existence (4 Lectures)

1. Understanding the harmony in the Nature
2. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature
3. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space
4. Holistic perception of harmony at all levels of existence

Practice Exercises and Case Studies will be taken up in Practice Sessions.

- Pedagogy / Course delivery tools: Chalk and talk, Power point presentation, Videos.
- Lab component / Practical Topics: Survey and polls for self-exploration
- Links: Harmony in Nature: https://youtu.be/K1Jpd_ojydw
- Links: Harmony in Existence: https://youtu.be/mormUeZ_RUE

Unit V

Implications of the above Holistic Understanding of Harmony on Professional Ethics (6 Lectures)

1. Natural acceptance of human values
2. Definitiveness of Ethical Human Conduct
3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
4. Competence in professional ethics:

- a) Ability to utilize the professional competence for augmenting universal humanorder
- b) Ability to identify the scope and characteristics of people-friendly and eco-friendlyproduction systems,
- c) Ability to identify and develop appropriate technologies and management patternsfor above production systems.
5. Case studies of typical holistic technologies, management models and productionsystems
6. Strategy for transition from the present state to Universal Human Order:
 - a) At the level of individual: as socially and ecologically responsible engineers,technologists and managers
 - b) At the level of society: as mutually enriching institutions and organizations
- Pedagogy / Course delivery tools: Chalk and talk, Power point presentation, Videos.
- Lab component / Practical Topics: Survey and polls for self-exploration

Suggested Learning Resources:

Text Books:

1. **R.R Gaur, R Sangal, G P Bagaria**, A foundation course in Human Values andprofessional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2

Reference Books:

1. **B L Bajpai**, 2004, Indian Ethos and Modern Management, New Royal Book Co.,Lucknow. Reprinted 2008.
2. **PL Dhar, RR Gaur**, 1990, Science and Humanism, Commonwealth Publishers.
3. **Sussan George**, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986,1991
4. **Ivan Illich**, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
5. **Donella H. Meadows, Dennis L. Meadows, Jorgen Randers**, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, Universe Books.
6. **Subhas Palekar**, 2000, How to practice Natural Farming, Pracheen(Vaidik) KrishiTantra Shodh, Amravati.
7. **A Nagraj**, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
8. **E.F. Schumacher**, 1973, Small is Beautiful: a study of economics as if peoplemattered, Blond & Briggs, Britain.
9. **A.N. Tripathy**, 2003, Human Values, New Age International Publishers.

Web links and Video Lectures (e-Resources):

1. https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw
2. <https://www.youtube.com/watch?v=P4vjfE-YnVk&list=PLWDeKF97v9SP7wSlapZcQRrT7OH0ZIGC4>
3. **Course handouts:**
https://drive.google.com/drive/folders/1zioX_4L2fCNX4Agw282PN86pcZZT3Osr?usp=sharing
4. **Presentation slides:**
https://drive.google.com/drive/folders/1rMUKh1s0HPRBlpp_b1mpS-duNRcwS6YH?usp=sharing

Course Outcomes (COs):

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

CO	Description	CO PO mapping
CO 1	Apprehend the need of Value Education over Human Aspirations	PO-6
CO 2	Assimilate Harmony over the physical needs and to overcome the self- needs for a prosperous life.	PO-6
CO 3	Recognize the need of Harmony in the Family and Society for a better World.	PO-6,
CO 4	Explain the need of mutual understanding for Holistic Harmony in all the Levels of Human Existence.	PO-6
CO 5	Explain the Holistic understanding of Harmony and Professional Ethics at Individual Level and Society.	PO-6,7

Course Assessment and Evaluation:

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 will be taken for 30 marks.		
Other components		
• Assignment • Quiz • Presentation • Model / miniproject • Any other	20 (10 + 10)	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE):		
Course end examination (Answer any one question from each unit – Internal choice)	100 (Scale down to 50 marks)	CO1, CO2, CO3, CO4, CO5

SMART URBAN INFRASTRUCTURE	
Course Code: CVAEC37	Credits: 1:0:0
Pre – requisites: Nil	Contact Hours: 15L+15S
Course Coordinator: Dr. Vivek R Das	

Course Content

Unit I

Introduction to Smart Urban Infrastructures and Smart Cities

Introduction to urban infrastructure, Basic concept of developing smart city, Global standards to create smart city. Different conceptual approaches to Smart Cities and discussing the pros and cons of each approach. Smart urban Infrastructure: List of infrastructure facilities, advantages and disadvantages.

- Pedagogy/ Course delivery tools: Chalk and Talk, Power point presentations, Videos, Models
- Link: nptel.ac.in/courses/105106832
- Link: <https://youtu.be/tKJZxsEeVzk>

Unit II

Smart Urban Energy Systems

Introduction to Smart Energy Systems, Government policy and technology. Energy sector to explore some of the most important managerial considerations in the transition phase and operation of Smart Urban Energy Systems.

- Pedagogy/ Course delivery tools: Chalk and Talk, Power point presentations, Videos
- Link: https://youtu.be/lXNWnvcF2rM?list=PL4flcvT_PXL1LSdalKln5vCqyaupAOaLe
- Link: nptel.ac.in/courses/105106832

Unit III

Smart Transportation Technologies

Introduction to smart transportation system, Mode of transport systems for smart city, data collection to arrive at best transport facility. Significant opportunities and threads for legacy urban transportation systems. Managerial considerations to facilitate the transition phase, and operation of Smart Urban Transportation Systems

- Pedagogy/ Course delivery tools: Chalk and Talk, Power point presentations, Animations, Models
- Link: nptel.ac.in/courses/105101008
- Link: nptel.ac.in/courses/105106832

Unit IV

Smart Water Supply system

Smart water supply systems, Sewage and drainage monitoring, Urban solid waste systems, Smart metering and energy systems. Integration of urban services

- Link: nptel.ac.in/courses/105106832 Pedagogy/ Course delivery tools: Chalk and Talk, Power point presentations, Videos
- Link: nptel.ac.in/courses/105106832

Unit V

Environmental Systems in Smart Cities

Air quality & pollution sensors, Wastewater treatment & reuse, Decentralized solid waste, models, Urban green spaces, Smart environmental monitoring.

- Pedagogy/ Course delivery tools: Chalk and Talk, Power point presentations, Opens source software.
- Link: nptel.ac.in/courses/105106832

Text Books:

1. Infrastructure for Smart Cities, Dr. R P Rathaliya, Shree Hari Publications, 2021
2. Building Smart Cities, ISBN-13 978-1032340128, by Carol L. Stimmel, 2022
3. Smart Cities for Sustainable Development, Ram Kumar Mishra, Ch Lakshmi Kumari, Sandeep

Reference Books:

1. **Vangelis Angelakis, Elias Tragos, Henrich C. Pöhls** - Designing, Developing, and Facilitating Smart Cities: Urban Design to IoT Solutions 1st ed. 2017 Edition,
2. **Poonam Sharma, Swati Rajput** - Sustainable Smart Cities In India, 2023 Edition.

Web links and Video Lectures (e-Resources):

1. <http://kcl.digimat.in/nptel/courses/video/124107007/L43.html>
2. <https://enine.digimat.in/nptel/courses/video/105106188/L10.html>
3. nptel.ac.in/courses/124107158
4. nptel.ac.in/courses/105101008
5. nptel.ac.in/courses/105106832

Course Outcomes (COs):

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

1. Understand the concept of smart city (PO1, PO6)
2. Comprehend efficient energy system for smart city ((PO1, PO6)
3. Identify an efficient transport system ((PO1, PO6)
4. Understand the concept of smart water supply system ((PO1, PO6)
5. Comprehend the various environment systems in smart cities ((PO1, PO6)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	Marks	Course Outcomes addressed
Internal Assessment-I	30	CO1, CO2, CO3 (1 st half of Unit3)
Internal Assessment-II	30	CO3 (2 nd half of Unit3), CO4 & CO5
Average of the two internal tests will be taken for 30 marks		
Other Components		
Assignment – MCQ, Quiz	10	CO1, CO2, CO3 (1 st half of Unit3)
Activity based learning - Group Presentation, Model/Project	10	CO3 (2 nd half of Unit3), CO4 & CO5
Semester End Evaluation (SEE)		
Course end examination(Answer one question from each unit internal choice)	100 (Scaledown to 50)	CO1, CO2, CO3, CO4, CO5

BUILDING PLANNING AND DRAWING LABORATORY	
Course Code: CVL38	Credits: 0:0:1
Pre – requisites: Nil	Contact Hours: 30P
Course Coordinator: Smt. Lakshmi H S	

Course Content

Unit I

Part–A – Working with AutoCAD

1. Introduction to AutoCAD- Components, Screen Layout and Ribbons, Toolbars etc.
2. Setting units, layout and drawing basic shapes (Draw and modify command) in AutoCAD with command and graphical approach.
3. Working with drawing aids such as layers, line weight and blocks, object snap etc., Editing sketches and dimensioning of elements.
4. Introducing text and tables in AutoCAD Hatching, modelling of layout and plotting of drawings.

Part–B – Drafting of Civil Engineering Building Elements

1. Building Components: Stepped wall footing, Column, Lintel and Chajja
2. Building Components: Doors, Windows and Ventilators
3. Building Components: Doglegged Staircase and Open Well Staircase
4. Drawing single floor building plan, section and elevation as per municipal byelaws.
5. Drawing of Post office plan.
6. Drawing of Bank plan.
7. Drawing of School building plan
8. Drawing of Public/Government Office plan (ex. PWD Office)
9. Drawing of Primary Health Centre.

Text Books:

1. **Gurucharan Singh and Subash Chander**, “Civil Engineering Drawing”. (2014), English Standard Publishers and Dist., Delhi.
2. **Sikka V B Kataria S K & Sons**. “A Course in Civil Engineering Drawing”.
3. Building Bye Law: Present BBMP Bye Law.

Reference Books:

1. **Shah M H and Kale C M**, “Building drawing”, Tata Mc-Graw Hill Publishing Co.Ltd., New Delhi.
2. **Gurucharan Singh**, “Building Construction”, Standard publishers and distributors, New Delhi.
3. National Building Code, BIS, New Delhi. 47
4. **Sham Tickoo**, “Understanding AUTOCAD 2004 A beginner’s Guide”, WileyDreamtech India Pvt Ltd.
5. **Jayaram M A., Rajendra Prasad D S.**, “A referral on CAD Laboratory”, SapnaPublications.

Web Links:

1. LinkforworkingwithAutoCad:https://www.youtube.com/watch?v=cmR9cfWJR_UU&list=PLcH1MIEuSvoGaH_GEI_BnQ5In4R_NNOghG
2. LinkforBuildingComponents:https://www.youtube.com/playlist?list=PLHTVTvUaTtbBLCiVX4_PZWTpUvwc_2RieQ
3. LinkforBuildingPlanning:https://www.youtube.com/playlist?list=PLcH1MIEuSvoHRuFu9XTT0_dbrvM3s_EqLB

Course Outcomes (COs):

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

1. Use the tools of AutoCAD and draft simple components (PO- 1,5)
2. Model the layout and plot the drawings. (PO- 1,5,6)
3. Sketch the bonds in brick masonry construction (PO- 1,5,6)
4. Sketch the different components of a building system (PO- 1,5,6,7)
5. Draft the building plan and elevation (PO- 1,5,6,7)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	Marks	Course Outcomes addressed
Weekly evaluation of laboratory Drawings and Files after the conduction of every experiment.	30	CO1, CO2, CO3, CO4 & CO5
Practical test	20	CO1, CO2, CO3, CO4 & CO5
Semester End Evaluation (SEE)		
Semester end examination	50	CO1, CO2, CO3, CO4 & CO5

MATERIALS TESTING LABORATORY	
Course Code: CVL39	Credits: 0:0:1
Pre – requisites: Nil	Contact Hours: 30P
Course Coordinator: Dr. Harish. M.L	

Course Content

Unit I

1. Hardness tests on ferrous and nonferrous metals.
2. Tests to determine Impact energy absorbed by mild steel and aluminum samples.
3. Test to determine the mechanical properties of the ferrous metals Fe 250.
4. Test to determine the mechanical properties of the ferrous metals Fe415 to 550.
5. Bend and re-bend tests on steel bars.
6. Tests to determine the compressive strength of steel.
7. Tests to determine the compressive strength of wood.
8. Tests to determine the shear strength of steel sample.
9. Tests to determine flexural strength test of wood.
10. Tests to determine torsional strength of steel sample.
11. Tests to determine Modulus of Elasticity of steel and wood by deflection equation.
12. Tests to determine the flexural strength of tiles.

Text Books:

1. **Basavarajaiah and Mahadevappa**, “Strength of Materials”, CBS Publishers, NewDelhi.
2. **R S Khurmi & N Khurmi**, “Strength of Materials”, S Chand Publishers, NewDelhi.
3. **Srinath L S, Prakash Desayi, Srinivasa Murthy N, S. Anantha Ramu**, “Strength of Materials”, MacMillan, India, New Delhi.
4. **S. Ramamrutham and R Narayanan**, “Strength of Materials”, Dhanpat RaiPublishing Co Pvt Ltd

Reference Books:

1. **Timoshenko and Young**, “Strength of Materials – Vol II”, Von Nastrand Company, New York.
2. Laboratory Manual prepared by the Department.

IS Codes:

IS 5652 (Part 1): 1993, IS 1500: 2005, IS 1598: 1977, IS 1757: 1988, IS 1608:2005, IS1708 part (8-9):1986, IS 5242:1979, IS 2408:1963, IS 1786:2008, IS 1717:2012, IS1717:2012, IS 3495 part (1-4):1992, IS 654:1992

Web Links:

1. Link for Impact test https://www.youtube.com/watch?v=T3tc33pd3hQ&ab_channel=Engineer%27sAcademy
2. Link for tension and Compression test https://www.youtube.com/watch?v=b5W8qgq7NNQ&ab_channel=CorecivilShubhamAgarwal
3. Link for shear test: https://www.youtube.com/watch?v=9Xnm6l8rpoQ&ab_channel=JSPMNTCAcademics

Course Outcomes (COs):

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

1. Classify the type of engineering material based on the energy absorption capacity. (PO- 1,5,6,7,9)
2. Demonstrate the experiments and evaluate the mechanical strength of various ductile materials. (PO- 1,5,6,7,9)
3. Demonstrate the experiments and evaluate the mechanical strength of various brittle materials. (PO- 1,5,6,7,9)
4. Demonstrate the experiments and evaluate the strength of various materials. (PO-1,5,6,7,9)
5. Summarize various properties of the materials and compile their suitability as per the provisions given in I.S codes. (PO- 1,5,6,7,9)

Course Assessment and Evaluation:

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 (SEE)		
Semester end examination	50	CO1, CO2, CO3, CO4 & CO5

(For Lateral Entry Diploma Students)

ADDITIONAL MATHEMATICS – I	
Course Code: AM31	Credits: 0:0:0
Pre – requisites: Nil	Contact Hours: 45L
Course Coordinator: Dr. Shashi Prabha Gogate S	

Course Content

Unit I

Differential Calculus: Successive differentiation, nth derivatives of some standard functions, Leibnitz theorem, Polar curves. Angle between the radius vector and the tangent, angle between curves, length of the perpendicular from pole to the tangent, pedal equations. Taylor's and Maclaurin's expansions.

- Pedagogy / Course delivery tools:-Chalk and talk
- Links:-<https://nptel.ac.in/courses/111/105/111105121/>
- Impartus recording: -<https://a.impartus.com/ilc/#/course/107625/1030>

Unit II

Integral Calculus: Introduction, Reduction formula, Reduction formula for $\int \sin^n x dx$, $\int \cos^n x dx$ and $\int \tan^n x dx$. Evaluation of double and triple integrals.

- Pedagogy / Course delivery tools:-Chalk and talk
- Links:-<https://nptel.ac.in/courses/111/105/111105121/>
- Impartus recording: -<https://a.impartus.com/ilc/#/course/107625/1030>

Unit III

Vector Algebra: Scalar and vectors. Vector addition and subtraction. Multiplication of vectors (Dot and Cross products). Scalar and vector triple product-simple problems. Vector functions of a single variable. Derivative of a vector function, geometrical interpretation. Velocity and acceleration.

- Pedagogy / Course delivery tools:-Chalk and talk
- Links:-<https://nptel.ac.in/courses/111/105/111105134>
- Impartus recording: -<https://a.impartus.com/ilc/#/course/107625/1030>

Unit IV

Vector Differentiation: Scalar and vector fields, gradient of a scalar field, directional derivative, divergence of a vector field, solenoidal vector, curl of a vector field, irrotational vector. Laplace's operator. Vector identities connected with gradient, divergence and curl.

- Pedagogy / Course delivery tools:-Chalk and talk
- Links:-<https://nptel.ac.in/courses/111/105/111105134>
- Impartus recording: -<https://a.impartus.com/ilc/#/course/107625/1030>

Unit V

First Order Differential Equations: Solution of first order and first degree differential equations, variable separable methods, homogeneous equations, linear and Bernoulli's equations, exact differential equations.

- Pedagogy / Course delivery tools:-Chalk and talk, Power Point Presentation
- Links:-<https://nptel.ac.in/courses/111/105/111105121/>
- Impartus recording: -<https://a.impartus.com/ilc/#/course/59742/295>

Text Books:

1. **B.S. Grewal** – Higher Engineering Mathematics, Khanna Publishers, 44th edition, 2017.
2. **Erwin Kreyszig** – Advanced Engineering Mathematics – Wiley Publication, 10th Edition, 2015.

Reference Books:

1. **H. K. Dass** – Higher Engineering Mathematics – S Chand Publications, 1998.
2. **B. V. Ramana** – Engineering Mathematics – Tata McGraw-Hill Publishing Co.Ltd., New Delhi, 2008.

Course Outcomes (COs):

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

1. Solve problems related to nth derivative to some standard functions, polar curves and power series expansions. (PO-1,2)
2. Apply the concept of reduction formula to determine the length, area, volume of revolution of an arc of the curve. (PO-1,2)
3. Solve the problems related to velocity and acceleration. (PO-1,2)
4. Apply vector differentiation to identify solenoidal and irrotational vectors. (PO-1,2)
5. Apply the concept of various methods to solve first order first degree differential equations. (PO-1,2).

Course Assessment and Evaluation:

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

IV SEMESTER

CONSTRUCTION MATERIALS AND TECHNOLOGY

Course Code: CV41	Credits: 3:0:1
Pre – requisites: Nil	Contact Hours: 45L+30P+45S
Course Coordinator: Dr. Lakshmikanth S	

Course Content

Unit I

Construction Materials: Engineering properties of Stones, Bricks and blocks. Timber, Lime, Cement-Composition of OPC, Types of cement, sand their uses. Tests on cement as per codes of practice. Pozzolanic 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. Evaluation of tensile strength and Poisson's ratio of structural steel sections. Testing of bricks and blocks.

- **Pedagogy/Course delivery tools:** Chalk and Talk, Power point presentations, Videos, Models

Lab component/Practical topics:

1. Determination of bulk density and water absorption of bricks and blocks
2. Demonstration of English and Flemish bond wall construction and testing
3. Determination of compressive strength of bricks and blocks

Unit II

Building Components: Foundations- Classifications & different types, Bearing capacity of soil. Flooring requirements for floor finish and its types. Doors- paneled 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, Power point presentations, Videos, Models

Unit III

Concrete Ingredients, Types of concrete and Microstructure: Concrete ingredients and its importance Cement- hydration of cement, structure of hydrated cement paste. Bogue's compound and transition zone in cement paste, microstructure of cement through XRD, FTIR and TGA. Tests on cement-field test and laboratory tests. Quality of mixing water. Aggregates – Physical properties of Coarse and Fine aggregate. Sieve

analysis, Fineness, grading of aggregates. 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

- **Pedagogy/Course delivery tools:** Chalk and Talk, Power point presentations, Videos, Models

Lab component/Practical topics:

1. Determination of bulk density and water absorption of aggregates
2. Determination of particle size distribution of fine and coarse aggregates

Unit IV

Mix design and fresh concrete: Concept of mix design, variables in proportioning, exposure conditions, procedure of mix design as per IS 10262-2019 and numerical examples of mix design of normal and high strength concrete.

- **Pedagogy/Course delivery tools:** Chalk and Talk, Power point presentations, Videos, Models

Lab component/Practical topics: Determination of Specific gravity, silt content, water absorption of fine and coarse aggregates:

Unit V

Hardened Concrete and Durability: 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, Power point presentations, Videos, Models

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
4. <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
7. https://swayam.gov.in/nc_details/NPTEL, Online certification course on

Concrete Technology

List of experiments:

1. Specific gravity of Ordinary Portland cement
2. Fineness of Ordinary Portland cement
3. Soundness of Ordinary Portland cement
4. Normal consistency and Initial setting time of Ordinary Portland cement
5. Determination of compressive strength of Cement Mortar
6. Determination of Specific gravity and water absorption of fine aggregates and Coarse aggregates
7. Particle size distribution, and zoning of fine aggregates
8. Particle size distribution of coarse aggregates
9. Bulk density of fine and coarse aggregates
10. Silt content and bulking of fine aggregates
11. Determination of bulk density and water absorption of bricks and blocks
12. Determination of compressive strength of bricks, paver blocks and solid blocks

Course Outcomes (COs):

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

1. Describe and demonstrate the basic engineering properties of the construction materials and their applications (PO: 1, 2,3)
2. Explain the 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. Explain the fresh properties concrete and its relevance in mix design (PO: 1,2,3,4,7,9)
5. Explain the hardened and durability properties of concrete for practical applications (PO:1,2,3,4,7,9)

Text Books:

1. Sushil Kumar, "Building Construction", Standard Publishers Distributors, New Delhi.
2. S .G Rangwala, "Building Construction Engineering materials Book Stall", Anand.
3. M S Shetty, "Concrete Technology-Theory and Practice", Chand. S and Co. New Delhi
4. M L Gambhir, "Concrete Technology", Tata McGraw Hill, New Delhi
5. Relevant IS Codes of practices. IS10262:2019

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	Marks	Course Outcomes addressed
Internal Assessment-I	30	CO1, CO2 & CO3
Internal Assessment-II	30	CO3, CO4 & CO5
Average of the two internal tests will be taken for 30 marks		
Other Components		
Lab – Experimental work and Record writing	15	CO1, CO2, CO3, CO4 & CO5
Lab Test	05	CO1, CO2, CO3, CO4 & CO5
Semester End Evaluation (SEE)		
Course end examination(Answer one question from each unit – internal choice)	100 (Scale down to 50)	CO1, CO2, CO3, CO4 & CO5

HYDROLOGY & IRRIGATION ENGINEERING	
Course Code: CV42	Credits: 2:1:0
Pre – requisites: Nil	Contact Hours: 30L+30T+45S
Course Coordinator: Mrs. Shilpa D N and Dr. Santhosh L G	

Course Content

Unit I

Hydrology and Watershed

Hydrology- Hydrologic cycle, Global water budget. Precipitation - forms, types, measurement of precipitation (Indian Standard Rain gauge and Tipping Bucket Rain gauge), Mass curve, Hyetograph, Rain gauge network, mean precipitation over an area, estimation of missing rainfall data, Doublemass curve technique, Return period, Plotting positions, I.D.F. curves, P.M.P. **Watershed** - Definition, stream pattern, description

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation, Videos.
- Links: <https://a.impartus.com/ilc/#/video/id/1003078>
- Links: <https://a.impartus.com/ilc/#/video/id/1020874>

Unit II

Abstractions from Precipitation and Groundwater

Abstractions from Precipitation: Introduction. Abstractions - Evaporation, factors affecting evaporation, measurement of evaporation using ISI Standard Pan, Pan coefficient, methods of reduction of reservoir evaporation. Transpiration, Evapotranspiration, factors affecting, estimation of evapotranspiration. Infiltration - Infiltration capacity, Infiltration rate, Horton's infiltration curve, Infiltrometer – Numerical Problems, Introduction of Infiltration indices (No Numerical Problems).

Groundwater - Introduction. Vertical distribution of Subsurface, Geological formations, Occurrence and movement of ground water. Specific retention, Specific yield, Concept of Darcy's Law, Hydraulic conductivity, Transmissivity. Concept of Steady radial flow into an unconfined aquifer- Numerical problem

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation, Videos.
- Links: <https://a.impartus.com/ilc/#/video/id/1028056>
- Links: <https://a.impartus.com/ilc/#/video/id/1044537>

Unit III

Runoff and Hydrographs

Runoff: Introduction, types of runoff, factors affecting runoff, Basin yield, stream gauging (Staff gauging and Currentmeter only), measurement of discharge (Velocity - Area method), stage-discharge relations. Rainfall-runoff correlation, estimation of runoff with empirical equations - Dicken's formula, Ryve's formula and Inglis formula.

Hydrographs - definition, factors affecting flood hydrograph, components of a hydrograph, Base flow separation, Effective rainfall, Unit Hydrograph- definition, derivation of units of hydrograph. Concept of S-Curve (No problems)

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation, Videos.
- Links: <https://a.impartus.com/ilc/#/video/id/1051548>
- Links: <https://www.youtube.com/watch?v=UjsRS4fBx8M>

Unit IV

Irrigation and Water Requirement of Crops

Irrigation - definition, necessity, benefits and ill-effects of irrigation, types of irrigation systems, Various irrigation methods **Water Requirement of Crops** – Introduction, Classification of soil water, soil moisture constants, depth of water applied and frequency of irrigation, crop seasons, crop period and base period, Duty, Delta, Commanded areas, Intensity of irrigation, Terms related to water requirements of crops, Consumptive Use of Water, Irrigation Efficiencies. Irrigation requirements of crops.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation, Videos.
- Links: <https://a.impartus.com/ilc/#/video/id/1185022>
<https://www.youtube.com/watch?v=1tVthHlp82k>

Unit V

Floods, Reservoir Planning and Design of Irrigation Canals

Floods: Introduction, Flood estimation, Rational method, PMF. Reservoir Planning- Types of reservoirs, Investigations for reservoir planning, Selection of site for a reservoir, Zones of storage in a reservoir, Reservoir yield, Mass curve and Demand curve, Concept of determination of reservoir capacity using mass curve (No problems)

Design of Irrigation Canals: Introduction. Classification of irrigation canals. Design of canals - Silt theories, Kennedy's theory, design procedure by Kennedy's theory, Lacey's theory, Regime channels, Regime conditions, Cross-Section of regime channel, Lacey's regime equations, comparison between Kennedy's and Lacey's theory, drawbacks in Lacey's theory. Longitudinal section of a canal, Balancing depth, Cross-section of an irrigation canal, barrow pit, spoil bank, Berms

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation, Videos.
- Links: <https://a.impartus.com/ilc/#/video/id/1192288>

- https://www.youtube.com/watch?v=IphCId7mkhk&list=PLwdnzlV3ogoU-zxx2wMFG_FSDsGKVQ93g

Text Books:

1. **K. Subramanya**- Engineering Hydrology, Tata McGraw Hill, 4th edition, 2013.
2. **P. Jaya Rami Reddy**, “Hydrology”, Laxmi Publications; 3rd edition (2016).
3. **P.N Modi**, “Irrigation, Water resources and Water Power Engineering”, STANDARD BOOK HOUSE; 11th edition (2014).

Reference Books:

1. **Lingsey, Franzini**- Water Recourses Engineering, Tata McGraw Hill, 4th edition (1992)

Web links and video Lectures (e- Resources):

1. <https://a.impartus.com/ilc/#/video/id/1072120>
2. <https://a.impartus.com/ilc/#/video/id/1050054>
3. <https://a.impartus.com/ilc/#/video/id/1139670>
4. <https://a.impartus.com/ilc/#/video/id/1173994>
5. <https://www.youtube.com/watch?v=Eth8f4mnkns>
6. <https://www.youtube.com/watch?v=Zq66h-iQurs>
7. <https://www.youtube.com/watch?v=ibzY0LjHu38&list=PLqxXB4Vk4q1HwI9Pd9B2M2IRVs9geupbK>

Course Outcomes (COs):

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

1. Describe the significance of water resources and analyze precipitation data. (PO-1,2,3)
2. Explain various abstractions from precipitation and evaluate infiltration capacity and groundwater potential. (PO-1,2,4)
3. Estimate runoff based on measurements, statistical data, empirical methods and hydrograph. (PO-1,2,4)
4. Discuss the significance of irrigation, identify suitable irrigation method and estimate crop water requirement. (PO-1,2,3)
5. Comprehend the concepts of reservoir planning and apply silt theories to design irrigation canals. (PO-1,2,3)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	Marks	Course Outcomes addressed
Internal Assessment-I	30	CO1, CO2 & CO3
Internal Assessment-II	30	CO3, CO4 & CO5
Average of the two internal tests will be taken for 30 marks		
Other Components:		
Assignment / Quiz	10	CO1, CO2, CO3, CO4 & CO5

Self Study Component	10	CO1, CO2, CO3, CO4 & CO5
Semester End Evaluation (SEE):		
Course end examination (Answer one question from each unit internal choice)	100 (Scale down to 50)	CO1, CO2, CO3, CO4 & CO5

STRUCTURAL ANALYSIS I	
Course Code: CV43	Credits: 2:1:0
Pre – requisites: Nil	Contact Hours: 30L+30T+45S
Course Coordinator: Dr. Nagashree B	

Course Content

Unit I

Introduction & analysis of Plane Trusses

Structural forms- Conditional of equilibrium- Degree of freedom- linear and Non- linear analysis- Static and Kinematic indeterminacies of structural systems- types of trusses- assumptions in analysis- analysis of determinate trusses by method of joints and method of sections.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: <https://youtu.be/FLGqcfHqeh0?si=WfdjgZs6UbA4Ry1x>
- Impartus recoding: <http://a.impartus.com/ilc/#/video/id/804665>

Unit II

Deflection of Beams & Energy Principles

Deflection of determinate beams by Strain energy due to axial force, BM and SF- Principle of virtual work and Castiglione's theorems- Unit load and its application to deflection of determinate beam and truss.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: https://youtu.be/30aP_fgqxzg?si=c0E126a14gYVO8GK
- Impartus recoding: <http://a.impartus.com/ilc/#/video/id/814088>

Unit III

Arches & cable Structures

Three hinged parabolic arches with supports at same and different levels, determination of normal thrust, radial shear and bending moment- analysis of cables under point loads and UDL, length of cables for supports at same and at different levels- Stiffening trusses for suspension cables.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: <https://www.youtube.com/live/NJfIGOLbeek?si=aUrVVWEDEIg6A07D>
- Impartus recoding: <http://a.impartus.com/ilc/#/video/id/4635649>

Unit IV

Influence Lines & Rolling Loads

Concept of influence lines- ILD for reactions, SF and BM for determinate beams- ILD for axial forces in determinate trusses- BM, SF and axial forces in determinate systems using ILD- Maximum BM and SF in determinate beams using rolling loads concepts

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation
- Links: <https://youtu.be/cNdEgnCmNU0?si=Z9MYulo4u6FIa6Ci>
- Impartus recoding: <http://a.impartus.com/ilc/#/video/id/4798357>

Unit V

Introduction to Indeterminate Structures

Propped cantilever and fixed beams using method of consistent. Deformations- Forces due to rotation and settlement of supports.

Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation

- Links: https://youtu.be/ovchkaopl90?si=3Fy1od9_wMXEOMHX
- Impartus recoding: <http://a.impartus.com/ilc/#/video/id/4896340>

Text Books:

1. **Negi and Jehangir**, “Basic Structural Analysis”, Tata McGraw Hill, Publicationcompany Ltd.
2. **Gupta SP, GS Pandit and R. Gupta**, “Theory of Structures Vol 2”, Tata McGraw Hill publication company Ltd.

Reference Books:

1. **J. Sterling Kinney**, “Indeterminate structural analysis”, Oxford of IBH PublishingCompany.
2. **Norris Wilbur JK**, “Elementary structural analysis”, McGraw Hill InternationalBook edition.
3. **Ashok K Jain**, “Advanced structural analysis”, Nem chand of Bros, Roorkee, India.

Web links and video Lectures (e- Resources):

1. <http://a.impartus.com/ilc/#/video/id/804665>
2. <http://a.impartus.com/ilc/#/video/id/814088>
3. <http://a.impartus.com/ilc/#/video/id/4635649>
4. <http://a.impartus.com/ilc/#/video/id/4798357>
5. <http://a.impartus.com/ilc/#/video/id/4896340>

Course Outcomes (COs):

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

1. Analyze the determinate truss and deflection of simple beams by different methods.(PO-1, 2 & PSO-1)
2. Analyze the arches and cables with supports at same and different levels, develop influence lines for long span structures. (PO-1, 2 & PSO-1)
3. Analyze the indeterminate structure of beam by slope deflection method. (PO-1, 2 & PSO-1)
4. Analyze the continuous beams by moment distribution method. (PO-1, 2 & PSO-1)
5. Analyze beams and trusses by flexibility and stiffness method. (PO-1, 2 & PSO-1)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	Marks	Course Outcomes addressed
Internal Assessment-I	30	CO1, CO2 & CO3
Internal Assessment-II	30	CO3, CO4 & CO5
Average of the two internal tests will be taken for 30 marks		
Other Components		
Assignment	10	CO1 , CO2
Assignment	10	CO3, CO4 & CO5
Semester End Evaluation (SEE)		
Course end examination (Answer one question from each unit –internal choice)	100 (Scale down to 50)	CO1, CO2, CO3, CO4 & CO5

WASTE WATER ENGINEERING & MANAGEMENT

Course Code: CV44	Credits: 3:0:0
Pre – requisites: Nil	Contact Hours: 45L+45S
Course Coordinator: Dr. A. Lavanya	

Course Content

Unit I

Introduction to Waste water

Terms used in wastewater engineering, various sources and types of wastewaters. Management of wastewater within the building: Different types of traps used in the building plumbing based on shape and locations. Sanitary efficient fixtures: Water closets-conventional and water efficient (low flush, dual flush, vacuum and water less), urinals – conventional and sensor-based water efficient/ waterless. Importance of grey water separation and reuse. Different types of plumbing system. Single stack, one pipe and two pipe systems. Drainage plan for a residential building. Management of rainwater in buildings: discharge into storm water drains and rainwater filtration for reuse.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation, video.
- Links: different types of plumbing system:
<https://www.youtube.com/watch?v=LLIbW2xfnhk&t=23s>
- NPTEL Links: https://www.youtube.com/watch?v=Lpuv_QxWvZY

Unit II

Collection of Waste water

Types of sewerage systems. Quantity of wastewater: Dry and wet weather flow. Factors affecting Dry weather flow. Sewage flow variations. Estimation of quantity of sewage and storm water using rational formula. Time of concentration and return period. Sewers- limiting velocities, effects of variation of flow. Design of circular sewer section using Manning's equation (Circular section with half and full flow conditions only). Sewer materials, construction of sewers, sewer maintenance and cleaning. Sewer Appurtenances: Street inlets, catch basins, infiltration pits in storm water drains. Manholes along with dropmanholes.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation, video.
- Links: design of circular sewer:
https://www.youtube.com/results?search_query=Design+of+circular+sewer
- NPTEL Links: https://www.youtube.com/watch?v=Lpuv_QxWvZY

Unit III

Characteristics of Waste water

Sampling of wastewater- grab and composite sampling. Wastewater characteristics: physical characteristics, chemical characteristics and biological characteristics of wastewater: Concept of BOD and COD. BOD kinetics and Problems. General standards for discharge of environmental pollutants, guidelines for commercial buildings.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation, video.
- Links:wastewatercharacteristics:<https://www.youtube.com/watch?v=bBNUEMgPMXQ>
- NPTEL Links: https://www.youtube.com/watch?v=Lpuv_QxWvZY

Unit IV

Treatment of Waste water

Conventional flow diagram of wastewater treatment. Preliminary and primary treatment of wastewater: screenings, grit removal, removal of oil and grease. Sedimentation- details and design of circular sedimentation tanks. Secondary treatment of wastewater: Activated sludge: concepts, modifications and design of aeration tank. Trickling filters: concepts, types and design of trickling filters. Sludge digestion: Anaerobic sludge digester, process details and sludge drying beds. CPHEEO guidelines for wastewater treatment.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation, videos, Conventional Wastewater treatment plant visit, invited lectures from industry people.
- Links:wastewatertreatment:<https://www.youtube.com/watch?v=eH38OrP0CPA>
- NPTEL Links: https://www.youtube.com/watch?v=Lpuv_QxWvZY

Unit V

Miscellaneous Treatment Methods

Working principles: oxidation pond, aerated lagoon, rotating biological contractor, moving bed biological reactor (MBBR), Up flow Anaerobic Sludge Blanket – UASB. Onsite wastewater treatment: Septic tank-leach pit and dispersion trench. Grey water treatment methods: Greywater separation, possible reuse of greywater, onsite treatment of grey water: low cost filters; other treatment methods – carbon adsorption, phosphorous removal, nitrification and de-nitrification, ammonia stripping, land treatment. A Case Study: Concept of smart city implementation with respect to water and wastewater.

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation, videos, Conventional Wastewater treatment plant visit, invited lectures from industry people.
- Links: wastewater treatment:
<https://www.youtube.com/watch?v=eH38OrP0CPA>
- NPTEL Links: https://www.youtube.com/watch?v=Lpuv_QxWvZY

Text Books:

1. **Garg S K**, “Sewage disposal and air pollution engineering”, Khanna Publications, 2019, ISBN-10: 9788174092304
2. **Punmia B C. and Ashok Jain**, Environmental Engineering II, Laxmi Publications, 2016, ISBN-10: 8131805964

Reference Books:

1. Manual on sewerage and sewage treatment systems, Part A B and C Central publichealth and environmental engineering organization (CPHEEO), Ministry of urban development
2. **Metcalf and Eddy**, “Wastewater Engineering- Treatment and Reuse” Tata McGraw Hill India, 2002, ISBN-10: 007124140X.

Web links and video Lectures (e- Resources):

1. https://www.youtube.com/results?search_query=Design+of+circular+sewer
2. https://www.youtube.com/watch?v=Lpuv_QxWvZY
3. <https://www.youtube.com/watch?v=eH38OrP0CPA>

Course Outcomes (COs):

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

1. Identify the sources of wastewater from building and design plumbing system for abuilding. (PO- 1,2,6)
2. Compute the quantity of wastewater and design, construct and maintain sewers.(PO- 1,2,3,6)
3. Illustrate sewer appurtenances and describe the characteristics of wastewater. (PO-1,2,3,6)
4. Plan and design wastewater treatment facilities. (PO- 1,2,3,6)
5. Describe alternative and onsite methods of wastewater treatment. (PO- 1,2,3,6)

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/ Mini project	10	CO1, CO2 & CO3
Quiz/Assignment/Mini project Work	10	CO4 & CO5
Semester End Examination (SEE)	100 (Scale down to 50)	CO1, CO2, CO3, CO4, CO5

URBAN TRANSPORT PLANNING	
Subject Code: CVE451	Credits: 3:0:0
Pre requisites: - Nil	Contact Hours: 45L+45S
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. Forecast of future conditions and plan synthesis. System Approach in Transport Planning

- Pedagogy / Course delivery tools:- Chalk and talk, PowerPoint presentations, Videos
- Links:-<https://archive.nptel.ac.in/courses/105/107/105107067/>
<https://archive.nptel.ac.in/courses/105/106/105106058/>
- NPTEL Links: -<https://nptel.ac.in/courses/105105204>

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 presentation
- Links: -<https://archive.nptel.ac.in/courses/105/107/105107067/>
<https://archive.nptel.ac.in/courses/105/106/105106058/>
- NPTEL Links: -<https://nptel.ac.in/courses/105105204>

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 presentation
- Links: https://www.civil.iitb.ac.in/tvm/nptel/204_InTse/web/web.html
- NPTEL Links: <https://archive.nptel.ac.in/courses/105/105/105105208>

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

- Pedagogy / Course delivery tools: Chalk and talk

- Links https://www.civil.iitb.ac.in/tvm/nptel/204_InTse/web/web.html
- NPTEL Links: <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.

- Pedagogy/Course delivery tools:-Chalk and talk, Power point presentation
- Links: -<https://archive.nptel.ac.in/courses/105/107/105107067/>
<https://archive.nptel.ac.in/courses/105/106/105106058/>
- NPTEL Links- <https://nptel.ac.in/courses/105105204>

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. Hutchinson. AG, “Urban and Regional Models in Geography and Planning”, John Wiley and Sons, London.

Web links and Video Lectures (e-Resources):

1. <https://youtu.be/77EN038oc-0>
2. <https://youtu.be/i6JsaC5Hxuk>
3. <https://youtu.be/HHFWsvigE6Y>
4. <https://youtu.be/N41fduE7Z2U>
5. <https://youtu.be/FFtvoYZfjsU>

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)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	Marks	Course out comes mapped
Internal Test-I	30	CO1, CO2 & CO3
Internal Test-II	30	CO4 & CO5
Average of the two internal tests shall be taken for 30 marks		
Other components		
Assignment – MCQ, Quiz, Group presentation	10	CO1, CO2, CO3
Presentation and Report	10	CO1, CO2, CO3, CO4 & CO5
Semester End Examination (SEE)	100(Scale down to 50)	CO1, CO2, CO3, CO4, CO5

SOLID WASTE MANAGEMENT	
Subject Code: CVE452	Credits: 3:0:0
Pre requisites: Nil	Contact Hours: 45L+45S
Course Coordinator: 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-can-reduce-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.

Web links:

1. <https://www.youtube.com/watch?v=HE-4UJncOQ0>
2. <https://www.youtube.com/watch?v=NaGbBEU5OfQ>
3. <https://www.unep.org/news-and-stories/story/how-composting-can-reduce-our-impact-planet>
4. <https://www.youtube.com/watch?v=Wzo5sv4IrIw>

Course Outcome (COs):

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

1. 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 routes 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:

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/Mini project	10	CO1, CO2 & CO3
Assignment/ Quiz/ Mini project	10	CO3, CO4 & CO5
Semester End Examination (SEE)	100 (Scale down to 50)	CO1, CO2, CO3, CO4&CO5

RURAL DEVELOPMENT	
Subject Code: CVE453	Credits: 3:0:0
Pre requisites: - Nil	Contact Hours: 45L+45S
Course Coordinator: Dr. Santhosh L G	

Course Content

UNIT I

Rural Area Progress

Introduction: Current status of villages in India, basic principles of self-sustainable villages, role and potentials of rural economy in the new economic era.

Education: The concept of sustainable education, role of computers in rural development.

Government Schemes: Overview of Government schemes for the rural areas.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos, Models
- Link: self-sustainable villages:
<https://www.youtube.com/watch?v=QdNAEbAkThA>
- Link: Government schemes:
<https://www.youtube.com/watch?v=x1wQ0OpOmc0>

Unit II

Water Management

Water: Water management and water harvesting for villages – methods and techniques. Water borne diseases, simple and feasible methods to purify water for domestic/ drinking purposes, successful case studies of water management.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos
- Link: Power projects: <https://www.youtube.com/watch?v=ROzYap1VhUs>
- Link: Water management:
<https://www.youtube.com/watch?v=kX0wB2qkC8g>

Unit III

Sustainable Agriculture

Secrets of fertile soil, sustainable organic agriculture: principles, strategies and models, successful case studies. Career through growing medicinal plants, cash crops, aquaculture, horticulture, and hydroponics. Agricultural machinery and processing: need for simple and efficient agricultural machinery.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos
- Link: sustainable organic agriculture:
<https://www.youtube.com/watch?v=K3f9oINVAR0&list=PLbRMhDVUMngdhPkxPPakK2aOQD47DQPMI>
- Link: Agricultural machinery:
<https://www.youtube.com/watch?v=LRyVcCxa5BU>

Unit IV

Solid Waste Management

Introduction, significance and method of segregation of municipal and agricultural solid wastes and its disposal, 4R's concept and their economic value, bio-gas and biofuels production, public awareness on significance of better hygiene.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos
- Link: Solid waste management:
https://www.youtube.com/watch?v=cjIacnNRLHE&list=PLwdnzlV3ogoXAap_BHeApkcF7M8nt13hv
- Link: public awareness: https://www.youtube.com/watch?v=KFAw_h0n0q0

Unit V

Role Model Villages

Need for application of modern technologies in rural areas. Study of selected role models of villages; viz., solar village, clean village, water harvesting. Concept of sustainable village model, power, machinery, processing for value addition of agricultural produce.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos, Models.
- Link: Role model villages:
<https://www.youtube.com/watch?v=nOF8jxRRJMo>
- Link: modern technologies in rural areas:
<https://www.youtube.com/watch?v=tijHjup-gM>

Text Books:

1. Erhard Hennig - Secrets of Fertile Soil, Acres, USA, 2015
2. Ayyappa Masagi - Bhageeratha, War on water crisis: Converting dry land into wet land, Water Literacy Foundation, Insight Publishers, 2014
3. B. P. Harichandra – SEAT for Rural India (Science, Education and Technology

for Rural India), RIT

Reference Books:

1. M K Gandhi – Village swaraj, Navjivan Trust, 2015

Web links and Video Lectures (e-Resources):

<https://a.impartus.com/ilc/#/video/id/482701>

<https://a.impartus.com/ilc/#/video/id/3146912>

<https://a.impartus.com/ilc/#/video/id/1957487>

Course Outcomes (COs):

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

1. Understand the characteristics of the rural economy (PO-1, 6, 10, 11)
2. Recognize methods of water management for rural development (PO-1, 3, 6,11)
3. Fundamental concepts for the success of, and choices for, a prosperous and healthy agriculture (PO-1, 3, 6,11)
4. Solutions for managing the vast volume of rural wastes (PO-1, 3, 6,11)
5. Knowledge of Indian model villages and the ability for the solution (PO-1, 3, 6,11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	Marks	Course out comes mapped
Internal Test-I	30	CO1, CO2 & CO3
Internal Test-II	30	CO4 & CO5
Average of the two internal tests shall be taken for 30 marks		
Other components		
Assignment \ Quiz	10	CO1, CO2, CO3, CO4 & CO5
Self Study Component	10	CO1, CO2, CO3, CO4 & CO5
Semester End Examination (SEE)	100 (Scale down to 50)	CO1, CO2, CO3, CO4, CO5

GREEN BUILDING MATERIALS AND SUSTAINABLE TECHNOLOGIES	
Subject Code: CVE454	Credits: 3:0:0
Pre requisites: - Nil	Contact Hours: 45L+45S
Course Coordinator: Smt. Lakshmi H S	

Course Content

Unit I

Introduction: Need for sustainable practices in construction- Impact of building industry on energy resources, natural resources and environment. Concept of Green Building and principles, Concept of Embodied energy and calculation. Life cycle assessment. Consideration while selecting material and design for longevity.

- Pedagogy / Course delivery tools:- Chalk and talk, PowerPoint presentations, Videos
- Links: -<https://www.youtube.com/watch?v=JOG4GwSPsY8>
<https://www.youtube.com/watch?v=wmoy27EZ8y0>
- NPTEL Links: -<https://archive.nptel.ac.in/courses/105/102/105102195/>

Unit II

Building materials: Conventional materials and Use of low energy materials Alternatives to Conventional building materials –Cement, aggregates, steel and concrete. Smart materials. Low energy construction- low energy material, locally sourced material, recycled materials.

- Pedagogy/Course delivery tools:- Chalk and talk, Power point presentation
- Links: -<https://www.youtube.com/watch?v=bsQBSVJoV04> ,
<https://www.youtube.com/watch?v=bsQBSVJoV04&t=10s>
- NPTEL Links: -<https://archive.nptel.ac.in/courses/105/102/105102195/>

Unit III

Building Siting: Orientation of the building- Need and significance. Use of natural light, solar heat and ventilation. Fenestration and shading. Effective cooling and heating systems-solar passive techniques of heating and cooling in a building design. Methods of minimizing load on Conventional Systems-Landscaping, water bodies.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links: <https://www.youtube.com/watch?v=hRo9k100ye4>
<https://www.youtube.com/watch?v=wOb5RF14i6I>
- NPTEL Links: <https://archive.nptel.ac.in/courses/105/102/105102195/>

Unit IV

Building Finishes, Energy Efficient Systems and Certifications: Glazing and shading systems. Building finishes. Effective electrical systems - photovoltaic systems. Efficient HVAC systems. Efficient lighting system- efficient bulbs, occupancy sensor systems and light sensors. Efficient motors. GRIHA, LEED.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: <https://www.usgbc.org/articles/what-green-building-0>

<https://www.youtube.com/watch?v=uaHRsiIBnhs>

<https://youtu.be/MyIOtsx3wDs>

- NPTEL Links: <https://archive.nptel.ac.in/courses/105/102/105102195/>

Unit V

Water Conservation: Water efficient fixtures-flow restrictors, sensors, no water fixtures. Alternatives for secondary uses. Rain water harvesting, solar water heaters and solar cooking. Low flush toilets, grey water recycling. Onsite treatment. Ecofriendly toilets. Reducing irrigation water requirements. Vertical farming. Xeriscaping

- Pedagogy/Course delivery tools:-Chalk and talk, Power point presentation
- Links: -<https://www.youtube.com/watch?v=f-sRcVkZ9yg>

<https://www.youtube.com/watch?v=suYcri3Fzcl>

<https://www.youtube.com/watch?v=hCQHwimJFGM>

- NPTEL Links-<https://archive.nptel.ac.in/courses/105/102/10510219/>

Text Books:

1. Kibert, Charles J. Sustainable construction: green building design and delivery, Wiley, 2008. 2nd Edition

References:

1. Prof. Dr. Michael Bauer, Peter Möhle and Dr. Michael Schwarz (2010) “Green Building – Guidebook for Sustainable Architecture” Springer.
2. Tom Woolley, Sam Kimmins, Paul Harrison and Rob Harrison (2001) “Green Building Handbook” Volume 1-Spon Press.
3. Mili Majumdar, (2002) “Energy-efficient buildings in India” Tata Energy Research Institute.
4. TERI “Sustainable Building Design Manual- Volume I & II” Tata Energy Research Institute.

Web links and Video Lectures (e-Resources):

1. <https://www.youtube.com/watch?v=QohffVIj-TQ>
2. <https://www.youtube.com/watch?v=bsQBSVJoV04&t=15s>
3. <https://www.youtube.com/watch?v=nFBvLIffFqI>
4. https://www.youtube.com/watch?v=WShyn98a8mY&list=PLXCfO3gR_tpRww_b6wpfkArLRWIojsyiB&index=1
5. https://www.youtube.com/watch?v=3Ww2TP_tU7o

Course Outcomes (COs):

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

1. Demonstrate the knowledge of sustainable building concepts. (PO -1,4,6,7)
2. Analyze different alternative building materials based on specific climate and with environmentally responsibility. (PO -1,4,6,7,8,9,11)
3. Demonstrate different sustainable building design techniques using passive techniques. (PO -1,4,6,7,8,9,11)
4. Design the building reducing energy and resource consumption. (PO -1,4,6,7,8,9, 11)
5. Apply water conservation principles in buildings. (PO -1,4,6,7,8,9, 11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	Marks	Course out comes mapped
Internal Test-I	30	CO1, CO2 & CO3
Internal Test-II	30	CO4 & CO5
Average of the two internal tests shall be taken for 30 marks		
Other components		
Assignment – MCQ, Quiz, Group presentation	10	CO1, CO2, CO3
Presentation and Report	10	CO1, CO2, CO3, CO4 & CO5
Semester End Examination (SEE)	100(Scale down to 50)	CO1, CO2, CO3, CO4, CO5

LAND USE PLANNING AND DISASTER RISK MITIGATION	
Subject Code: CVE455	Credits: 3:0:0
Pre requisites: - Nil	Contact Hours: 45L+45S
Course Coordinator: Dr. J Sumalatha	

Course Content

Unit I

Land Resources and Mapping Basics: Definition and classification of land resources; Types of maps used in civil engineering: Topographic maps, Land-use / land-cover maps, Soil maps, Hazard and risk maps; Map elements: scale, contour, symbols, legend; Land capability classification and its importance in land use planning; Applications of land maps in civil engineering projects

- Pedagogy: Chalk & talk, PPT
- Links: <https://www.youtube.com/watch?v=Obw4ndcnPYs>
- <https://www.youtube.com/watch?v=Kn-c92XbEuc>
- <https://www.youtube.com/watch?v=EnCpia7g39I>

Unit II

Formation of Soils and Soil Types: Weathering processes: physical, chemical, and biological; Soil formation and soil profile; Residual soils and transported soils; Factors affecting soil formation: climate, parent material, topography, vegetation; Major soil types of India and their engineering significance.

- Pedagogy: Chalk & talk, PPT
- Links: <https://www.youtube.com/watch?v=PxoOq8pMfMc>
- <https://www.youtube.com/watch?v=nvvMgZYWM4c>
- <https://www.youtube.com/watch?v=ilmXUhsHaZg>

Unit III

Soil Mapping and Wasteland Identification: Concept of soil survey and soil mapping; Methods of soil mapping (overview); Interpretation of soil maps for construction suitability; Definition and classification of wastelands; Types of wastelands in India: Saline and alkaline lands, Waterlogged areas, Mining and industrial wastelands, Causes of land degradation, Role of soil and land maps in wasteland management

- Pedagogy: Chalk & talk, PPT
- Links: <https://www.youtube.com/watch?v=10Wt2vuiGLA>

- <https://www.youtube.com/watch?v=XIvqc-yimuU>
- <https://www.youtube.com/watch?v=EnCpia7g39I&list=PLg6dY4ATfXEyU97TCzOwv25-4NMdSO1X>

Unit IV

Natural Disasters and Disaster Risk Reduction: Classification of natural disasters; Geological disasters relevant to civil engineering: Earthquakes, Landslides, Floods (overview); Concepts of hazard, vulnerability, exposure, and risk; Disaster risk assessment using land and soil maps; Disaster risk reduction strategies.

National Disaster Management Authority (NDMA); Role and functions of NDMA; NDMA guidelines relevant to civil engineering projects (overview); Importance of NDMA guidelines in disaster preparedness and mitigation; Role of civil engineers in disaster management

- Pedagogy: Chalk & talk, PPT
- Links: <https://www.youtube.com/watch?v=2B823bEBKGU>
- <https://www.youtube.com/watch?v=oj5tbAFDQYA&t=1268s>
- <https://www.youtube.com/watch?v=mGa5RArg1d0>

Unit V

Landslides and Mitigation Measures: Definition and types of landslides; Causes of landslides: geological, hydrological, and human-induced; Landslide hazard zonation mapping; Effects of landslides on infrastructure; Landslide mitigation measures (conceptual); Surface and subsurface drainage, Vegetation and bio-engineering, Retaining structures (introductory); Case studies of landslides in India.

- Pedagogy/Course delivery tools:-Chalk and talk, Power point presentation
- Links: <https://www.youtube.com/watch?v=2UW5ce7zl8>
- <https://www.youtube.com/watch?v=8X6-T-9IQBE>
- <https://www.youtube.com/watch?v=-QobxZDZjoc>

Textbooks

1. R. P. Misra & V. N. Mishra, **Land Use Planning**, Concept Publishing Company
2. C. S. Rao, **Environmental Engineering and Disaster Management**, Khanna Publishers
3. K. R. Arora, **Soil Mechanics and Foundation Engineering – Conceptual Applications**, Standard Publishers (selected conceptual chapters only)

Reference Books

1. Braja M. Das, **Principles of Geotechnical Engineering** – conceptual background chapters, Cengage Learning
2. V. N. S. Murthy, **Geotechnical Engineering: Principles and Practices**, CRC Press (application-oriented reference)
3. R. B. Peck, W. E. Hanson & T. H. Thornburn, **Foundation Engineering**, Wiley (case-history based reading)

Government Reports / Guidelines

1. **Wasteland Atlas of India**, NRSC / ISRO
2. **National Disaster Management Authority (NDMA) Guidelines** – Landslides, Floods, Earthquakes
3. **Disaster Management Act, 2005** (overview only)
4. **Land Use Planning Guidelines in India** – TCPO / MoHUA (overview)
5. **Change of Land Use (CLU)** – Concept, necessity and role of planning authorities (introductory)

Web Links:

- <https://www.youtube.com/watch?v=qGGj2O-H47I>
- <https://www.youtube.com/watch?v=W5FtAQTlWIs>
- https://www.youtube.com/watch?v=skB_A2sfBcY
- <https://www.youtube.com/watch?v=4mwHwRr34Q4>
- <https://www.youtube.com/watch?v=doXzwSYKmdA>
- https://www.youtube.com/watch?v=_1oyWRGwmCg
- <https://www.youtube.com/watch?v=nZP5w3-tvsM>

Course Outcomes (CO)

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

1. Explain concepts of land use planning and different thematic maps used in civil engineering (PO - 1, 2, 5, 6, 7)
2. Describe soil formation, land capability, and wasteland characteristics relevant to planning decisions. (PO - 1, 2, 6, 7)
3. Interpret land-use, soil, and wasteland maps for basic engineering and planning applications. (PO - 1, 2, 3, 4, 5, 6, 7, 10)
4. Identify disaster-prone areas and explain disaster risk concepts using land and soil information. (PO - 1, 2, 4, 6, 7)
5. Explain disaster risk mitigation strategies and the role of NDMA, CLU, and planning authorities. (PO - 1, 2, 3, 6, 7, 8, 10, 11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	Marks	Course out comes mapped
Internal Test-I	30	CO1, CO2 & CO3
Internal Test-II	30	CO4 & CO5
Average of the two internal tests shall be taken for 30 marks		
Other components		
Assignment – MCQ, Quiz, Group presentation	10	CO1, CO2, CO3
Presentation and Report	10	CO1, CO2, CO3, CO4 & CO5
Semester End Examination (SEE)	100 (Scale down to 50)	CO1, CO2, CO3, CO4, CO5

STATISTICS, PROBABILITY & OPTIMIZATION	
Subject Code: CVE456	Credits: 3:0:0
Pre requisites: - Calculus & Probability	Contact Hours: 45L+45S
Course Coordinator: Dr. Dinesh.P.A & Dr. Manidipa Pal	

Course Content

Unit I

Linear Transformation: Introduction to vector spaces, Linear transformations, Composition of matrix transformations, Rotation about the origin, Dilation, Contraction and Reflection.

- Pedagogy/Course delivery ➤ Chalk and talk, PowerPoint Presentation, Videos tools:
- Links: ➤ <https://nptel.ac.in/courses/111105121>
- Impartus recording: ➤ <https://a.impartus.com/ilc/#/course/619570/1030>
- <https://a.impartus.com/ilc/#/course/621524/1030>

Unit II

Linear Programming: Introduction to Linear Programming Problem (LPP), Formulation of the problem, Graphical method, Simplex method and Big-M method.

- Pedagogy / Course delivery ➤ Chalk and talk tools:
- Links: ➤ <https://nptel.ac.in/courses/111107127>

Unit III

Calculus of variation: Variation of a functional, Extremal of a functional, Euler's equation, Standard variational problems, Geodesics, Minimal surface of revolution, Hanging cable and Brachistochrone problems.

- Pedagogy/Course delivery tools: • Chalk and talk, PowerPoint Presentation
- Links: • <https://nptel.ac.in/courses/111104025>
- Impartus recording: • <https://a.impartus.com/ilc/#/course/621524/1030>

Unit IV

Markov Chain: Probability vectors, Stochastic matrices, Regular stochastic matrices, Markov processes, Markov chains, Higher transition probabilities, Stationary distribution of regular Markov chains and absorbing states.

- Pedagogy/Course delivery tools:
- Links:
- Impartus recording:
- Chalk and talk
- <https://nptel.ac.in/courses/111103158>
- <https://a.impartus.com/ilc/#/course/96127/452>
- <https://a.impartus.com/ilc/#/course/119635/593>

Unit V

Sampling and Statistical Inference: Sampling distributions, central limit theorem, concepts of standard error and confidence interval, level of significance, type I and type II errors, one tailed and two tailed tests, Z-test: for single mean, Student's t –test: for single mean and for difference between two means, F – test for equality of two variances, Chi-square test: for goodness of fit.

- Pedagogy/Course delivery tools:
- Links:
- Impartus recording:
- Chalk and talk, PowerPoint Presentation, Videos
- <https://nptel.ac.in/courses/111102112>
- <https://a.impartus.com/ilc/#/course/96151/1112>
- <https://a.impartus.com/ilc/#/course/619570/1030>

Textbooks:

1. **Murray R Spiegel, John Schiller & R. Alu Srinivasan** – Probability and Statistics – Schaum's outlines -4th edition-2012
2. **T. Veerarajan** - Probability, Statistics and Random Processes – Tata McGraw Hill - 3rd edition-2009.
3. **David C. Lay, Steven R. Lay and Judi J. Mc. Donald** – Linear Algebra and its Applications – Pearson – 5th edition – 2015.

Reference Books:

1. **Peter V. O' Neil** – Advanced Engineering Mathematics, Thomson Brooks/Cole, 7th edition, 2011.
2. **Srimanta Pal & Subobh C Bhunia** - Engineering Mathematics, Oxford University Press, 3rd Reprint, 2016.
3. **B. S. Grewal** – Higher Engineering Mathematics, Khanna Publishers, 44th edition, 2017

Course Outcomes (CO)

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

1. Understand and apply the fundamental concepts of vector spaces and linear transformations and analyze geometric transformations. **(PO–1,2 & PSO–1)**
2. Formulate and solve linear programming problems using graphical, simplex, and Big-M methods to obtain optimal solutions. **(PO–1,2 & PSO–1, 2)**
3. Apply the principles of calculus of variations, including Euler's equation, to determine extremals and solve standard variational problems. **(PO–1,2 & PSO–1, 2)**
4. Analyze Markov processes using probability vectors and stochastic matrices and apply them for real world problems. **(PO–1,2 & PSO–1, 2)**
5. Choose an appropriate test of significance and make inference about the population from a sample. **(PO–1,2 & PSO–1, 2)**

Course Assessment and Evaluation:

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

INTRODUCTION TO BUILDING INFORMATION MODELLING	
Course Code: CVAEC46	Credits: 1:0:0
Pre – requisites: Nil	Contact Hours: 15L+15S
Course Coordinator: Dr. Basavana Gowda G M	

Course Content

Unit I

Introduction to BIM

Understanding BIM: Definition and Importance of BIM, Definition and evolution of Building Information Modeling. Key Concepts and Terminology BIM Standards. Key benefits and uses of BIM in the construction. Introduction to BIM Dimensions (4D, 5D, 6D).

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos, Models
- Link: <https://m.youtube.com/watch?v=ZM31mVvx2Jg&t=221s>
- Link: <https://www.youtube.com/watch?v=llJ0qG5z11A>

Unit II

BIM Overview

Overview of BIM software platforms (e.g., Revit, AutoCAD Civil 3D). BIM Uses in Structural Engineering: Application of BIM for structural design and analysis. BIM Uses in MEP (Mechanical, Electrical, Plumbing) MEP coordination and system integration using BIM. The role of BIM in operations and maintenance (O&M).

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos
- Link: <https://www.youtube.com/watch?v=wSc4QmKBk6I>
- Link: https://www.youtube.com/watch?v=ytOYfVG_Va8

Unit III

BIM Process Overview

BIM Process Overview: Understanding BIM process flow from planning to construction and maintenance. Key stages of a BIM project lifecycle. BIM Execution Plan: Developing a BIM execution plan (BEP), Roles and responsibilities in BIM teams. Coordination and Collaboration: Strategies for effective collaboration using BIM.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos
- Link: <https://www.youtube.com/watch?v=nB48vfzxKfl>
- Link: <https://www.youtube.com/watch?v=pdLpmQqt4jg>

Unit IV

BIM Standards and guidelines

National and International BIM Standards: Overview of BIM standards and guidelines (e.g., ISO 19650). Importance of data management and information sharing in BIM projects. Importing/exporting BIM data across platforms.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos
- Link: <https://www.youtube.com/watch?v=Ur5TQOyC4mY>
- Link: <https://www.youtube.com/watch?v=6XkYYsOSmag>

Unit V

Role Model Villages

BIM Careers and Opportunities: Career opportunities and skillsets required in the BIM industry. BIM Evolution and Trends: Current trends and future directions in BIM. Case studies of BIM implementation in Civil Engineering Projects.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos, Models.
- Link: <https://www.youtube.com/watch?v=UWp4Yx815WI>
- Link: <https://www.youtube.com/watch?v=LkhvqqrUqMA>

Text Books:

1. Chuck Eastman, Paul Teicholz, Rafael Sacks, and Kathleen Liston, "BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers", John Wiley & Sons Inc; 2nd edition, 2011, ISBN-10: 9780470541371, ISBN-13: 978-0470541371.
2. "Building Information Modeling: Framework for Structural Design" by Nawari O. Nawari
3. ISO 19650 - Building Information Modelling (BIM)
4. Coursera: "Building Information Modeling (BIM) Fundamentals" by Autodesk.

Reference Books:

1. Willem Kymmell, "Building Information Modeling: Planning and Managing Construction Projects with 4D CAD and Simulations", McGraw-Hill Construction Series, 1st Edition, 2008, ISBN: 9780071494533

Web links and Video Lectures (e-Resources):

1. <https://www.youtube.com/watch?v=qmRr6j4EMyA>
2. <https://www.youtube.com/watch?v=WYcVLNxsQjw>
3. <https://www.youtube.com/watch?v=KcE9yBrMHH4>

Course Outcomes (COs):

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

1. Demonstrate the understanding of BIM fundamentals (PO-1, 5, 11)
2. Utilize BIM software tools effectively (PO-1, 5, 11)
3. Analyze Real-world applications and future trends (PO-1, 2, 5, 11)
4. Demonstrate the importance of data management and information sharing in BIM projects (PO-1, 2, 3, 5, 10, 11)
5. Apply the concept of BIM in various real time civil engineering projects (PO-1, 2, 5, 6,11)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	Marks	Course Outcomes addressed
Internal Assessment-I	30	CO1, CO2, CO3 (1 st half of Unit3)
Internal Assessment-II	30	CO3 (2 nd half of Unit3), CO4 & CO5
Average of the two internal tests will be taken for 30 marks		
Other Components:		
Assignment – MCQ, Quiz	10	CO1, CO2, CO3 (1 st half of Unit3)
Activity based learning - Group Presentation, Model/Project	10	CO3 (2 nd half of Unit3), CO4 & CO5
Semester End Evaluation (SEE)		
Course end examination (Answer one question from each unit – internal choice)	100 (Scale down to 50)	CO1, CO2, CO3, CO4, CO5

ENVIRONMENTAL ENGINEERING LABORATORY	
Subject Code: CVL47	Credits: 0:0:1
Pre requisites: Nil	Contact Hours: 30P
Course Coordinator: Dr. A. Lavanya	

Course Content

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, 22nd 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.

5. Metcalf and Eddy Inc., (2004) “Wastewater Engineering – Treatment and Reuse”, 4th 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:
<https://www.youtube.com/watch?v=yqlUsWOi3XI>
2. 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. (PO1,2,4,6,8)
2. Recommend suitability of tested water sample as per the Indian standards for drinking/ wastewater sample for discharge into water bodies. (PO 2,4,6,8)
3. Identify and choose the water source for water supply schemes. (PO 2,4,6,8)
4. Determine air and noise pollution levels in the surrounding environment. (PO 1,2,4,6,8)
5. Demonstrate working of sewage treatment process. (PO 2,6,8)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE) : 50 Marks		
Assessment Tool	Marks	Course outcomes addressed
Weekly evaluation of laboratory manuals/records after the conductionof 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

SURVEYING PRACTICE LABORATORY	
Course Code: CVL48	Credits: 0:0:1
Pre – requisites: Geoinformatics and Digital Surveying (CV32)	Contact Hours: 30P
Course Coordinator: Dr. Santhosh L G	

Course Content

List of Experiments:

1. Distance measurement using tapes, hand held distance meter, distance measuring wheel and Electronic Distance Measurements (EDM)
2. Angle measurement using Theodolite- Horizontal and vertical angle measurement.
3. Angle measurement using Total station - Horizontal and vertical angle measurement.
4. Leveling - finding elevation by differential leveling (Plane of collimation method)
5. Measurements of heights and distances using Theodolite
6. Finding areas using total station.
7. Setting out a simple curve by deflection angle method using Total station.
8. Contouring using total station and plotting using SWDTM software
9. Profile survey L/S, C/S using total station and plotting using SWDTM software
10. Setting out simple curve using Total station
11. Setting out building by centre line method.
12. Setting out sewer line using Total station.

Text Books:

1. Surveying Vol.I, Dr. B.C.Punmia, Ashok Kumar Jain, Dr Arun Kuma Jain, Laxmi Publications, 2017, 17th edition. ISBN: 9788170088534
2. Elementary surveying : an introduction to geomatics by Charles D. Ghilani, 13th ed, Prentice Hall, 2012, ISBN-13: 978-0-13-255434-3
3. Higher Surveying, by A M Chandra, New Age International, 2005, ISBN: 81:224:1628:4

Reference Books:

1. S.K.Jain, (1971), Plane and Geodetic surveying for Engineers. 6th edition, CBS Publishing and distributors, New Delhi

2. S.K.Duggal ,(2008), Surveying – Vol I, Tata McGraw hill publishing company Ltd, New delhi.
3. Advanced Surveying: Total Station, GIS and Remote Sensing by N. Madhu, R. Sathikumar, Satheesh Gopi

Course Outcomes (COs):

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

1. Measure linear distances and angles using different survey instruments (PO - 1,2,4,5,11)
2. Determine the levels and heights of accessible and inaccessible points and plot profiles (PO - 1,2,4,5,11)
3. Demonstrate the use of total station in finding areas, conduct profile survey and plot contours using Total station (PO - 1,2,4,5,11)
4. Set out simple circular curve using theodolite and total station (PO - 1,2,3,4,5,11)
5. Set out centerline of building and sewer line using total station (PO - 1,2,3,4,5,6,11)

Course Assessment and Evaluation:

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

FLUID MECHANICS LABORATORY	
Course Code: CVL49	Credits: 0:0:1
Pre – requisites: Nil	Contact Hours: 30P
Course Coordinator: Mrs. Shilpa D N	

Course Content

List of Experiments:

1. Determination of Basic Fluid Properties like Specific gravity, Capillarity and Viscosity on Hydrostatic table
2. Verification of Bernoulli's theorem
3. Visualization of Reynold's experiment
4. Determination of Impact of Jet on Vanes
5. Determination of losses of energy head in pipe flow
6. Calibration of Venturimeter
7. Calibration of Orifice meter
8. Calibration of V-Notch
9. Calibration of Rectangular Notch
10. Calibration of Cipolletti Notch
11. Calibration of Broad Crested Weir
12. Calibration of Ogee Weir

Text Books:

1. **Parashar A.K.**, Fluid mechanics Lab manual, B P International, 2022.
2. **N. Kumara Swamy**- Fluid mechanics and machinery laboratory manual, CharotarPublishing House Pvt. Ltd., 1st Edition: 2008.

Reference Books:

1. **Streeter, Wylie and Bedford**- Fluid Mechanics, Tata McGraw Hill
2. **P. N. Modi & S. M. Seth**- Hydraulics and Fluid Mechanics, Standard Book House, 22nd edition, 2019.
3. **R. K. Bansal**- Fluid Mechanics and Hydraulic Machines, Laxmi Publications (P)Ltd., 11th edition, 2019.

Web links and Video Lectures (e-Resources):

1. Link for Verification of Bernoulli's theorem:
<https://www.youtube.com/watch?v=B7U0rBIR0sU>
2. Link for Estimation of losses in pipes
<https://www.youtube.com/watch?v=hNtQMu57j44>
3. Link for Calibration of V-Notch: <https://www.youtube.com/watch?v=iycu-8BKIDo>
4. Link for Determination of Impact of Jet on Vanes:
<https://www.youtube.com/watch?v=2anjwbSakbQ>

Course Outcomes (COs):

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

1. Determine basic properties of fluid. (PO-1,2,8)
2. Visualize and verify basic principles of fluid flow. (PO-1,2,8)
3. Determine loss of energy head for flow through pipe (PO-1,2,3,8).
4. Calibrate flow measuring devices for pipe flow.(PO-1,2,4,8)
5. Calibrate flow measuring devices for open channel flow (PO-1,2,4,8).

Course Assessment and Evaluation:

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

INTER/ INTRA INSTITUTIONAL INTERNSHIP	
Course Code: INT410	Credits: NCMC
Pre – requisites: Nil	
Course Coordinator: -	

Course Content

All the students shall have to undergo a mandatory Internship of 02 weeks which is an NCMC course, during the intervening vacation of the II and III semesters. Internship shall include Intra Institutional activities across the institute. A student shall select an internship of his/her choice and attend for 02 weeks. An internal evaluation of the same will be conducted by the internship organizing department and marks scored will be sent to the parent department. A student shall register for the internship in IV semester and shall complete the internship requirements.

All the students admitted under the lateral entry category shall have to undergo this Internship of 02 weeks which is an NCMC course, during the intervening vacation of the III and IV semesters.

IV SEMESTER
(For Lateral Entry Diploma Students)

ADDITIONAL MATHEMATICS – II	
Course Code: AM41	Credits: 0:0:0
Pre – requisites: Nil	Contact Hours: 45L
Course Coordinator: Dr. Veena. B N	

Course Content

Unit I

Differential Calculus- I: Partial differentiation, Euler's theorem, total differential coefficient, differentiation of composite and implicit functions.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: <https://nptel.ac.in/courses/111/105/111105121/>
- Impartus recording: <https://a.impartus.com/ilc/#/course/107625/1030>

Unit II

Differential Calculus- II: Jacobian and Properties. Taylor's theorem for function of two variables, maxima and minima for functions of two variables.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: <https://nptel.ac.in/courses/111/105/111105121/>
- Impartus recording: <https://a.impartus.com/ilc/#/course/107625/1030>
<https://a.impartus.com/ilc/#/course/59742/295>

Unit III

Vector Integration: Line integrals, surface integrals and volume integrals. Green's theorem, Stokes' and Gauss divergence theorem (without proof) and problems, orthogonal curvilinear coordinates.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: <https://nptel.ac.in/courses/111/105/111105134/>
- Impartus recording: <https://a.impartus.com/ilc/#/course/107625/1030>

Unit IV

Higher Order Differential Equations: Higher order linear differential equations, method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: <https://nptel.ac.in/courses/111/105/111105121/>
- Impartus recording: <https://a.impartus.com/ilc/#/course/96127/452>
<https://a.impartus.com/ilc/#/course/59742/295>

Unit V

Probability: Introduction. Sample space and events. Axioms of probability. Addition and multiplication theorems. Conditional probability- illustrative examples. Bayes theorem – examples.

- Pedagogy / Course delivery tools:-Chalk and talk
- Links:-<https://nptel.ac.in/courses/111/107/111107119/>
- Impartus recording: -<https://a.impartus.com/ilc/#/course/283623/703>

Text Books:

1. **B.S. Grewal** – Higher Engineering Mathematics, Khanna Publishers, 44th edition, 2017.
2. **Erwin Kreyszig** – Advanced Engineering Mathematics – Wiley Publication, 10th Edition, 2015.

Reference Books:

1. **H. K. Dass** – Higher Engineering Mathematics – S Chand Publications, 1998
2. **B. V. Ramana** – Engineering Mathematics – Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 2008.

Course Outcomes (COs):

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

1. To carryout differentiation of function of several variables. (PO-1,2)
2. Solve the problems related to Jacobians, the extreme values of a function and Taylors series. (PO-1,2)
3. Exhibit the interdependence of line, surface and volume integrals using integral theorems. (PO-1,2)
4. Find the solution of second and higher order ODEs with constant and variable coefficients. (PO-1,2)
5. Solve the problems on conditional probability and Baye's theorem. (PO-1,2)

Course Assessment and Evaluation:

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