

RAMAIAH Institute of Technology

CURRICULUM

Outcome Based Education (Academic Year 2023 – 2024)

CIVIL ENGINEERING

III & IV SEMESTER B.E.

RAMAIAH INSTITUTE OF TECHNOLOGY

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

About the Institute:

Dr. M. S. Ramajah a philanthropist, founded 'Gokula Education Foundation' in 1962 with an objective of serving the society. M S 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 17 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) & Visvesvarava Technological University (VTU) have conferred Autonomous Status to MSRIT for both UG and PG Programs since 2007. The institute has also been conferred autonomous status for Ph.D. program since 2021. The institute is a participant to the Technical Education Ouality Improvement Program (TEOIP), an initiative of the Government of India. The institute has 380 competent faculty out of which 67% are doctorates. Some of the distinguished features of MSRIT are: State of the art laboratories, individual computing facility for all faculty members, all research departments active with sponsored funded projects and more than 300 scholars pursuing Ph.D. To promote research culture, the institute has established Centre of Excellence for Imaging Technologies, Centre for Advanced Materials Technology, Centre for Antennas and Radio Frequency systems (CARES). Center for Cyber Physical Systems, Schneider Centre of Excellence & Centre for Bio and Energy Materials Innovation. Ramaiah Institute of Technology has obtained "Scimago Institutions Rankings" All India Rank 107 & world ranking 600 for the year 2022.

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

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

About the Department:

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

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

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

VISION OF THE INSTITUTE

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

MISSION OF THE INSTITUTE

MSRIT shall meet the global socio-economic needs through

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

QUALITY POLICY

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

VISION OF THE DEPARTMENT

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

MISSION OF THE DEPARTMENT

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

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

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

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

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

PEO1:To perform well in Engineering profession as competent professionals using contemporary technical knowledge and professional skills.(**THEME: Perform well in Engineering profession as competent professionals**)

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

(THEME: Higher education and lifelong learning)

PEO3:To communicate effectively to work in multi-disciplinary environments embedded with ethical values and social responsibilities.(**THEME: Effective communication, leadership and ethical values**)

PROGRAM OUTCOMES (POs):

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

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

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

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

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

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

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

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

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

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

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

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

PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO1: Apply the knowledge of basic sciences, geology and environmental science along with the conceptual knowledge of engineering sciences to illustrate the process involved in planning, analysis and design of sustainable civil engineering systems.

PSO2: Conduct laboratory experiments/field investigations, and analyze/interpret the experimental results for appropriate conclusions and recommendations to a real-world civil engineering problem with a significant perspective of economy, society and environment.

PSO3: Demonstrate professional ethics and implement the principles of project management, business and public policy to lead the project execution as per the design requirement, with the state-of-the-art technology and contemporary skills.

Semester wise Credit Breakdown for B.E Degree Curriculum Batch 2022-26

Semester Course Category	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Total Credits
Basic Sciences (BSC)	08	08	03	03					22
Engineering Sciences (ESC)	08	09							17
Humanities, Social Sciences and Management (HSMC)	02	02			03	03			10
Ability Enhancement Course (AEC)	02	01	01	01	01		03		09
Universal Human Values (UHV)	1		02		1				02
Professional Core Courses (PCC)			11	12	12	06	04		45
Integrated Professional Core Course (IPCC)			04	04	03		04		15
Professional Elective Courses (PEC)	-	-			03	06	03		12
Institutional Open Elective Courses (IOE)	-	-			-	03	03		06
Internship (INT)				Yes				05	05
Mini Project / Project Work (PW)						04	03	10	17
Non Credit Mandatory Courses (NCMC)			Yes		Yes			Yes	
Total Credits	20	20	21	20	22	22	20	15	160

REVISED SCHEME OF TEACHING FOR THE ACADEMIC YEAR 2023-24 III SEMESTER

Sl.	Subject	Subject	Teaching	Category		Cr	edits		Total
No.	Code		Dept.		L	Т	Р	Total	contact
									hours /week
1	CV31	Integral Transforms & Calculus of Variation	Maths	BSC	2	1	0	3	4
2	CV32	Geo-informatics and Digital Surveying	Civil	IPCC	3	0	1	4	5
3	CV33	Strength of Materials	Civil	PCC	2	1	0	3	4
4	CV34	Fluid Mechanics and Hydraulics	Civil	PCC	3	0	0	3	3
5	CV35	Water Supply Engineering andConservation	Civil	PCC	3	0	0	3	3
6	CVL36	Building Planning and Drawing Lab	Civil	PCC	0	0	1	1	2
7	CVL37	Materials Testing Laboratory	Civil	PCC	0	0	1	1	2
8	UHV38	Universal Human Value Course	HS	UHV	2	0	0	2	2
9	AEC39	Ability Enhancement Course- III		AEC	1	0	0	1	1
				Total	16	2	3	21	26
10	PE83	Physical Education			All stud	ents hav	ve to reg	gister compu	lsorily for any
	Y083	Yoga			one of	the	course	s with th	e concerned
	NS83	NSS			coordina	ator (Y	oga Tea	acher/ Physic	cal Education
					Director	/ NSS	Coordin	nator) in the	beginning of
				NCMC	the III s	emester	r. Atten	ding the reg	istered course
					from III	to VII	I semes	sters and qu	alifying is
					mandate	ory for t	the awa	rd of the deg	gree.
12	AM31	Additional Mathematics - I *	Maths	NCMC	0	0	0	0	3

Nomenclature: BSC: Basic Science Course, IPCC: Integrated Professional Core Course, PCC: Professional Core Course, HSMC: Humanity and Social Science & Management Courses, AEC–Ability Enhancement Courses, UHV: Universal Human Value Course, NCMC: Non-credit Mandatory Course

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

Integrated Professional Core Course (IPCC): Refers to Professional Theory Core Course Integrated with practical of the same course. Credit for IPCC is 04 and its Teaching–Learning hours (L : T : P) can be considered as (3 : 0 : 1). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated only by CIE (no SEE). However, questions from the practical part of IPCC can be included in the SEE question paper.

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 VIII semesters and shall attend the course from the III semesters and upto end of VIII semesters to complete all the formalities of the course and appear for the SEE. Marks scored in SEE shall be included in the VIII 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. SEE marks will be allotted by the concerned course teacher based on attendance and performance in the practice sessions/field in the ratio of 50:50. Maximum CIE marks are 50. SEE should be awarded by the course teacher every semester (III to VIII) for 50 marks and marks scored by the student are scaled down to 50 in the VIII semester.
- 4. The students who take a course on Physical Education and Yoga, he/she has to take up the semester end practical examination prescribed for 100 marks. The students who opt for NSS course have to submit report and attend viva-voce examination. The marks of the report shall be 50 marks and for the presentation/viva-voce 50 marks. SEE scale down to 50 marks.
- 5. 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, Inter/Intra Institutional Internship: All the students admitted under the lateral entry category shall have to undergo a mandatory summer Internship of 02 weeks which is an NCMC course, during the intervening vacation of the III and IV semesters. Summer Internship shall include Inter / Intra Institutional activities. A Viva-voce examination

shall be conducted during the IV semester. The internship shall be considered as a head of passing and shall be considered for vertical progression and for the award of the degree. Those, who do not take up / complete the internship shall be declared fail and shall have to complete during subsequent examination after satisfying the internship requirements during subsequent semesters.

* 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. Incase 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.

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

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

REVISED SCHEME OF TEACHING FOR THE ACADEMIC YEAR 2023-24 IV SEMESTER

	B.E. in Civil Engineering								
	Scheme of Teaching and Examination 2022-23								
	(Effective from the academic year 2022-23)								
		IV S	EMESTER						•
				Category		0	Credit	S	Total
SI.	Subject	Subject	Teaching		L	Т	Р	Total	contact
No.	Code		Department						hours
									/week
1	CV41	Statistics, Probability and Linear Programming	Maths	BSC	2	1	0	3	4
2	CV42	Construction Materials and Technology	Civil	IPCC	3	0	1	4	5
3	CV43	Hydrology and Water Resources	Civil	PCC	3	0	0	3	3
		Engineering			-	-	-		
4	CV44	Analysis of Determinate and Indeterminate	Civil	PCC	2	1	0	3	3
		Structures			_	-	Ŭ		
5	CV45	Waste Water Engineering and Management	Civil	PCC	3	0	0	3	3
6	CVL46	Environmental Engineering Laboratory	Civil	PCC	0	0	1	1	2
7	CVL47	Digital Terrain Mapping Laboratory	Civil	PCC	0	0	1	1	2
8	CVL48	Fluid Mechanics Laboratory	Civil	PCC	0	0	1	1	2
9	CVAEC49	Ability Enhancement Course - IV		AEC	1	0	0	1	1
10	INT410	Inter/ Intra Institutional Internship		NCMC	0	0	0	0	-
				Total	14	2	4	20	25
11	AM41	Additional Mathematics II *	Maths	NCMC	0	0	0	0	-

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

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

Integrated Professional Core Course (IPCC): Refers to Professional Theory Core Course Integrated with practical of the same course. Credit for IPCC is 04 and its Teaching–Learning hours (L : T : P) can be considered as (3 : 0 : 1). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated only by CIE (no SEE). However, questions from the practical part of IPCC can be included in the SEE question paper.

* 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 an F grade. In such a case, the student has to fulfill the requirements during subsequent semester/s to appear for CIE. Incase 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.

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

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

III SEMESTER

INTEGRAL TRANSFORMS & CALCULUS OF VARIATION				
Course Code: CV31	Credits: 2:1:0			
Pre – requisites: Nil Contact Hours: 28L+14T				
Course Coordinator: Dr. A. Sreevallabha Reddy & Dr. Suresh Babu R				

Course Content

Unit I

Laplace Transforms: Definition, transforms of elementary functions, properties of Laplace transforms, existence conditions, transform of derivatives, integrals, multiplication by tⁿ, division by t, evaluation of integrals by Laplace transforms. Transform of Periodic functions.

- Pedagogy/Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/111/105/111105134/ https://nptel.ac.in/courses/111/105/111105035/ https://nptel.ac.in/courses/111107098
- Impartus recording: https://a.impartus.com/ilc/#/course/119640/593 https://a.impartus.com/ilc/#/course/59742/295

Unit II

Application of Laplace Transforms: Unit–step function, Unit–impulse function. Inverse transforms, Convolution Theorem, Solution of linear differential equations and Simultaneous linear differential equations using Laplace transforms. Engineering applications.

- Pedagogy/Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/111/105/111105134/ https://nptel.ac.in/courses/111/105/111105035/ https://nptel.ac.in/courses/111107098
- Impartus recording: https://a.impartus.com/ilc/#/course/119640/593 https://a.impartus.com/ilc/#/course/59742/295

Unit III

Fourier series: Introduction to Fourier series. Fourier series for even and odd functions. Fourier series of functions having arbitrary period. Complex form of Fourier Series, Half range Fourier series. Fourier cosine and sine series. Harmonic analysis.

- Pedagogy/Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/111/105/111105134/ https://nptel.ac.in/courses/111/105/111105035/
- Impartus recording: https://a.impartus.com/ilc/#/course/619570/1030 https://a.impartus.com/ilc/#/course/107622/533

Unit IV

Fourier Transform: Derivation of Fourier transform from Fourier series, Introduction to Fourier transform, Fourier sine and cosine transforms. Properties of Fourier transform. Inverse transform. Parseval's identities. Evaluation of definite integrals using Fourier transform. Solution of ordinary differential equations and integral equations using Fourier transform. Limitations of Fourier transform and need of wavelet transform.

- Pedagogy/Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/111/105/111105035/
- https://nptel.ac.in/courses/111/105/111105134/
- Impartus recording: https://a.impartus.com/ilc/#/course/132243/636
- https://a.impartus.com/ilc/#/course/119635/593

Unit V

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
- Links:https://nptel.ac.in/courses/111104025
- Impartus recording: https://a.impartus.com/ilc/#/course/621524/1030

Text Books:

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

Reference Books:

- Peter V. O' Neil Advanced Engineering Mathematics, Thomson Brooks/Cole, 7th edition, 2011.
- Glyn James & Phil Dyke Advanced Modern Engineering Mathematics, Pearson Education, 5th edition, 2018.

 Dennis G. Zill, Michael R. Cullen - Advanced Engineering Mathematics, Jones and Barlett Publishers Inc. – 3rdedition – 2009.

Course Outcomes (COs):

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

- 1. Determine Laplace transform of standard functions. (PO-1, 2 & PSO-1)
- 2. Solve initial and boundary value problems using Laplace transforms. (PO-1, 2 & PSO-1)
- 3. Construct the Fourier series expansion of functions/tabulated data. (PO-1, 2 & PSO-1)
- 4. Evaluate Fourier transforms of functions and use it to solve ODE's. (PO-1, 2 & PSO-1)
- 5. Solve variational problems. (PO-1, 2 & PSO-1)

Continuous Internal Evaluation (CIE): 50 Marks					
Assessment tool	Marks	Course outcomes attained			
Internal test-I	30	CO1, CO2 & CO3			
Internal test-II	30	CO3, CO4 & CO5			
Average of the two internal tests shall be taken for 30 marks					
Other components					
Quiz/Assignment	10	CO1 & CO2			
Quiz/Assignment/Mini project work	10	CO3, CO4 & CO5			
Semester End Examination (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: 42L+14P					
Course Coordinator: Dr. Santhosh L G and Dr. H U Raghavendra					

Course Content Unit I

Geo-informatics: Definition, concepts and applications. Surveying: Definition, Necessity, uses, Primary divisions and three classifications of surveying. Methods of linear measurements. **Leveling survey:** Introduction, Terminology, Objectives, Dumpy level and Levelling staff, Classifications of levelling survey, Profile survey and cross-sections and its uses, Numerical problems on calculation of reduced levels using plane of collimation method. **Theodolite survey:** Introduction, Terminology, computation of heights and reduced levels using single & double plane method. **Contours:** Introduction, terminologies, Characteristics of contours, and uses. Introduction to Total station.

- Pedagogy/ Course delivery tools:Chalk and Talk, Power point presentations, Videos, Models
- Lab component/ Practical topics:Distance measurement Angle measurement using Theodolite
- Link: Surveying:https://youtu.be/chhuq_t40rY
- Link: Higher Surveying:https://nptel.ac.in

Unit II

Curves: Introduction and types of curves, Simple Circular Curve: Elements, Curve setting by Rankine's method of deflection angles, Numerical problems. Compound Curves: Elements of compound curve, Numerical problems. Introduction to Reverse curve and Transition curves. **Area and Volume estimation**: Introduction, Trapezoidal & Simpsons 1/3rd rule methods, Prismoidal method, Numerical problems. Estimation of Reservoir capacity using contours, Numerical problems, Estimation of Volume by spot levels, Numerical problems.

- Pedagogy/ Course delivery tools: Chalk and Talk, Power point presentations, Videos,
 - Models
- Lab component/ Practical topics: Angular measurement using Total station Leveling – finding elevation by differential leveling
- Link: Drones:https://https://www.equinoxsdrones.com/blog/10-major-pros-consof-unmanned-aerial-vehicle-uav-drone
- Link: Quantity survey:https://youtu.be/TnaAQ4-a7JI

Unit III

Geodynamics & Geomorphology: Internal structure of the Earth & its composition. Plate tectonics and their types. **Landslides:** Introduction, Causes and its preventive measures. **Earthquakes:** Terminologies, Formation of Earthquakes, Earthquake zones, Considerations for the construction of seismic resistant structures; Weathering of rocks and types, Soil profile, Soil erosion & its conservation; Geological work of rivers and flood control measures.

Minerals and different Rocks: Definition, classification, structures. Folds and Faults: Introduction, geometrical parts of folds, faults and its types. Structural deformation of folds, faults in selection of site for Dams, Reservoirs and Tunnels.

- Pedagogy/ Course delivery tools: Chalk and Talk, Power point presentations, Videos,
- Models
- Lab component/Practical topics:Measurements of heights and distances Finding areas using total station ,Contouring using total station
- Link: Geotechnics: https://www.youtube.com/watch?v=fvoYHzAhvVM
- Intro. to Geomorphology:https://youtu.be/0PjZ7G00OGc
- Link: Image interpretation:https://youtu.be/X8jirWMSDOI, https://https://www.youtube.com/watch GF27RMbck0g

Unit IV

Remote Sensing - Introduction, Components of RS, Ideal RS, Types of RS, Interaction of EMR with atmosphere and Earth surface features. Atmospheric Window. Satellites, Sensors & platforms, Introduction to optical, hyperspectral, thermal, microwave, Ultra spectral remote sensing. Advantages and Disadvantages of Remote Sensing.

Digital Image Preprocessing (DIP): Digital Image: Introduction, characteristics, advantages and disadvantages of Digital Images. DIP: Introduction, stages in DIP, Image classification - Methodology and Accuracy assessment procedure. Image Interpretation key elements.

GPS: Definition, Components, Applications. Introduction to Drones and its components.

- Pedagogy/ Course delivery tools: Chalk and Talk, Power point presentations, Videos
- Lab component/Practical topics:Setting out simple curve by deflection angle method Profile survey (L/S, C/S) using total station
- Link: Remote Sensing: https://youtu.be/eABubdXSYO8
- Link: Image Classification:https://youtu.be/iaaFqDVrN6

Unit V

Geographic Information System (GIS): Introduction, components, functions. Data types and structures, Data analysis tools – Proximity and Spatial analysis 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

Opens source software's

- Lab component/Practical topics:Setting out simple curve using Total station Setting out building by centre line method Setting out sewer line using total station
- Link: GIS: https://youtu.be/vJAQHA5XQWI
- Link: Applications of RS& GIS: https://youtu.be/SVa66vO08So

Overall lab component list

- 1. Distance measurement
- 2. Angle measurement using Theodolite
- 3. Angular measurement using Total station
- 4. Leveling finding elevation by differential levelling
- 5. Measurements of heights and distances
- 6. Finding areas using total station
- 7. Contouring using total station
- 8. Setting out simple curve by deflection angle method
- 9. Profile survey (L/S, C/S) using total station
- 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. **G S Srivastava** Introduction to Geoinformatics, McGraw Hill Education, 2014.
- 2. **S K Duggal** Surveying Vol I, Tata McGraw Hill publishing company Ltd, New Delhi, 4th edition, 2013.

Reference Books:

- 1. **Punmia B C** Surveying Vol. 1 & 2, Standard book house, Laxmi Publications Pvt. Ltd., New Delhi, 2005.
- 2. S K Roy Fundamental of Surveying, Prentice Hall of India, New Delhi, 2008.
- 3. **Charles D. Ghilani** Elementary Surveying: an introduction to geomatics, Prentice Hall, 13th edition, 2012.
- 4. **A M Chandra** Higher Surveying, New Age International, 2005.
- 5. **K V G Gokhale**–Principles of Engineering Geology, B S Publication, Hyderabad, 2011.
- 6. **J R Jensen** –Introductory digital image processing: a remote sensing perspective, Prentice Hall, 2nd edition, 1996.
- T M Lillesand & R W Kiefer Remote sensing and image interpretation, John Wiley & Sons, 4th edition, 2000.

Web links and Video Lectures (e-Resources):

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

Course Outcomes (COs):

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

- 1. Expose the working of modern advanced field survey systems and solve the mapping problems. (PO-1, 2, 5, 9)
- 2. Compute data for angular measurement, curve setting & earthwork estimation methods. (PO-1, 3, 5, 6, 9)
- 3. Demonstrate index properties of earth's formation and use of total station, GPS for plotting areas and contours. (PO-1, 2, 3, 5, 6, 9)
- 4. Understand the remote sensing platforms and sensors and to introduce the elements of data interpretation. (PO-1, 2, 4, 5, 9)
- Delineate the change detection through various GIS techniques. (PO-1, 3, 4, 5, 7, 9)

Continuous Internal Evaluation (CIE): 50 Marks					
Assessment tool	Marks	Course out comes attained			
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	10	CO1, CO2, CO3, CO4 & CO5			
presentation					
Experiment conduction, Report	10	CO1, CO2, CO3, CO4 & CO5			
writing and Viva-voce					
Semester End Examination	100 (Scale	CO1, CO2, CO3, CO4, CO5			
(SEE):	down to 50)				

STRENGTH OF MATERIALS

Course Code: CV33 Pre – requisites: Nil Credits: 2:1:0

Contact Hours: 28L+14T

Course Coordinator: Dr. Anil Kumar R

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: <u>https://www.youtube.com/watch?v=aQf6Q8t1FQE</u>, https://www.youtube.com/watch?v=YkdQB0JnJD4
- NPTEL Links: <u>https://archive.nptel.ac.in/courses/105/105/105105108;</u> <u>https://youtu.be/GkFgysZC4Vc;</u>

Unit II

Compound Stresses

Introduction –State of stress at point, stress components on inclined planes – general twodimensional 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: <u>https://www.youtube.com/watch?v= DH3546mSCM</u> <u>https://www.youtube.com/watch?v=xqrVFypkbAA</u> https://www.youtube.com/watch?v=EU8kMOJEn0I
- NPTEL Links: <u>https://archive.nptel.ac.in/courses/105/105/105105108/</u> 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: <u>https://www.youtube.com/watch?v=C-FEVzI8oe8</u> https://www.youtube.com/watch?v=gYjWWjVMmoU
- NPTEL Links: <u>https://archive.nptel.ac.in/courses/105/105/105/105108/</u> <u>https://youtu.be/ITuWnrl3aKI;</u>

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. Combined Direct and Bending stresses - shear stresses under Torsion.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation
- Links: <u>https://www.youtube.com/watch?v=f08Y39UiC-o</u>,
- https://www.youtube.com/watch?v=X1KzYy2d9BU
- NPTEL Links: https://archive.nptel.ac.in/courses/105/105/105105108/
- <u>https://youtu.be/sP34uzn7diA;</u>
- Torsion: <u>https://youtu.be/IQB0bJRCRxo</u>

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: <u>https://www.youtube.com/watch?v=MvBqCeZllpQ</u>, <u>https://www.youtube.com/watch?v=21G7LA2DcGQ</u>;
- NPTEL Links: -<u>https://archive.nptel.ac.in/courses/105/105/105105108/</u>
- Deflection of Beams: <u>https://youtu.be/GUOKSExdjq8;</u> https://youtu.be/vi0tjfDSjNY;
- Elastic Stability of Columns: <u>https://youtu.be/ZSQ_51Rj5gI;</u> <u>https://youtu.be/3By6vS5xY6s;</u>

Text Books:

- 1. **Basavarajaiah and Mahadevappa**, "Strength of Materials", CBS Publishers, New Delhi.
- 2. **R S Khurmi & N Khurmi**, "Strength of Materials", S Chand Publishers, New Delhi.
- 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 Rai Publishing 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 analyse their structural behaviour 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. Analyse 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 &			
	20	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	10	CO3 (2 nd half of Unit3), CO4 &			
Activity based learning.		CO5			
Semester End Evaluation (SEE):					
Course end examination	100 (Scale				
each unit –internal choice)	down to 50	CO1, CO2, CO3, CO4, CO5			

FLUID MECHANICS & HYDRAULICS				
Course Code: CV34	Credits: 3:0:0			
Pre – requisites: Nil Contact Hours: 42L				
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. Surface tension and Capillarity-Numerical problems (no derivations). **Fluid Pressure and measurement**–Different types of Pressures, Pascals Law and Hydrostatic Law- Numerical problems. Manometers– Piezometer, U-Tube and Differential U-Tube manometers (no single column monometers)-Numerical problems. Types of Mechanical Pressure gauges. **Hydrostatics**: Total pressure and Centre of pressure on plane vertical, inclined surfaces–Numerical problems (No Derivations).

- 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 in cartesian coordinates, Application of I-M equation on pipe bends–Numerical problems. Introduction to Flow Measurement devices- Orifices and Mouth pieces. Venturimeter and Orifice meter, Notches and Weirs. Introduction to Pitot tubes and its types.

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation, videos
- Links: <u>https://a.impartus.com/ilc/#/video/id/705351</u> <u>https://a.impartus.com/ilc/#/video/id/717150</u> <u>https://a.impartus.com/ilc/#/video/id/735816</u>

Unit-III

Flow through Pipes

Flow through Pipes: Introduction, Losses in pipe flow-Derivation of expressions for Major loss of energy due to friction. Minor Losses- Equations for Sudden contraction and sudden expansion in pipe system (No Derivation). Pipes in series - Compound pipe and Equivalent pipe, pipes in parallel, Branched pipes. Concept of Hydraulic Gradient Line and Total Energy Line. Water hammer in pipes- Definition, Causes and Factors affecting Water Hammering. Numerical problems on Time for sudden closure and gradual closure of Valves (No derivations).

- Pedagogy/Course delivery tools: Chalk and talk, Power point presentation, videos
- Links: <u>https://a.impartus.com/ilc/#/video/id/535276</u>

Unit IV

Hydraulic Machines

Impact of jet on vanes- Force exerted by fluid jet on stationary (flat normal, inclined and curved) Numerical Problems. **Turbines -** components and layout of Hydroelectric power plant, Head and efficiency of turbines, classifications of turbines, Pelton wheel turbines-equation for work done and efficiency, Working proportions. Governing of turbines. Performance of Turbines- Numerical Problems (No derivations). **Pumps -** Centrifugal pumps, Work done by the impeller, Priming of pumps, Head and efficiencies of pump, Minimum starting speed, NPSH, performance of centrifugal pumps- Numerical Problems (No derivations) Introduction to Submersible pumps.

- Pedagogy/Course delivery tools:-Chalk and talk, Power point presentation, videos
- Links: Impact of Jets-<u>https://a.impartus.com/ilc/#/video/id/578080</u>
- Links: Pumps- <u>https://a.impartus.com/ilc/#/video/id/582686</u>

Unit V

Open Channel Flow, Dimensional Analysis and Model Studies

Open Channel Flow: Introduction. Types of open channels. Uniform flow in channels -Chezy's formula, Manning's formula. Most economical channel sections - rectangular, triangular and trapezoidal sections-Numerical Problems. Concepts of Specific energy & Critical flow - Specific energy curve-Simple numerical problems R.V.F. - 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. Types of models -Undistorted models and distorted models.

- Pedagogy/Course delivery tools:-Chalk and talk, Power point Presentation, Videos.
- Links: Flow in Open Channel-https://a.impartus.com/ilc/#/video/id/547529
- Links: Gradually Varied Flow-https://a.impartus.com/ilc/#/video/id/565974
- Links: Dimensional Analysis-https://a.impartus.com/ilc/#/video/id/605161
- Links: Model Studies-<u>https://www.youtube.com/watch?v=OdldY3RLw24</u>
- https://a.impartus.com/ilc/#/video/id/547529
- https://a.impartus.com/ilc/#/video/id/565974
- <u>https://a.impartus.com/ilc/#/video/id/605161</u>
- <u>https://www.youtube.com/watch?v=OdldY3RLw24</u>

Text Books:

- 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/685978
- 2. https://a.impartus.com/ilc/#/video/id/716833
- 3. https://a.impartus.com/ilc/#/video/id/602744
- 4. https://www.youtube.com/watch?v=JpnzRs4gpxM
- 5. 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 the fluid properties and demonstrate the skills in evaluation of hydrostatic forces on bodies at rest. (PO-1,2)
- 2. Apply basic principles for fluid flow measurement. (PO-1,2,3)
- 3. Apply the concepts to analyze flow through pipes. (PO-1,2,3)

- 4. Evaluate impact of jet on vanes and analyze performance of hydraulic machines considering the basic principles of fluid flow. (PO-1,2,3)
- 5. Apply concepts to analyze flow through open channels and understand study of models for engineering design. (PO-1,2,3)

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

WATER SUPPLY ENGINEERING AND CONSERVATION

Course Code: CV35

Credits: 3:0:0

Pre – requisites: Nil

Contact Hours: 42L

Course Coordinator: Mrs. Jyothi. M.R

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 portable 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, 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 distribution of distribution in systems, storage, layout 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 with in 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, water tap, 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. <u>https://www.youtube.com/watch?v=YteigN81-Sw</u>
- 4. <u>https://www.youtube.com/watch?v=KsVfshmK0Ak</u>
- 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)

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

BUILDING PLANNING AND DRAWING LABORATORY

Course Code: CVL36

Credits: 0:0:1

Pre – requisites: Nil

Contact Hours: 14P

Course Coordinator: 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/Govt Office plan (ex. PWD Office)

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", Wiley Dreamtech India Pvt Ltd.
- 5. Jayaram M A., Rajendra Prasad D S., "A referral on CAD Laboratory", Sapna Publications.

Web Links:

- 1. Link for working with AutoCad: <u>https://www.youtube.com/watch?v=cmR9cfWJRUU&list=PLcH1MIEuSvoGaH</u> <u>GEI_BnQ5In4R_NNOghG</u>
- 2. Link for Building Components: <u>https://www.youtube.com/playlist?list=PLHTVTvUaTtbBLCiVX4_PZWTpUvwc</u> <u>2RieO</u>
- 3. Link for Building Planning: 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- 1,5,6,8)
- 5. Draft the building plan and elevation (PO- 1,5,6,8)

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): 50 Marks					
Semester end examination	50	CO1, CO2, CO3, CO4 & CO5			

MATERIALS TESTING LABORATORY

Course Code: CVL37

Credits: 0:0:1

Pre – requisites: Nil

Contact Hours: 14P

Course Coordinator: Mr. 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 aluminium samples.
- 3. Test to determine the mechanical properties of the ferrous metals Fe 250 and Fe 415 to 550 used for RCC subjecting it to tensile load.
- 4. Tests to determine the compressive strength of steel & wood.
- 5. Tests to determine the shear strength of steel sample.
- 6. Tests to determine flexural strength test of wood and demonstrate strain ageing of steel bar.
- 7. Tests to determine torsional strength of steel sample.
- 8. Tests to determine young's modulus of steel and wood by deflection equation.
- 9. Tests to determine the compressive strength of bricks / Solid blocks/ light weight concrete blocks/clay blocks & roof tiles.

Text Books:

- 1. **Basavarajaiah and Mahadevappa**, "Strength of Materials", CBS Publishers, New Delhi.
- 2. **R S Khurmi & N Khurmi**, "Strength of Materials", S Chand Publishers, New Delhi.
- 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 Rai Publishing 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, IS 1708 part (8-9):1986, IS 5242:1979, IS 2408:1963, IS 1786:2008, IS 1717:2012, IS 1717:2012, IS 3495 part (1-4):1992, IS 654:1992

Web Links:

- 1. Link for Impact test <u>https://www.youtube.com/watch?v=T3tc33pd3hQ&ab_channel=Engineer%27sAc_ademy</u>
- 2. Link for tension and Compression test <u>https://www.youtube.com/watch?v=b5W8qgo7NNQ&ab_channel=CorecivilShub</u> <u>hamAgarwal</u>
- Link for shear test: <u>https://www.youtube.com/watch?v=9Xnm6l8rpoQ&ab_channel=JSPMNTCAcad_emics</u>

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- 1,5,6,8,10)
- 2. Demonstrate the experiments and evaluate the mechanical strength of various ductile materials. (PO- 1,5,6,8,10)
- 3. Demonstrate the experiments and evaluate the mechanical strength of various brittle materials. (PO- 1,5,6,8,10)
- 4. Demonstrate the experiments and evaluate the strength of various materials. (PO-1,5,6,8,10)
- 5. Summarize various properties of the materials and compile their suitability as per the provisions given in I.S code. (PO- 1,5,6,8,10)

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): 50 Marks		
Semester end examination	50	CO1, CO2, CO3, CO4 & CO5

UNIVERSAL HUMAN VALUES

Course Code: UHV38

Pre – requisites: Nil

Credits: 2:0:0

Contact Hours: 28L

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- <u>https://youtu.be/0ERSMkRPQBM</u>
- Survey and polls for self-exploration: <u>https://youtu.be/aJ_BU2OgpKs</u>

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
- 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
- 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 (Akhand Samaj), 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: <u>https://youtu.be/F2KVW4WNnS8</u>
- Links: Harmony in family- Respect: <u>https://youtu.be/iLqNRPuv0_8</u>

- Links: Harmony in family- Other Feeling Justice: • https://voutu.be/TcYJB7reKnM
- Links: Harmony in the Society: https://youtu.be/BkWgFinrnPw •

Unit IV

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

- 1 Understanding the harmony in the Nature
- 2 Interconnectedness and mutual fulfillment among the four orders of naturerecyclability 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 human order
- b) Ability to identify the scope and characteristics of people-friendly and eco- friendly production systems,
- c) Ability to identify and develop appropriate technologies and management patterns for above production systems.
- 5. Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order: 6.
- 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 and professional 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) Krishi Tantra 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 people mattered*, Blond & Briggs, Britain.
- 9. A.N. Tripathy, 2003, Human Values, New Age International Publishers.

Web links and Video Lectures (e-Resources):

- 1. <u>https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw</u>
- 2. <u>https://www.youtube.com/watch?v=P4vjfE-</u> <u>YnVk&list=PLWDeKF97v9SP7wSlapZcQRrT7OH0ZlGC4</u>
- 3. Course handouts: https://drive.google.com/drive/folders/1zioX_4L2fCNX4Agw282PN86pcZZT3Os r?usp=sharing
- 4. **Presentation slides:** https://drive.google.com/drive/folders/1rMUKh1s0HPRB1pp_b1mpSduNRcwS6YH?usp=sharing

Course Outcomes (COs):

СО	Description	CO-PO
		mapping
CO 1	Apprehend the need of Value Education over Human	PO-6
	aspirations	
CO 2	Assimilate Harmony over the physical needs and to overcome	PO-6
	the self- needs for a prosperous life.	
CO 3	Recognize the need of Harmony in the Family and Society for	PO-6,
	a better World.	
CO 4	Explain the need of mutual understanding for Holistic	PO-6
	Harmony in all the Levels of Human Existence.	
CO 5	Explain the Holistic understanding of Harmony and	PO-6,8
	Professional Ethics at Individual Level and Society.	

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

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 inte	ernal tests will be taken for 30 m	arks.
Other components	Marks	Course outcomes addressed
Assignment		
• Quiz		
• Presentation	$20(10 \pm 10)$	CO1 CO2 CO3 CO4 CO5
Model / mini	20 (10 + 10)	
project		
• Any other		
Semester End Examin	nation (SEE):	
Course end		
examination		
(Answer any one	100 (Scale down to 50	CO1 CO2 CO3 CO4 CO5
question from each	marks)	C01, C02, C03, C04, C03
unit – Internal		
choice)		

(For Lateral Entry Diploma Students)

ADDITIONAL MATHEMATICS – I

Course Code: AM31 Pre – requisites: Nil Credits: 0:0:0

Contact Hours: 42

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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/
- https://nptel.ac.in/courses/111/104/111104144/
- Impartus recording: -https://a.impartus.com/ilc/#/course/107625/1030

Unit II

Integral Calculus: Introduction, Reduction formula, Reduction formula for

and

. 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 avector 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:

- B.S. Grewal Higher Engineering Mathematics, Khanna Publishers, 44th edition, 2017.
- 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.
- 2. Apply the concept of reduction formula to determine the length, area, volume of revolution of an arc of the curve.
- 3. Solve the problems related to velocity and acceleration.
- 4. Apply vector differentiation to identify solenoidal and irrotational vectors.
- 5. Apply the concept of various methods to solve first order first degree differential equations.

IV SEMESTER

STATISTICS, PROBABILITY AND LINEAR PROGRAMMING ode: CV41 Credits: 2:1:0

Course Code: CV41 Pre – requisites: Nil

Credits: 2:1:0 Contact Hours: 28L+14T

Course Coordinator: Dr. A. Sreevallabha Reddy & Dr. Suresh Babu R

Course Content

Unit I

Statistics: Curve fitting by the method of least squares, fitting linear, quadratic and geometric curves, Correlation and Regression, Multiple regression analysis.

- Pedagogy/Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/111/105/111105035/ https://nptel.ac.in/courses/111/107/111107119/
- Impartus recording: https://a.impartus.com/ilc/#/course/619570/1030 https://a.impartus.com/ilc/#/course/96127/452

Unit II

Random variables and Probability distributions: Review of Random variables, Discrete and continuous random variables, Review of Binomial distribution, Poisson distribution, Uniform distribution, Exponential distribution and Normal distribution.

- Pedagogy/Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/111/105/111105035/
- https://nptel.ac.in/courses/111/107/111107119
- Impartus recording: https://a.impartus.com/ilc/#/course/619570/1030
- https://a.impartus.com/ilc/#/course/96127/452

Unit III

Sampling and Statistical Inference: Sampling distributions, Concepts of standard error and confidence interval, Central Limit Theorem, Type I and Type II errors, Level of significance, One tailed and two tailed tests, Z-test: for single mean, for single proportion, for difference between means, Student's t –test: for single mean, for difference between two means, F – test: for equality of two variances, Chi-square test: for goodness of fit, for independence of attributes.

- Pedagogy/Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/111/107/111107119/ https://nptel.ac.in/courses/111/105/111105035/
- Impartus recording: https://a.impartus.com/ilc/#/course/96151/1112

Unit IV

Joint Probability Distributions: Discrete and continuous Joint probability distributions. **Linear Programming-I:** Introduction to Linear Programming Problem (LPP), Formulation of the problem, Graphical method, General, Canonical and standard forms of LPP, Simplex method.

- Pedagogy/Course delivery tools-Chalk and talk
- Links:-https://nptel.ac.in/courses/111/105/111105035/
- https://nptel.ac.in/courses/111104027
- Impartus recording: -https://a.impartus.com/ilc/#/course/96127/452

Unit IV

Linear Programming-II: Big-M method, Two-phase simplex method. General Primal – Dual pair, Formulating a Dual problem, Primal – Dual pair in Matrix form, Transportation problem.

- Pedagogy/Course delivery tools: Chalk and talk, Power Point Presentation, Videos
- Links: <u>https://nptel.ac.in/courses/111103022</u>
- https://nptel.ac.in/courses/111104027

Unit V

Sampling and Statistical Inference: Sampling distributions, Concepts of standard error and confidence interval, Central Limit Theorem, Type I and Type II errors, Level of significance, One tailed and two tailed tests, Z-test: for single mean, for single proportion, for difference between means, Student's t –test: for single mean, for difference between two means, F – test: for equality of two variances, Chi-square test: for goodness of fit, for independence of attributes.

- Pedagogy / Course delivery tools-Chalk and talk
- Links:-https://nptel.ac.in/courses/111/107/111107119/
- https://nptel.ac.in/courses/111/105/111105035/
- Impartus recording: -https://a.impartus.com/ilc/#/course/96151/1112

Text Books:

- B.S. Grewal Higher Engineering Mathematics, Khanna Publishers, 44th edition, 2017.
- 2. **T. Veerarajan** Probability, Statistics and Random processes Tata McGraw-Hill Education 3rd edition -2017.

Reference Books:

- 1. **R.E. Walpole, R. H. Myers, R. S. L. Myers and K. Ye** Probability and Statistics for Engineers and Scientists Pearson Education Delhi 9th edition 2012.
- 2. **Glyn James & Phil Dyke** Advanced Modern Engineering Mathematics, Pearson Education, 5th edition, 2018.
- 3. **Murray R Spiegel, John Schiller & R. Alu Srinivasan** Probability and Statistics Schaum's outlines -4th edition-2012.

Course Outcomes (COs):

At the end of the course, the students 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. Find parameters of Discrete and Continuous Probability distributions.(PO-1, 2 & PSO-1)
- 3. Calculate the marginal and conditional distributions of bivariate random variables. Formulate and solve a simple linear programming problem. (PO-1, 2 & PSO-1)
- 4. Solve a simple and complex linear programming problem.(PO-1, 2 & PSO-2,3)
- 5. Choose an appropriate test of significance and make inference about the population from a sample. (PO-1, 2 & PSO-1)

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	Marks	Course outcomes addressed
Internal test-I	30	CO1, CO2, CO3
Internal test-II	30	CO3, CO4, CO5
Average of the two internal tests sha	all be taken for 3	0 marks.
Other components	Marks	Course outcomes addressed
Quiz	10	CO1, CO2, CO3
Assignment	10	CO3, CO4, CO5
Semester End Examination (SEE):	100 (Scale	CO1, CO2, CO3, CO4, CO5
	down to 50)	

CONSTRUCTION MATERIALS AND TECHNOLOGY	
Course Code: CV42	Credits: 3:0:1
Pre – requisites: Nil	Contact Hours: 42L+14P
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. Evaluation of tensile strength and Poisson's ratio of structural steel sections
 - 2. Determination of bulk density and water absorption of bricks and blocks
 - 3. Determination of normal consistency and specific gravity of OPC.

Unit II

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

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos, Models
- Lab component/Practical topics:

Unit III

Concrete Ingredients and Microstructure: Cement- hydration of cement. 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 (detailed procedures covered in laboratory). Quality of mixing water. Aggregates – Physical properties of Coarse and Fine aggregate. Sieve analysis, Fineness, grading of aggregates. Structure of aggregate phase, structure of hydrated cement paste, strength-porosity relationship in

hydrated cement paste. Manufactured sand, its significance and differences. Blended cement and its importance.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos, Models
- Lab component/Practical topics:
 - 1. Microstructure of cement by XRD, FTIR and TGA
 - 2. Determination of bulk density and water absorption of aggregates
 - 3. Determination of particle size distribution of fine aggregates
 - 4. Determination of setting times of OPC

Unit IV

Fresh Concrete &Mix Design: Workability - definition, factors affecting workability, measurement of workability by slump, compaction factor, vee-bee and flow tests. Segregation and bleeding. Process of manufacture of concrete-batching, mixing, transporting, placing, compaction and curing of concrete. Admixtures: classification and its uses. Concept of mix design, variables in proportioning, exposure conditions, procedure of mix design as per IS 10262-2019 and numerical examples of mix design.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos, Models
- Lab component/Practical topics:

Unit V

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

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos, Models
- Lab component/Practical topics:
 - 1. Determination of compressive strength of concrete cubes
 - 2. Determination of flexural and split tensile strengths of concrete
 - 3. Determination of compressive strength of OPC

List of experiments:

- 1. Determination of normal consistency and specific gravity of OPC
- 2. Determination of setting times of OPC
- 3. Determination of compressive strength of OPC
- 1. Determination of particle size distribution of fine aggregates
- 2. Determination of bulk density and water absorption of aggregates
- 3. Determination of bulk density and water absorption of bricks and blocks
- 4. Microstructure of cement by XRD, FTIR and TGA
- 5. Evaluation of tensile strength and Poisson's ratio of structural steel sections
- 6. Determination of compressive strength of concrete cubes
- 7. Determination of flexural and split tensile strengths of concrete

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.

Continuous Internal Evaluation (CIE): 50		
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 take	n for 30 marks
Other Components:		
Experiment Conduction and Record Writing	10	CO1, CO2, CO3, CO4 & CO5
Viva-Voce and Assignment writing	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

HYDROLOGY & WATER RESOURCE ENGINEERING Course Code: CV43 Credits: 3.0.0 Contact Hours: 42L

Pre – requisites: Nil

Course Coordinator: Dr. Santhosh L G and Mrs. Shilpa D N

Course Content Unit I Hydrology and Watershed

Hydrology- Hydrologic cycle, Global water budget and water budget equation-. Precipitation - forms, types, measurement of precipitation, Hyetograph, Rain gauge network, mean precipitation over an area, estimation of missing rainfall data. Double mass curve technique, Return period, Plotting positions, I.D.F. curves, P.M.P.

Watershed - Definition, stream pattern, description and types of watershed. Watershed Management-Definition. Objectives, Control measures of watershed management. Concept of Integrated Watershed Management

- Pedagogy/Course delivery tools: Chalk and talk. Power point Presentation. Videos.
- Links: Average Rainfall -https://a.impartus.com/ilc/#/video/id/1003078
- Links: Catchment -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 evaporation pan, methods of reduction of reservoir evaporation, transpiration, evapotranspiration, estimation of evapotranspiration. Infiltration - Infiltration capacity, Infiltration rate, Horton's infiltration curve. Infiltration indices.

. Groundwater - Introduction. Specific retention, Specific yield, Darcy's Law, Hydraulic conductivity, Transmissivity. Concept of Steady radial flow into a confined aquifer-Numerical problem

- Pedagogy/Course delivery tools:-Chalk and talk, Power point Presentation, Videos
- Links: Abstractions and Runoff https://a.impartus.com/ilc/#/video/id/1028056
- Links: Infiltration Indices • https://a.impartus.com/ilc/#/video/id/1044537

Unit III

Runoff and Hydrographs

Runoff: Introduction, types of runoff, classification of streams, factors affecting runoff, Basin yield, stream gauging, Methods of measurement of discharge, 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, assumptions and limitations of Unit hydrograph, derivation of units of hydrograph. Derivation of S-Curve

- Pedagogy/Course delivery tools: Chalk and talk, Power point Presentation, Videos.
- Links: Runoff -<u>https://a.impartus.com/ilc/#/video/id/1051548</u> https://a.impartus.com/ilc/#/video/id/1139670
- Links: Hydrograph -

Unit IV

Irrigation and Water Requirement of Crops

Irrigation - definition, necessity, benefits and ill-effects of irrigation, types of irrigation systems, Traditional methods of irrigation. Modern methods of irrigation- Methods, Importance and benefits **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, G.C.A., C.C.A., Intensity of irrigation, P.E.T., Irrigation Efficiencies. Irrigation requirements of crops.

- Pedagogy/Course delivery tools:Chalk and talk, Power point Presentation, Videos.
- Links: <u>https://www.youtube.com/watch?v=1tVthHIp82k</u>

Unit V

Design of Irrigation Canals

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/605161

Text Books:

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

Reference Books:

1. Lingsey, Franzini- Water Recourses Engineering, Tata McGraw Hill

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/1173994
- 4. https://www.youtube.com/watch?v=lyecuNbxlAs
- 5. https://www.youtube.com/watch?v=57nKcvfwbnc

Course Outcomes (COs):

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

- 1. Appraise water resources potential on earth and its data analysis in evaluating extreme hydrological events. (PO-1,2)
- 2. Estimate various abstractions from precipitation and evaluate groundwater potential. (PO-1,2)
- 3. Develop stage discharge relations and analyse runoff using hydrographs. (PO-1,2)
- 4. State the importance of irrigation, types and methods of irrigation and evaluate water requirements of crops. (PO-1,2,3)
- 5. Apply silt theories and design irrigation canals. (PO-1,2,3,4)

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 tes	ts will be taken fo	or 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

ANALYSIS OF DETERMINATE AND INDETERMINATE STRUCTURES	
Course Code: CV44	Credits: 2:1:0

Pre – requisites: Nil

Contact Hours: 28L + 14T

Course Coordinator: Mrs. Nagashree B

Course Content Unit I

Introduction and 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. **Deflection of Beams:** 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/oa5ojjGEUSw
- Impartus recoding , <u>III II http://a.impartus.com/ilc/#/video/id/804665</u>

Unit II

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

Influence Lines and Moving 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/_lUGcIT1mF4
- Impartus recoding , DDD http://a.impartus.com/ilc/#/video/id/814088

Unit III

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

Slope Deflection Method: Introduction, sign convention, development of slope deflection equation, analysis of continuous beams, analysis of orthogonal rigid plane frames including sway frames with kinematic indeterminacy ≤ 3 .

- Pedagogy/Course delivery tools:, Chalk and talk, Power point Presentation
- Links: , https://youtu.be/pdqw8p6BJMQ
- Impartus recoding , DDD http://a.impartus.com/ilc/#/video/id/4635649

Unit IV

Moment Distribution Method: Introduction, definition of terms, development of method, analysis of continuous beams, analysis of orthogonal rigid plane frames including sway frames with kinematic indeterminacy ≤ 3 .

- Pedagogy/Course delivery tools:, Chalk and talk, Power point Presentation
- Links: , https://youtu.be/ELXjh51p7dc
- Impartus recoding, ____http://a.impartus.com/ilc/#/video/id/4798357

Unit V

Matrix Method of Analysis (Flexibility method): Introduction, Axis and Coordinates, Flexibility matrix, analysis of continuous beam and plane trusses using system approach. Matrix Method of Analysis (Stiffness method): Introduction, Stiffness matrix, analysis of continuous beam. Analysis of simple orthogonal rigid frames using system approach.

- Pedagogy/Course delivery tools:, Chalk and talk, Power point Presentation
- Links: , https://youtu.be/Fd8F-O1-cEk
- Impartus recoding , DDD http://a.impartus.com/ilc/#/video/id/4896340

Text Books:

- 1. **Negi and Jehangir**, "Basic Structural Analysis", Tata McGraw Hill, Publication company Ltd.
- 2. **Gupta SP, GS Pandit and R. Gupta**, "Theory of Structures Vol 2", Tata Mc Ggraw Hill publication company Ltd.

Reference Books:

- 1. **J. Sterling Kinney**, "Indeterminate structural analysis", Oxford of IBH Publishing Company.
- 2. **Norris Wilbur JK**, "Elementary structural analysis", Mcgraw Hill International Book 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. <u>http://a.impartus.com/ilc/#/video/id/4798357</u>
- 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)
- 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)

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 tes	ts will be taken fo	or 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

WASTEWATER ENGINEERING & MANAGEMENT

Course Code: CV45

Credits: 3.0.0

Pre – requisites: Nil

Contact Hours: 42L

Course Coordinator: Dr. Jvothi Roopa, S.K

Course Content Unit I Introduction to Wastewater

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 closetsconventional 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.voutube.com/watch?v=LLIbW2xfnhk&t=23s
- NPTEL Links: https://www.voutube.com/watch?v=Lpuv_OxWvZY

Unit II

Collection of Wastewater

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. Sewerslimiting 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 drop manholes.

- 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.voutube.com/watch?v=Lpuv OxWvZY •

Unit III

Characteristics of Wastewater

- 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: wastewater characteristics: https://www.youtube.com/watch?v=bBNUEMgPMXQ
 - NPTEL Links: https://www.youtube.com/watch?v=Lpuv_QxWvZY

Unit IV

Treatment of Wastewater

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: wastewater treatment: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 public health 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 a building. (PO- 1,2,7)
- 2. Compute the quantity of wastewater and design, construct and maintain sewers. (PO- 1,2,3,7)
- 3. Illustrate sewer appurtenances and describe the characteristics of wastewater. (PO-1,2,3,7)
- 4. Plan and design wastewater treatment facilities. (PO- 1,2,3,6,7)
- 5. Describe alternative and onsite methods of wastewater treatment. (PO- 1,2,3,6,7)

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

ENVIRONMENTAL ENGINEERING LABORATORY

Course Code: CVL46

Pre – requisites: Nil

Credits: 0:0:1

Contact Hours: 14P

Course Coordinator: Dr. Jyothi Roopa and Mrs. Jyothi M R

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.
- Punmia. B.C, (2011) Environmental Engineering Vol. I and II, Laxmi Publishers (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].
- Clair N Sawyer, Perry L McCarty "Chemistry for Environmental Engineering and Science", Tata Mc Graw-Hill edition 2003.
- 4. Manual on sewerage and Sewage Treatment, (2010) CPHEEO, Ministry of Urban Development, New Delhi.
- Metcalf and Eddy Inc., (2004) "Wastewater Engineering Treatment and Reuse", 4th Edition, Tata McGraw Hill, India.

 "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
- Link for wastewater characteristics : https://www.youtube.com/watch?v=bBNUEMgPMXQ

Course Outcomes (COs):

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

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

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

DIGITAL TERRAIN MAPPING LABORATORY

Course Code: CVL47	Credits: 0:0:1
Pre – requisites: Geo-informatics and Digital	Contact Hours: 14P
Surveying	
Course Coordinator: Dr. H II Raghavendra and D	r Santhash I C

Course Content

List of Experiments:

- 1. Identification of Minerals through physical properties
- 2. Recognition and descriptive study of Rock/Stones through physical properties
- 3. Study of Terrain maps and their interpretation of sections
- 4. Find out the thickness of Terrain formation
- 5. Exploration of groundwater using Geophysical methods
- 6. Registration of toposheet and Digitization of features
- 7. Generation of thematic layers using remote sensing satellite images
- 8. Delineation of watershed, drainage network using DEM
- 9. Generation of Hill shade, aspect & slope maps from DEM
- 10. Land Use Land Cover Mapping using satellite images
- 11. Mapping of Change detection using image data
- 12. Demonstration of drone data acquisition & processing.

Text Books:

- 1. **K V G Gokhale** Principles of Engineering Geology, B S Publication, Hyderabad, 2011.
- 2. G S Srivastava Introduction to Geoinformatics, McGraw Hill Education, 2014.

Reference Books:

- 1. K S Valdiya Environmental Geology, Mc Graw Hill Education, Chennai, 2017
- 2. **M T Maruthesha Reddy** Lab manual of engineering Geology observation book", Subhas stores, Bangalore, 2017.
- 3. **J R Jensen** Introductory digital image processing: a remote sensing perspective. 2nd ed. Prentice Hall, 1996.

Web links and Video Lectures (e-Resources):

- 1. https://a.impartus.com/ilc/#/video/id/672632
- 2. https://a.impartus.com/ilc/#/video/id/2346021
- 3. https://a.impartus.com/ilc/#/video/id/2155387

Course Outcomes (COs):

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

- 1. Scrutinize the different types of earth materials and their properties. (PO-1, 2, 7)
- 2. Demonstrate construction of surface and subsurface terrain maps. (PO-2, 3, 5, 7)
- 3. Estimate the thickness of ground strata from drill-hole logs and tapping the under groundwater. (PO-1, 2, 4, 5, 7)
- 4. Delineate thematic layers through geo-informatics techniques. (PO-2, 3, 5, 6, 7)
- 5. Evaluate the changes in level trend and variability occurs during the period of seasons through GIS. (PO-2, 3, 4, 5, 7)

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: CVL48

Pre – requisites: Nil

Credits: 0:0:1 Contact Hours: 14P

Course Coordinator: Dr. Santhosh L G and Mrs. Shilpa .D.N

Course Content

List of Experiments:

- 1. Verification of Bernoulli's theorem
- 2. Visualization of Reynold's experiment
- 3. Estimation of losses in pipes
- 4. Calibration of Venturimeter and Orificemeter
- 5. Calibration of V-Notch
- 6. Calibration of Rectangular Notch
- 7. Calibration of Cipolletti Notch
- 8. Calibration of Broad Crested Weir
- 9. Calibration of Ogee Weir
- 10. Determination of Impact of Jet on Vanes
- 11. Determination of performance characteristics of single stage centrifugal pump
- 12. Determination of performance characteristics of Pelton Wheel Turbine

Text Books:

- 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.

Reference Books:

- 1. Streeter, Wylie and Bedford- Fluid Mechanics, Tata McGraw Hill
- 2. Parashar A.K., Fluid mechanics Lab manual, B P International, 2022.
- N. Kumara Swamy- Fluid mechanics and machinery laboratory manual, Charotar Publishing House Pvt. Ltd., 1st Edition: 2008.

Web links and Video Lectures (e-Resources):

- 1. Link for Verification of Bernoulli's theorem: https://www.youtube.com/watch?v=B7U0rBlR0sU
- 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. Verify and visualize basic principles of fluid flow. (PO-1,2)
- 2. Demonstrate experiments on flow measuring devices in pipe and calibrate them. (PO-1,2,4)
- 3. Demonstrate experiments on flow measuring devices in open channel and calibrate them (PO-1,2,4).
- 4. Demonstrate experiment to verify momentum principle through impact of jet on vanes (PO-1,2,3).
- 5. Chart the characteristics of hydraulic machinery for analyzing their performance (PO-1,2,3,4).

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	

IV SEMESTER (For Lateral Entry Diploma Students)

ADDITIONAL MATHEMATICS – II

Course Code: AM41 Pre – requisites: Nil Credits: 0:0:0 Contact Hours: 42

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
- Online tools: Use of open source software's to demonstrate methods and solve problems on interpolation
- 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
- Use of open source software's to demonstrate methods and solve problems on numerical differentiation and integration.
- 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/619570/1030

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