



RAMAIAH
Institute of Technology

CURRICULUM
Outcome Based Education
(Academic Year 2022 – 2023)

CIVIL ENGINEERING

III & IV SEMESTER B.E.

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

About the Institute:

Dr. M. S. Ramaiah a philanthropist, founded 'Gokula Education Foundation' in 1962 with an objective of serving the society. M S Ramaiah Institute of Technology (MSRIT) was established under the aegis of this foundation in the same year, creating a landmark in technical education in India. MSRIT offers 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) & Visvesvaraya Technological University (VTU) have conferred Autonomous Status to MSRIT for both UG and PG Programs since 2007. The institute is also been conferred autonomous status for Ph.D program since 2021. The institute is a participant to the Technical Education Quality Improvement Program (TEQIP), an initiative of the Government of India. The institute has 380 competent faculty out of which 65% are doctorates. Some of the distinguished features of MSRIT are: State of the art laboratories, individual computing facility for all faculty members, all research departments active with sponsored funded projects and more than 300 scholars pursuing Ph.D. To promote research culture, the institute has established Centre of Excellence for Imaging Technologies, Centre for Advanced Materials Technology, Centre for Antennas and Radio Frequency systems (CARFS), Center for Cyber Physical Systems, Schneider Centre of Excellence & Centre for Bio and Energy Materials Innovation. **M S 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. MSRIT is a member of DELNET, CMTI and VTU E-Library Consortium. MSRIT has a modern auditorium and several hi-tech conference halls with video conferencing facilities. The institute has excellent hostel facilities for boys and girls. MSRIT Alumni have distinguished themselves by occupying high positions in India and abroad and are in touch with the institute through an active Alumni Association.

As per the National Institutional Ranking Framework (NIRF), MoE, Government of India, M S Ramaiah Institute of Technology has achieved 67th rank among 1249 top Engineering Institutions & 17th Rank for School of Architecture in India for the year 2022 and is 1st amongst the Engineering Colleges affiliated to VTU, Karnataka.

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 socio-economic needs

MISSION OF THE INSTITUTE

MSRIT shall meet the global socio-economic needs through

- Imparting quality technical education by nurturing a conducive learning environment through continuous improvement and customization
- Establishing research clusters in emerging areas in collaboration with globally reputed organizations
- 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 MS 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.

**Scheme Structure of Undergraduate Engineering Program
from the Academic year 2021-22**

Sl. No.	Category	MSRIT Breakup of Credits (Total 160)
1	Humanities and Social Sciences including Management Courses (HSMC)	08
2	Basic Science Courses (BSC)	22
3	Engineering Science Courses including Workshop, Drawing, Basics of Electrical/Mechanical/Computer Science, etc (ESC)	20
4	Professional Core Courses (PCC)	54
5	Professional Elective Courses (PEC)	15
6	Open Elective Courses (OEC) Ability Enhancement Courses (AEC)	6+5=11
7	Mini and Major Project work (PW)/Technical Seminar (TS)/Summer Internship and Research/Industrial Internship (INT)	27
8	Mandatory Non- Credit Courses	03
	Total	160

**UG Curriculum Course Credits
2021 onwards**

Semester	Humanities & Social Sciences (HSMC)	Ability Enhancement Courses (AEC) +UHV	Basic Sciences / Lab (BSC)	Engineering Sciences / Lab (ESC)	Professional Courses Core (Hard core, soft core, Lab) (PCC)	Professional Courses - Electives (PEC)	Other Electives (IOE)	Project Work (PW)	Internship/other activities (INT/T S)	Total semester load
First	2	1	8	9	-	-	-	-	-	20
Second	-	1	8	11	-	-	-	-	-	20
Third	1	3	3	-	14	-	-	-	-	21
Fourth	1	1	3	-	15	-	-	-	2	22
Fifth	6	1	-	-	8	3	3	-	-	21
Sixth	-	-	-	-	8	6	3	3	2	22
Seventh	-	-	-	-	10	3	-	-	6	19
Eighth	-	-	-	-	-	-	-	14	1	15
Total	10	7	22	20	55	12	6	17	11	160

REVISED SCHEME OF TEACHING FOR THE ACADEMIC YEAR 2022-23

III SEMESTER

Sl. No.	Subject Code	Subject	Teaching Dept.	Category	Credits				Total contact hours /week
					L	T	P	Total	
1	CV31	Engineering Mathematics – III	Maths	BSC	2	1	0	3	4
2	CV32	Geo-Informatics & Digital Surveying	Civil	IPCC	2	0	1	3	4
3	CV33	Strength of Materials	Civil	PCC	2	1	0	3	4
4	CV34	Fluid Mechanics & Hydraulics	Civil	PCC	2	1	0	3	4
5	CV35	Water Supply Engineering & Conservation	Civil	PCC	3	0	0	3	3
6	CVL36	Building Graphics Laboratory	Civil	PCC	0	0	1	1	2
7	CVL37	Materials Testing Laboratory	Civil	PCC	0	0	1	1	2
8	UHV38	Universal Human Values	Civil	UHV	2	0	0	2	2
9	HS392	Constitution of India & Professional Ethics	HS	HSMC	1	0	0	1	1
10	AEC3IO	Ability Enhancement Course	Civil	AEC	1	0	0	1	1
Total					15	03	03	21	27
11	PE83	Physical education		NCMC	All students have to register compulsorily for any one of the courses with the concerned coordinator (yoga teacher/ physical education director/ NSS coordinator) in the beginning of the III semester. Attending the registered course from III to VIII semesters. Qualifying is mandatory for the award of the degree				
	YO83	Yoga							
	NS83	NSS							
12	AM31	Additional Mathematics - I*	Maths	--	0	0	0	0	3

**NOTE: Branches: CSE, AI & ML, AI & DS, CSE(CS), CSE (AI & ML), ISE, ECE: Kannada (Kali / Manasu) in III Semester
Constitution of India & Professional Ethics in IV Sem**

**Branches: EEE, MLE, ETE, EIE, ME, CV, IEM, CH, BT: Constitution of India & Professional Ethics in III Semester
Kannada (Kali / Manasu) in IV Semester**

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 03 and its Teaching–Learning hours (L : T : P) can be considered as (2 : 0 : 1). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated only by CIE (no SEE). However, questions from the practical part of IPCC can be included in the SEE question paper.

HS39/ HS49Kannada Manasu is for students who speak, read and write Kannada and

HS39/ HS49 Kannada Kali is for non-Kannada speaking, reading, and writing students.

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, Additional Mathematics I is prescribed for III Semester Lateral Entry Diploma students admitted to III Semester of BE Program. The student shall register for this course along with other III semester courses. The students shall attend classes for the course during the semester and complete all formalities of attendance and CIE. In case, any student fails to secure the minimum 40% of the prescribed CIE marks, he/she shall be deemed to have secured 'F' grade. In such a case, the student has to fulfill the requirements during subsequent semester/s to appear for CIE. In case student fails to register for the said course/ falls short of attendance, he/she will repeat the course whenever it is offered next. Additional Mathematics I shall have CIE component only and no SEE component. This Course shall not be considered for vertical progression, but completion of the course shall be mandatory for the award of the degree.

Inter/Intra Institutional Internship: All the students admitted under lateral entry category shall have to undergo a mandatory summer Internship-I of 03 weeks during the intervening vacation of III and IV semesters. Summer Internship shall include Inter / Intra Institutional activities. A Viva-voce examination shall be conducted during IV semester and the prescribed credit shall be included in IV semester after students clearing this head. The internship shall be considered as a head of passing and shall be considered for vertical progression and for the award of degree. Those, who do not take up / complete the internship shall be declared fail and shall have to complete during subsequent examination after satisfying the internship requirements during subsequent semesters.

Lateral Entry Students:

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. In case 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 2022-23

IV SEMESTER

Sl. No.	Subject Code	Subject	Teaching Dept	Category	Credits				Total contact hours /week
					L	T	P	Total	
1	CV41	Engineering Mathematics – IV	Math	BSC	2	1	0	3	4
2	CV42	Hydrology & Water Resource Engineering	Civil	IPCC	2	0	1	3	4
3	CV43	Analysis of determinate and indeterminate Structures	Civil	PCC	2	1	0	3	4
4	CV44	Highway Technology	Civil	PCC	2	1	0	3	4
5	CV45	Wastewater Engineering & Management	Civil	PCC	3	0	0	3	3
6	CVL46	Highway Materials 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	HS491	Kannada (Kali/ Manasu)	HS	HSMC	1	0	0	1	1
10	AEC410	Ability Enhancement Course	Civil	AEC	1	0	0	1	1
11	INT411	Inter/ Intra Institutional Internship		INT	0	0	2	2	-
				Total	13	03	06	22	27
12	AM41	Additional Mathematics II *	Math	NMC	0	0	0	0	--

NOTE: Branches: CSE, AI & ML, AI & DS, CSE(CS), CSE (AI & ML), ISE, ECE: Kannada (Kali / Manasu) in III Semester
Constitution of India & Professional Ethics in IV Sem

Branches: EEE, MLE, ETE, EIE, ME, CV, IEM, CH, BT: Constitution of India & Professional Ethics in III Semester
Kannada (Kali / Manasu) in IV Semester

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 03 and its Teaching–Learning hours (L : T : P) can be considered as (2 : 0 : 1). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated only by CIE (no SEE). However, questions from the practical part of IPCC can be included in the SEE question paper.

HS39/ HS49Kannada Manasu is for students who speak, read and write Kannada and
HS39/ HS49 Kannada Kali is for non-Kannada speaking, reading, and writing students.

Innovation/ Societal/ Entrepreneurship based Internship: At the End of fourth Semester four - weeks summer internship shall be carried out at industry, State and Central Govt./NGO/MSME, Innovation center’s or incubation centers. The internship can be Rural Internship. All the students shall have to undergo mandatory internship of 04 weeks during the intervening period of IV & V semesters. A Viva-Voce examination (CIE) shall be conducted during V semester and the prescribed credit shall be included in VI semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the internship shall be declared fail and shall have to complete during subsequent examination after satisfying the internship requirements. The in-charge faculty has to monitor the student’s internship progress and interact to guide them for the successful completion of the internship.

Innovation/ Societal/ Entrepreneurship based Internship shall have only CIE no SEE component.

* **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. In case student fails to register for the said course/ falls short of attendance, he/she will repeat the course whenever it is offered next. Additional Mathematics II shall have CIE component only and no SEE component. This Course shall not be considered for vertical progression, but completion of the course shall be mandatory for the award of the degree.

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. In case 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: -	Contact Hours: 28L+14T
Course Coordinator: Mr. B. Azghar Pasha & Dr. Aruna A S	

Course Content

Unit I

Laplace Transforms: Definition, transforms of elementary functions, properties of Laplace transforms, existence conditions, transform of derivatives, integrals, multiplication by t^n , 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 series to Fourier transforms, 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.

- 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/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.
2. **B.S. Grewal** – Higher Engineering Mathematics, Khanna Publishers, 44th edition, 2017.

Reference Books:

1. **Peter V. O' Neil** – Advanced Engineering Mathematics, Thomson Brooks/Cole, 7th edition, 2011.
2. **Glyn James & Phil Dyke** – Advanced Modern Engineering Mathematics, Pearson Education, 5th edition, 2018.
3. **Dennis G. Zill, Michael R. Cullen** - Advanced Engineering Mathematics, Jones and Barlett Publishers Inc. – 3rd edition – 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)

Course Assessment and Evaluation:

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

GEO-INFORMATICS & DIGITAL SURVEYING

Course Code: CV32	Credits: 2:0:1
Pre – requisites: -	Contact Hours: 28L+14P
Course Coordinator: Dr. H U Raghavendra & Dr. Santhosh L G	

Course Content

Unit I

Geomatics & Mapping

Importance of Geomatics in Civil Engineering. Different methods of surveying; Leveling, EDM & Total station. Concepts of cadastral and topographic mapping. Calculation of differential leveling using plane of collimation method. Plotting of L/S & C/S using Total station. Distance measurement using single & double plane method. Characteristics of contours & its applications in Civil Engineering practices.

- Pedagogy / Course delivery tools: Chalk and Talk, Power point presentations, Videos, Models
- Lab component/Practical topics: Distance measurement- Using tapes, hand held Distance meter, distance measuring wheel and Electronic Distance Measurements (EDM)
Angle measurement using Theodolite- Horizontal and vertical angle measurement
- Link: Surveying: https://youtu.be/chhuq_t40rY
- Link: Higher Surveying: <https://nptel.ac.in>

Unit II

Advances in Survey Applications

Advances & challenges in surveying - Differential & Kinematics, Drones, Lidar, UAV. Types & application of curves, Curve setting by Rankine's method using Total station, components of compound curve, Reverse curve between 2 parallel straights, Transition curve. Trapezoidal & Simpsons rule methods for determining areas, Prismoidal and Trapezoidal rule for measurements of volume.

- Pedagogy / Course delivery tools: Chalk and Talk, Power point presentations, Videos, Models
- Lab component/Practical topics: Angle measurement and Area measurement using Total station – Horizontal and vertical angle measurement.
Leveling – finding elevation by differential leveling (Plane of collimation method)
- Link: Drones: <https://https://www.equinoxsdrones.com/blog/10-major-pros-cons-of-unmanned-aerial-vehicle-uav-drone>
- Link: Quantity survey: <https://youtu.be/TnaAQ4-a7JI>

Unit III

Geodynamics & Geomorphology

Internal structure of the Earth & its composition; Concept of Plate tectonics; Causes of landslides and its stabilization; Formation of Earthquakes, Construction of seismic resistant structures; Kinds of weathering of rocks, Soil profile, Soil erosion & its conservation; Geological work of rivers and flood control measures.

Applied Earth resources; Structural deformation of Folds, Faults in selection of site for Dams, Reservoirs, Tunneling.

- Pedagogy / Course delivery tools: Chalk and Talk, Power point presentations, Videos, Models
- Lab component/Practical topics: Mobile Mapping using GPS
Contouring using total station. Plotting using CAD
- Link: Geotechnics: <https://youtu.be/0PjZ7G00OGc>
- Link: Image interpretation: <https://youtu.be/X8jirWMSDOI>
<https://www.youtube.com/watch?v=GF27RMbck0g>

Unit IV

Earth Observation System

Physical principles & concepts underlying common forms of remote sensing, Satellites, Sensors & platforms, EMR interaction with earth material, Types of remote sensing, MSS, Hyper & Ultra-spectral data.

Satellite Image Preprocessing, Image classification & interpretations using GIS Software.

Space-borne, Airborne & ground based remote sensing techniques for various applications on natural resources management.

- Pedagogy / Course delivery tools: Chalk and Talk, Power point presentations, Videos
- Lab component/Practical topics: Profile survey L/S, C/S using total station.
Plotting using CAD
- Link: Remote Sensing: <https://youtu.be/eABubdXSYO8>
- Link: Image Classification: <https://youtu.be/iaaFqDVrN6>

Unit V

Geo-Spatial Technology & Application to Natural Resources

GIS technology and its components, Data structure & Format, Data capture & management, analysis & visualization, overview of GIS software – commercial & open source software & data.

Integrated Remote sensing & GIS applications in various domains of civil engineering.

- Pedagogy / Course delivery tools: Chalk and Talk, Power point presentations, Videos, Opens source software's
- Lab component/Practical topics: Setting out building by centre line method
Setting out sewer line using total station
- Link: GIS: Remote Sensing: <https://youtu.be/vJAQHA5XQWI>
- Link: Applications of RS& GIS: <https://youtu.be/SVa66vO08So>

Text Books:

1. **G S Srivastava** – Introduction to Geoinformatics, McGraw Hill Education, 2014.
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.
7. **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. Demonstrate the working of modern advanced field survey systems and solve the mapping problems. (PO-1, 2, 5, 9)
2. Compute data for angular measurement & earthwork estimation. (PO-1, 3, 5, 6, 9)

3. Demonstrate index properties of earth's formation and use of total station, GPS, find areas, plot contours. (PO-1, 2, 3, 5, 6, 9)
4. Demonstrate the various remote sensing platforms and sensors and to introduce the elements of data interpretation. (PO-1, 2, 4, 5, 9)
5. Delineate the change detection through various GIS techniques. (PO-1, 3, 4, 5, 7, 9)

Course Assessment and Evaluation:

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 presentation	10	CO1, CO2, CO3, CO4& CO5
Experiment conduction, Report writing and Viva-voce	10	CO1, CO2, CO3, CO4 & CO5
Semester End Examination (SEE)	100	CO1, CO2, CO3, CO4, CO5

STRENGTH OF MATERIALS	
Course Code: CV33	Credits: 2:1:0
Pre – requisites: -	Contact Hours: 28L+14T
Course Coordinator: Dr. Lakshmikanth	

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 strains - expression for volumetric strain, elastic constants, relationship among elastic constants, thermal stresses.

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

Unit II

Compound Stresses

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

- Pedagogy / Course delivery tools: Chalk and talk, Power point presentation
- Links: https://www.youtube.com/watch?v=_DH3546mSCM
<https://www.youtube.com/watch?v=xqrVFypkbAA>
<https://www.youtube.com/watch?v=EU8kMQJEn0I>
- NPTEL Links: <https://archive.nptel.ac.in/courses/105/105/105105108>/
<https://youtu.be/EyIEenmUUfU>; <https://youtu.be/nb9zS3fD3Vo>

Unit III

Shear Force and Bending Moment in Beams

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

- Pedagogy / Course delivery tools: Chalk and talk, Power point presentation
- Links: <https://www.youtube.com/watch?v=C-FEVZi8oe8>
<https://www.youtube.com/watch?v=gYjWWjVMmoU>
- NPTEL Links: <https://archive.nptel.ac.in/courses/105/105/105105108/>
<https://youtu.be/ITuWnr13aKI>;

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 due to Torsion.

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

Unit V

Deflection of Prismatic Beams & Elastic Stability of Columns

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

- Pedagogy / Course delivery tools: Chalk and talk, Power point presentation
- Links: <https://www.youtube.com/watch?v=MvBqCeZllpQ>
[https://www.youtube.com/watch?v=21G7LA2DcGQ](https://www.youtube.com/watch?v=21G7LA2DcGQ;);
- NPTEL Links: <https://archive.nptel.ac.in/courses/105/105/105105108/>
Deflection of Beams: <https://youtu.be/GUOKSExdjq8>;
<https://youtu.be/vi0tjFDSjNY>;
Elastic Stability of Columns: https://youtu.be/ZSQ_51Rj5gl;
<https://youtu.be/3By6vS5xY6s>;

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. AnanthaRamu**, “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/pXcDvpNt1IU>;
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 & CO5
Average of the two internal tests will be taken for 30marks		
Other Components:		
Assignment	10	CO1, CO2, CO3 (1 st half of Unit3)
Activity based learning.	10	CO3 (2 nd half of Unit3), CO4 & CO5
Semester End Evaluation (SEE)	100	CO1, CO2, CO3, CO4, CO5

FLUID MECHANICS & HYDRAULICS

Course Code: CV34	Credits: 2:1:0
Pre – requisites: -	Contact Hours: 28L+14T
Course Coordinator: Mrs. Shilpa D N	

Course Content

Unit I

Fluid Properties, Fluid Pressure and Hydrostatics

Scope of fluid mechanics. Basics of Fluid properties. Newton's law of viscosity, Classification of fluids. Applications of Surface tension and Capillarity. Fluid Pressure and measurement – Manometers and Pressure gauges.

Total pressure and Centre of pressure on plane vertical, inclined and curved surfaces - practical applications, Pressure diagram. Application of Archimedes principle - Buoyant force and Centre of buoyancy, Meta centre, Stability of submerged and floating bodies.

- 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

Approaches in Hydro Kinematics, classification of fluid flow. Principle of Conservation of Mass - Continuity equation in Cartesian coordinates and One-Dimensional flow. Incompressible flow - Stream function, velocity potential, Flow net analysis - applications. Principle of Conservation of Energy - Euler's equation and Bernoulli's equation of motion, Bernoulli's equation for real fluid. Principle of Conservation of Momentum - Impulse-momentum equation and Angular momentum principle - application on pipe bends. Energy and Momentum correction factors.

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

Unit III

Applications of Bernoulli's Principle for Flow Measurement

Measurement in tanks- Orifices and Mouth pieces. Classification, Hydraulic Coefficients, time taken for emptying a tank (with no inflow). Measurement in pipes - Venturimeter and Orifice meter. Measurement in open channels - Notches and Weirs. Classification, End contractions. Equation for discharge over triangular notch,

Rectangular notch, Trapezoidal notch, Cipolletti notch, Broad Crested weir and Ogee weir. Velocity measurement - Pitot tube and Static pitot tube.

- Pedagogy / Course delivery tools: Chalk and talk, Power point presentation, videos
- Links: Notches and Weirs - <https://a.impartus.com/ilc/#/video/id/735816>
- Links: Problems on Pitot Tube - <https://a.impartus.com/ilc/#/video/id/747175>

Unit IV

Fundamentals of Laminar and Turbulent Flows

Reynolds experiment. Laminar flow - relation between shear and pressure gradients. Boundary Layer Theory - Boundary layers, Boundary Layer Thickness. Separation of Boundary layer. Drag and lift. Turbulent Flow - Moody's chart, Smooth and rough boundaries. Losses in pipe flow - expressions for loss of energy due to friction, sudden contraction and sudden expansion in pipe system. Pipes in series - Compound pipe and Equivalent pipe, pipes in parallel, Branched pipes. Siphon. Transmission of power through pipes. Water hammer in pipes.

- Pedagogy / Course delivery tools: Chalk and talk, Power point presentation, videos
- Links: Reynolds Experiment - <https://a.impartus.com/ilc/#/video/id/752057>
- Links: Flow in Pipes - <https://a.impartus.com/ilc/#/video/id/535276>

Unit V

Impact of jet on vanes- Force exerted by fluid jet on stationary and moving vanes (flat normal, inclined and curved). Force exerted by fluid jet on moving curved vane striking at its centre and tangentially at one tip, Velocity triangles, equation for work done and efficiency. Force exerted by fluid jet on series of moving flat and curved vane mounted on a wheel. 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. Pumps - Centrifugal pumps, Work done by the impeller, Priming of pumps, Head and efficiencies of pump, Minimum starting speed, NPSH, Cavitation in centrifugal pump, performance of centrifugal pumps. Submersible pump.

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

Text Books:

1. **P. N. Modi & S. M. Seth-** Hydraulics and Fluid Mechanics, Standard Book House, 22nd edition, 2019.
2. **R. K. Bansal-** Fluid Mechanics and Hydraulic Machines, Laxmi Publications

(P) Ltd., 11th edition, 2019.

3. **C. S. P. Ojha, P. N. Chandramouli, and R. Berndtsson-** Fluid Mechanics and Machinery, Oxford University Press, 2010.

Reference Books:

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

Web links and Video Lectures (e-Resources):

1. <https://a.impartus.com/ilc/#/video/id/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 their significance in fluid mechanics and demonstrate the skills in evaluation of hydrostatic forces on bodies at rest. (PO-1,2)
2. Summarize the basic principles of fluid flow. (PO-1,2)
3. Apply Principle of conservation of energy for flow measurement. (PO-1,2,3)
4. Describe laminar and turbulent flow near boundary surface and apply the concepts to analyze flow through pipes. (PO-1,2,3)
5. Evaluate impact of jet on vanes and analyze hydraulic machines considering the basic principles of fluid flow. (PO-1,2,3)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	Marks	Course Outcomes addressed
Internal Assessment-I	30	CO1 & CO2 & CO3
Internal Assessment-II	30	CO3, CO4 & CO5
Average of the two internal tests will be taken for 30 marks		
Other Components:		
Assignment	10	CO1 & CO2
Assignment	10	CO3, CO4 & CO5
Semester End Evaluation (SEE)	100	CO1, CO2, CO3, CO4 & CO5

WATER SUPPLY ENGINEERING AND CONSERVATION

Course Code: CV35	Credits: 3:0:0
Pre – requisites: -	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, videos
- 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=ILGq_AgU17Q
<https://www.youtube.com/watch?v=iraonis64HY>
- 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=1LGq_AgU17Q
<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, design of circular Sedimentation tank, filtration- theory of filtration, Rapid sand filters, design of filtration units and pressure filters- construction, working and operation (no design), disinfection of water, chlorination, description of lime soda, zeolite process, RO membranes and elements, ozonation and UV treatment of water.

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

Unit V

Distribution System and Water Conservation

General requirements, systems of distribution, methods of supply, maintenance of pressure in distribution systems, storage, layout of distribution system. Water supply arrangements in buildings: pipe materials - plastic pipes, High Density Polythene Pipes, merits and demerits. Connections from water main to buildings, supply system 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. <https://www.youtube.com/watch?v=YteigN81-Sw>
4. <https://www.youtube.com/watch?v=KsVfshmk0Ak>
5. <https://www.youtube.com/watch?v=CZnNucQmjKA>

Course Outcomes (COs):

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

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

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment tool	Marks	Course outcomes attained
Internal test-I	30	CO2 & CO3
Internal test-II	30	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
Semester End Examination (SEE)	100	CO1, CO2, CO3, CO4, CO5

BUILDING GRAPHICS LABORATORY

Course Code: CVL36	Credits: 0:0:1
Pre – requisites: -	Contact Hours: 14P
Course Coordinator: Dr. Prashant Sunagar	

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
4. Editing sketches and dimensioning of elements.
5. Introducing text and tables in AutoCAD
6. Hatching, modelling of layout and plotting of drawings.

Part–B – Drafting of Civil Engineering Building Elements

1. Building Construction: Bonds in Brick Masonry- English & Flemish
2. Building Components: Stepped wall footing
3. Building Components: Column, Lintel and Chajja
4. Building Components: Doors
5. Building Components: Windows and Ventilators
6. Building Components: Doglegged Staircase and Open well Staircase
7. Urban and Municipal bylaws as per National Building Codes.
8. Drawing Simple building plan and elevation

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:
https://www.youtube.com/watch?v=cmR9cfWJRUU&list=PLcH1MIEuSvoGaHGEI_BnQ5In4R_NNOghG
2. Link for Building Components:
https://www.youtube.com/playlist?list=PLHTVTvUaTtbBLCiVX4_PZWTpUvwc2RieO
3. Link for Building Planning:
https://www.youtube.com/playlist?list=PLcH1MIEuSvoHRuFu9XTT0_dbrvM3sEqLB

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)

Course Assessment and Evaluation:

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

MATERIALS TESTING LABORATORY

Course Code: CVL37	Credits: 0:0:1
Pre – requisites: -	Contact Hours: 14P
Course Coordinator: Mr. Harish. M.L	

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- stress-strain behaviour 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 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 adopting deflection equation.
9. Tests to determine the compressive strength of bricks / Solid blocks/ light weight concrete blocks/clay blocks & roof tiles.

Text Books:

1. **B.S.Basavarajaiah and M. 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. AnanthaRamu**, “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 of Civil Engineering, RIT.

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
https://www.youtube.com/watch?v=T3tc33pd3hQ&ab_channel=Engineer%27sAcademy
2. Link for tension and Compression test
https://www.youtube.com/watch?v=b5W8qgo7NNQ&ab_channel=CorecivilShubhamAgarwal
3. Link for shear test:
https://www.youtube.com/watch?v=9Xnm6l8rpoQ&ab_channel=JSPMNTCAcademics

Course Outcomes (COs):

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

1. Classify the type of engineering material based on the energy absorption capacity. (PO- 1,5,6,8,10)
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)

Course Assessment and Evaluation:

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

UNIVERSAL HUMAN VALUES

Course Code: UHV38	Credits: 2:0:0
Pre – requisites: Nil	Contact Hours: 28L
Course Coordinator: Dr. L.G. Santhosh & Dr. Lakshmikanth	

Course content

Unit I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

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: Survey/polls for self-exploration
 - Links: Holistic Development and Role of Education <https://youtu.be/sGZtTPE-lhQ>

Unit II

Understanding Harmony in the Human Being - Harmony in Myself!

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: Survey/polls for self-exploration
- Links: Harmony in Human Being- Self and Body
<https://youtu.be/0ERSMkRPQBM>
 Links: Harmony in Human Being- Self <https://youtu.be/83oGJ4oDeIg>
 Links: Harmony between Self and Body Prosperity
https://youtu.be/aJ_BU2OgpKs

Unit III

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

1. *Understanding Harmony in the family – the basic unit of human interaction*
2. Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*;
3. Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship
4. Understanding the meaning of *Vishwas*; Difference between intention and competence
5. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship
6. Understanding the harmony in the society (society being an extension of family):
7. *Samadhan, Samridhi, Abhay, Sah-astitva* as comprehensive Human Goals
8. 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/polls for self-exploration
- Links: Harmony in Family- Trust <https://youtu.be/F2KVVW4WNnS8>
 Links: Harmony in family- Respect https://youtu.be/iLqNRPuv0_8
 Links: Harmony in family- Other Feeling Justice <https://youtu.be/TcYJB7reKnM>
 Links: Harmony in the Society <https://youtu.be/BkWgFinrnPw>

Unit IV

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

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

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

- Pedagogy / Course delivery tools: Chalk and talk, Power point presentation, Videos.
- Lab component / Practical Topics: Survey/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

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
6. Strategy for transition from the present state to Universal Human Order:
 - A. At the level of individual: as socially and ecologically responsible engineers, technologists and managers
 - B. At the level of society: as mutually enriching institutions and organizations

Suggested Learning Resources:

- Pedagogy / Course delivery tools: Chalk and talk, Power point presentation, Videos.
- Lab component / Practical Topics: Survey/polls for self-exploration

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. https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEKQw
2. <https://www.youtube.com/watch?v=P4vjfE-YnVk&list=PLWDeKF97v9SP7wSlapZcQRrT7OH0ZIGC4>
3. **Course handouts:**
https://drive.google.com/drive/folders/1zioX_4L2fCNX4Agw282PN86pcZZT3Osr?usp=sharing
4. **Presentation slides:**
https://drive.google.com/drive/folders/1rMUKh1s0HPRBlpp_b1mpS-duNRcwS6YH?usp=sharing

Course Outcomes (COs):

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

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

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE)		
Assessment Tool	Marks	Course outcomes addressed
Internal test-I	30	CO1, CO2, CO3
Internal test-II	30	CO3, CO4, CO5
Average of the two internal tests will be taken for 30 marks.		
Other components		
<ul style="list-style-type: none">• Assignment• Quiz• Presentation• Model / mini project• Any other	20 (10 + 10)	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE) Scaled to 50 Marks	100	CO1, CO2, CO3, CO4, CO5

CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS

Course Code: HS392	Credits: 1:0:0
Pre – requisites: Nil	Contact Hours: 14L
Course Coordinator: Mrs. Kanya Kumari S	

Course Content

Unit I

Introduction to the Constitution of India

Meaning and Significances of the Constitution, making of the Indian Constitution and its salient features, Preamble of the Constitution, Fundamental Rights and relevant cases.

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

Unit II

Relevance of Directive Principles of State Policy -part-IV

Fundamental Duties & their significance. Special constitutional provisions for the betterment of Women, children and backward classes in India.

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

Unit III

Union executive and State executive

President of India, Vice President, Prime Minister & Council of Ministers. The Union Legislature, Compositions & the functions of Parliament and the Supreme court of India -composition & Jurisdictions

State executive-Governor, Chief Minister& council of Ministers, State legislature-composition & functions of legislative assembly& legislative council and State Judiciary.

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

Unit IV

Local self-Governments, Emergency provisions, Electoral process & Major Constitutional Amendments

Local Self Governments- Panchayath Raj system, Emergency provisions, election commission of India & Electoral process, Amendment procedure and Major Constitutional amendments.

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

Unit V

Human Rights and Professional Ethics

Human Rights - meaning and significances of Human Rights. Universal Declaration of Human Rights (UDHR) protection of Human Rights in Indian Context. Scope and Aim of Ethics. Responsibility of Engineers, impediment to Responsibility.

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

Text Books:

1. A Primer on Constitution of India & Professional ethics, VTU Publication-2007.

Reference Books:

1. Durga Das Basu,- ' Introduction to Constitution of India' - 19th /20th edition 2001
2. M.V.Pylee.- ' An Introduction to Constitution of India, 4th edition, 2008
3. Dr. K. R. Phaneesh,- 'Constitution of India & Professional ethics' –Sudha publication, Tenth revised edition 2018.

Course Outcomes (COs):

At the end of the course students will be able to

1. Identify the fundamental principles of Indian constitution. (PO-12)
2. Examine various provisions of the Directive principles of state policies and fundamental duties. (PO-6, PO-12)
3. Understand the powers & functions of executive, Legislature and judicial system at the center and state level. (PO-6, PO-12)
4. Identify the role of government. (PO-12)
5. Understand about basic Human rights in India (PO-6, PO-8, PO-12)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 marks		
Assessment tool	Marks	Course outcome attained
Internal test-I	30	CO1, CO2, CO3
Internal test-II	30	CO4, CO5
Average of the two internal tests will be taken for 30 marks.		
Other components		
Assignment	10	CO1, CO2
quiz	10	CO3, CO4, CO5
Semester end examination (SEE)		
Scaled to 50 Marks	100	CO1, CO2, CO3, CO4, CO5

ABILITY ENHANCEMENT COURSE - III

Course Code: AEC310	Credits: 1:0:0
Pre – requisites: Nil	Contact Hours: 14L
Course Coordinator: Dr. Rama Shivakiran Reddy	

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

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

PHYSICAL EDUCATION

Course Code: PE83	Credits: NCMC
Pre – requisites: Nil	
Course Coordinator: Dr. Kiran Kumar H K	

Course Learning Objectives:

1. To introduce students to the importance of physical fitness for success in any career.
2. To instill in them concepts of team spirit and team building
3. To develop positive thinking, goal setting and decision-making abilities under duress.
4. To harness values and skills like leadership, communication and sacrifice.
5. To inculcate in students, the ability to handle success and failures with equanimity.

Selection Process: A Student shall select any one of the following Sports based on his/her interest and the facility available. The details of **Sports Facilities available (both indoor and outdoor) at institute campus** are as below:

Outdoor Games		Indoor Games		Athletics	
Games	No. of Students	Games	No. of Students	Events	No. of Students
Volleyball	12 x 4 = 48	Badminton	30	Sprint - 100mt, 200mt, 400mt	60
Basketball	12 x 4 = 48	Table Tennis	30	Middle distance running – 800mt, 1,500mt	
Kabaddi	12 x 4 = 48	Chess	30	Long distance running – 5,000mt, 10,000mt	
Kho Kho	12 x 4 = 48	Weight Training [Gym]	35	Jumping Events – Long Jump, Triple Jump, High Jump	30
Throw ball	12 x 4 = 48			Throwing Events Shot Put, Discus, Javelin	30
Football	16 x 4 = 64	Note: Students should bring their own sports attires			
Hockey	16 x 4 = 64				
Cricket	16 x 4 = 64				

Contact Sessions: A student shall abide by the following during the sessions scheduled in the semester.

Session 1

Fundamentals of Physical Education, value addition to personality through fitness education, discipline and team building activities, Orientation towards particular sports and skill training

Session 2

Formation of teams based on student's orientation and preference. Team practice and skill enhancement.

Session 3

Conduction of matches in all sporting events registered by Students. Evaluation of each student shall be based on their performance either in team or individual. The student representing the Institute at University/State/National/International Level will be awarded additional marks during evaluation.

Course Outcomes (COs):

1. Develop interest and skill in playing particular sports.
2. Understand the process of organizing sporting events.
3. Appreciate the role of fitness for a better lifestyle.
4. Derive lessons from sports activities for effective planning and discipline in Life.
5. Analyze situations and optimize end results.

Course Assessment & Evaluation:

1. A committee consisting of Sports Director and Coaches of respective Sports will be formed to observe and evaluate the students for CIE in each semester.
2. Students shall follow the schedules, rules and regulations as prescribed by the Committee.
3. Students shall mandatorily have 85% attendance to be eligible for evaluation.
4. All the Sessions and evaluation process will be common for all semesters of the academic year.
5. The final result will be reflected on the grade card of 8th Semester.
6. The final marks shall be calculated after scaling down CIE to 50 marks & combining with 50 marks for SEE.

YOGA	
Course Code: YO83	Credits: NCMC
Pre – requisites: Nil	
Course Coordinator: Dr. Hari Chandra B P & Dr. Parimala P	

Course Learning Objectives:

1. To introduce to the students, the fundamental theoretical aspects of yoga.
2. To inculcate in students a habit of practicing yoga.
3. To be able to demonstrate basic yoga asanas.
4. To be able to practice fundamental breathing practices and mudras.
5. To understand the relevance of yoga and research in modern times.

Course Content

Introduction: Definition of yoga, benefits, astangas of yoga, Relevance of yoga and yoga-research in modern times.

Asanas: Kriyathmakachalanas, Suryanamaskar, Superbrain yoga, Vrikshasana, Trikonasana, Veerabhadrasana, Paschimotasana, Purvothanasana, Bharadwajasana, Amruthasana, Parivruttha Trikonasana, Parsvakonasana, Ustrasana, Padmasana, Jaaanushirshasana, Navasana, Ardhaachakrasana, Ardhakatichakrasana, Jataraparivarthanasana, Sethubandasana, Sarvangasana, Mathyasana, Dhanurasana, Shirshasana.

Pranayamas: Anuloma-Viloma, Suryanuloma, Chandranuloma, Brahmari, Suryanbedhana, Chandrabedhana, Sheetal, Seethkari, Sadantha, bastrika.

Mudras: Chinmudra-Jnanamudra, Praana mudra, panchaprana mudras, panchabhoota mudras, Pruthvi mudra, Shoonya mudra, Surya mudra, Jalodharanashaka mudra, Kundalini mudra, shoonyaavaayu mudra, shakti mudra, sandhi mudra, vajra mudra and garuda mudra.

Course Outcomes (COs):

At the end of the course, a student will

1. Understand the fundamental and theoretical aspects of yoga.
2. Develop a habit of practicing yoga.
3. Demonstrate basic yoga asanas.
4. Demonstrate fundamental breathing practices.
5. Understand the relevance of yoga and its research in modern times.

Reference books:

1. Light on yoga, B K S Iyengar, Publisher -Thorsons, UK, 2006
2. Light on pranayama, B K S Iyengar, Publisher - Element; First Edition
3. The Essential Yoga Mudras for Healing, Dr. Aasoori K. Rangaraja Iyengar, Saranga Publishing; First Edition 2021

Pedagogy:

Chalk and talk, demonstration, videos, ppt.

Contact Sessions:

There would be one introduction class, and five contact classes in each semester.

The candidates shall practice yoga on a daily basis, or in the worst case on alternate days at their place of residence and maintain a short diary in the format provided by yoga teacher. The same shall be brought to the classes.

Online reference sources:

- Yoga for beginners part 1: <https://www.youtube.com/watch?v=VwPeThpwfWI>
- Yoga for beginners part 2: https://www.youtube.com/watch?v=s_pnJTcOp8A
- Suryanamaskar: <https://www.youtube.com/watch?v=nUdlucNd6go&t=133s>
- Yoga for anxiety and stress: https://www.youtube.com/watch?v=hJbRpHZr_d0
- Common yoga protocol: https://www.youtube.com/watch?v=Av5ib_XRKT4
- Relevance of yoga in modern times: www.youtube.com/watch?v=HUzBCts7BT0

Course Assessment & Evaluation:

1. A committee consisting of Yoga Instructors will be formed to observe and evaluate the students for CIE in each semester.
2. Students shall follow the schedules, rules, and regulations as prescribed by the Committee.
3. Students shall mandatorily have 85% attendance to be eligible for evaluation.
4. All the Sessions and evaluation processes will be common for all semesters of the academic year.
5. The final result will be reflected on the grade card of 8th Semester.
6. The final marks shall be calculated after scaling down CIE to 50 marks & combining it with 50 marks for SEE.

Scheme of SEE

Practical Demonstration	30 marks
Write-up	10 marks
Viva	10 marks
Total	50 marks

NATIONAL SERVICE SCHEME

Course Code: NS83	Credits: NCMC
Pre – requisites: Nil	
Course Coordinator: Dr. Puttabore Gowda & Dr. Siddaraju C	

Course Learning Objectives:

1. To introduce students to the importance of national service
2. To harness values and skills like leadership, teamwork and sacrifice.
3. To serve society through educational services and health
4. To work towards rural and local development through technological services
5. To inculcate in students, the ability to handle socially relevant projects.

Students shall involve in activities related to national and regional technical and non-technical services, as listed below.

- Serving society by bringing awareness on education and cleanliness.
- Blood donation camps
- Developing technologies for rural masses.
- Conduction and participation in camps for a social cause.
- Educating towards health and well-being of individuals/society.
- Cultural and educational programs for society.
- Contributing towards the improvement of civil services and bringing certain shortcomings to the notice of higher authorities for suitable remedial actions.
- Contribution towards traffic management and other public services.
- Clean up and development of water sources around public places.
- Services during a disaster or other needy situations.
- Camps for the rejuvenation of lakes and water bodies.
- Serving nature and agriculture.
- Awareness programs on health and food adulteration.
- Presenting papers/talks in various fora on the above topics.
- Developing technologies for rural masses beyond academic requirements.
- Plantation programs.
- Conducting programs for self-sustainability, and human and national development.
- Contribution towards orphans and challenged individuals through well-recognized organizations.
- Carrying out designated activities in villages.
- Development and implementation of strategies for solid waste, E-waste etc.

- Education towards pollution control and traffic management.
- Production of documentaries and short films/videos for motivating people on any of the above causes.

Course Outcomes (COs):

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

1. Understand the importance of national service.
2. Gain skills like leadership and teamwork.
3. Volunteer towards educational services and health.
4. Contribute to rural and local development through technical services.
5. Comprehend socially relevant projects

Contact Sessions:

The students shall attend the review and contact sessions as scheduled by the course coordinator.

Course Assessment & Evaluation:

1. The candidates shall maintain a record of activities in a Diary, and get them endorsed during the contact sessions at least 3 times in a semester.
2. A detailed project report should be submitted during the last fortnight of the semester
3. Evaluation will be done during each semester based on the nature of the contribution.
4. The final marks shall be calculated after scaling down CIE to 50 marks & combining with 50 marks for SEE

ADDITIONAL MATHEMATICS – I

Course Code: AM31	Credits: 0:0:0
Pre – requisites: Nil	Contact Hours: 42L
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 $\int \sin^n x \, dx$, $\int \cos^n x \, dx$ and $\int \sin^n x \cos^m x \, dx$. Evaluation of double and triple integrals.

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

Unit III

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

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

Unit IV

Vector Differentiation: Scalar and vector fields, gradient of a scalar field, directional derivative, divergence of a vector field, solenoidal vector, curl of a vector field,

irrotational vector. Laplace's operator. Vector identities connected with gradient, divergence and curl.

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

Unit V

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

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

Text Books:

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

Reference Books:

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

Course Outcomes (COs):

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

1. Solve problems related to nth derivative to some standard functions, polar curves and power series expansions.
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

NUMERICAL METHODS & PROBABILITY MODELS

Course Code: CV41	Credits: 2:1:0
Pre – requisites: -	Contact Hours: 28L+14T
Course Coordinator: Mr. B. Azghar Pasha & Dr. Aruna A S	

Course Content

Unit I

Interpolation: Forward and Backward differences, Interpolation, Newton-Gregory Forward and Backward Interpolation, Lagrange’s interpolation and Newton’s divided difference interpolation techniques (no proof). Cubic spline interpolation.

Bivariate Interpolation: Lagrange’s bivariate interpolation. Newton’s bivariate interpolation.

Problem solving/demonstration of methods using any open source software such as Scilab.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: Use of open source software’s to demonstrate methods and solve problems on interpolation
<https://nptel.ac.in/courses/111/106/111106101/>
- Impartus recording: <https://a.impartus.com/ilc/#/course/96127/452>
<https://a.impartus.com/ilc/#/course/132243/636>

Unit II

Numerical Differentiation: Derivatives using Newton-Gregory forward and backward interpolation formula. Derivatives using finite differences of higher order.

Numerical Integration: Newton-Cotes quadrature formula: Trapezoidal, Simpson’s 1/3rd and Simpson’s 3/8th rule (no proof).

Gaussian Quadrature: Gauss Legendre one point, two point and three point techniques. Romberg integration.

Problem solving/demonstration of methods using any open source software such as Scilab.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: Use of open source software’s to demonstrate methods and solve problems on numerical differentiation and integration.
<https://nptel.ac.in/courses/111/106/111106101/>
- Impartus recording: <https://a.impartus.com/ilc/#/course/96127/452>
<https://a.impartus.com/ilc/#/course/132243/636>

Unit III

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

Discrete Probability Distributions: Random Variables, Binomial distribution, Poisson 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 IV

Continuous Probability Distributions: Uniform distribution, Exponential distribution, Gamma distribution and Normal distribution.

Joint probability distribution: Joint probability distribution (both discrete and continuous), Conditional probability, Conditional expectation.

- 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/96127/452>
<https://a.impartus.com/ilc/#/course/96151/1112>

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:

1. **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. **Erwin Kreyszig** –Advanced Engineering Mathematics, Wiley publication, 10th edition, 2015.
4. **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. Interpolate the given data. (PO-1, 2 & PSO-1)
2. Find derivative and integral of a given data numerically. (PO-1, 2 & PSO-1)
3. Fit a least squares curve to a given data, analyze the given discrete random data and its probability distribution. (PO-1, 2 & PSO-1)
4. Find parameters of Continuous Probability distributions and calculate the marginal and conditional distributions of bivariate random variables. (PO-1, 2 & PSO-1)
5. Choose an appropriate test of significance and make inference about the population from a sample. (PO-1, 2 & PSO-1)

Course Assessment and Evaluation:

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

HYDROLOGY & WATER RESOURCE ENGINEERING

Course Code: CV42	Credits: 2:0:1
Pre – requisites: -	Contact Hours: 28L+14P
Course Coordinator: Dr. Santhosh L G	

Course Content

Unit I

Open Channel Flow

Introduction. Types of open channels. Geometrical properties of channel sections. Uniform flow in channels - Chezy's formula, Manning's formula. Most economical channel sections - rectangular, triangular and trapezoidal sections. Computation of uniform flow. Specific energy & Critical flow - Specific energy curve, critical flow in rectangular channels. Problems on humps. G.V.F. - Dynamic equation, classification of flow profiles. R.V.F. - Hydraulic jump in rectangular channels, types of jumps, applications of hydraulic jumps.

- Pedagogy / Course delivery tools: Chalk and talk, Powerpoint 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>
- Lab / Practical Component: - Determine the elements of Hydraulic Jump

Unit II

Dimensional Analysis and Model Studies

Introduction. Units and dimensions. Dimensional Homogeneity. Methods of Dimensional Analysis - Raleigh's method and Buckingham's method. Model studies. Similitude - Geometric, Kinematic and Dynamic similarities. Force ratio & Dimensionless numbers. Similarity laws - Reynold's model law, Froude model law, Euler model law. Types of models - Undistorted models and distorted models.

- Pedagogy / Course delivery tools: Chalk and talk, Powerpoint Presentation, Videos.
- Links: Introduction - <https://a.impartus.com/ilc/#/video/id/605161>
- Links: Model Studies - <https://www.youtube.com/watch?v=OdldY3RLw24>
- Lab / Practical Component: - Study of various fluid parameters using Hydrostatic bench

Unit III

Hydrology

Introduction. Hydrologic cycle, world water budget. 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. Catchment - definition, stream pattern, description of the basin.

- Pedagogy / Course delivery tools: Chalk and talk, Powerpoint Presentation, Videos.
- Links: Average Rainfall - <https://a.impartus.com/ilc/#/video/id/1003078>
- Links: Catchment - <https://a.impartus.com/ilc/#/video/id/1020874>
- Lab / Practical Component: - Evaluate losses from precipitation and runoff using rainfall simulator

Unit IV

Abstractions from Precipitation

Introduction. Abstractions - Evaporation, factors affecting evaporation, measurement of evaporation using evaporation pans, 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. Well Hydraulics - Steady-radial flow into a confined and unconfined aquifer, Thiem's equation. Well irrigation: advantages and disadvantages. Introduction to Tube wells and their types.

- Pedagogy / Course delivery tools: Chalk and talk, Powerpoint 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>
- Lab / Practical Component: Estimate infiltration rate using Infiltrometer
Ground water flow modeling

Unit IV

Runoff

Introduction, types of runoff, classification of stream, factors affecting runoff, Basin yield, stream gauging, measurement of discharge, stage-discharge relations. Rainfall-runoff correlation, estimation of runoff with empirical equations - Dicken's formula, Ryve's formula and Inglis formula. Hydrograph - 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, Unit hydrograph from complex storms, Unit hydrograph of different durations, S-Curve method.

- Pedagogy / Course delivery tools: Chalk and talk, Powerpoint Presentation, Videos.
- Links: Runoff - <https://a.impartus.com/ilc/#/video/id/1051548>
- Links: Hydrograph - <https://a.impartus.com/ilc/#/video/id/1139670>
- Lab / Practical Component: Delineation of micro-watershed and stream flow pattern recognition

Text Books:

1. **P. N. Modi & S. M. Seth-** Hydraulics and Fluid Mechanics, Standard Book House, 22nd edition, 2019.
2. **K. Subramanya-** Engineering Hydrology, Tata McGraw Hill, 4th edition, 2013.

Reference Books:

1. **Streeter, Wylie and Bedford-** Fluid Mechanics, Tata McGraw Hill
2. **Lingsey, Franzini-** Water Resources Engineering, 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/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=lyecuNbx1As>
5. <https://www.youtube.com/watch?v=57nKcvfwbnc>

Course Outcomes (COs):

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

1. Design open channels for various types of flow systems in open channels. (PO-1,2,3)
2. Describe similarity laws and study models to evaluate the behavior of proto types. (PO-1,2,4)
3. Appraise water resources potential on earth and its data analysis in evaluating extreme hydrological events. (PO-1,2)
4. Estimate various abstractions from precipitation and evaluate groundwater potential. (PO-1,2)
5. Develop stage discharge relations and analyze runoff using hydrograph. (PO-1,2)

Course Assessment and Evaluation:

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

ANALYSIS OF DETERMINATE AND INDETERMINATE STRUCTURES	
Course Code: CV43	Credits: 2:1:0
Pre – requisites: -	Contact Hours: 28L+14T
Course Coordinator: Dr. Geetha Kumari. T and Mr. Raje Gowda	

Course Content

Unit I

Introduction and Analysis of Plane Trusses: Structural forms- Conditions 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.

- Pedagogy / Course delivery tools: Chalk and talk, Powerpoint Presentation
- Links: <https://youtu.be/oa50jjGEUSw>
- Impartus recoding: <http://a.impartus.com/ilc/#/video/id/804665>

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 moment- analysis of cables under point loads and UDL, length of cables for supports at same and at different levels- Stiffening trusses for suspension cables.

Influence Lines and Moving Loads: Concept of influence lines- ILD for reactions, SF and BM for determinate beams. Maximum BM and SF in determinate beams using rolling loads concepts

- Pedagogy / Course delivery tools: Chalk and talk, Powerpoint Presentation
- Links: https://youtu.be/_UGcIT1mF4
- Impartus recoding: <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, Powerpoint Presentation

- Links: <https://youtu.be/pdqw8p6BJMQ>
- Impartus recoding: <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, Powerpoint 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, Powerpoint Presentation
- Links: <https://youtu.be/Fd8F-O1-cEk>
- Impartus recoding: <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 McGraw 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”, Nemchand of Bros, Roorkee, India.

Web links and video Lectures (e- Resources):

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

Course Outcomes (COs):

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

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

Course Assessment and Evaluation:

Continuous Internal Evaluation: 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 taken for 30marks		
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	CO1, CO2, CO3, CO4 & CO5

HIGHWAY TECHNOLOGY

Course Code: CV44	Credits: 2:1:0
Pre – requisites: -	Contact Hours: 28L+14T
Course Coordinator: Dr. Vivek R Das	

Course Content

Unit I

Transportation Systems: Transportation developments in India, highway alignment and engineering surveys, new and re-alignment projects, modes of transportation and Intelligent Transport System.

Highway Economics: Highway user benefits - tangible and intangible - motor vehicle operation cost - annual highway costs, methods of economic analysis - highway financing, BOT, BOOT- Numerical problems.

- Pedagogy / Course delivery tools: Chalk and talk, Powerpoint Presentation
- Link for Multi Modal Urban Transport Systems:
<https://www.youtube.com/watch?v=5zKuUoCBGnI&t=435s>
- Link for PPP in Infrastructure: <https://nptel.ac.in/courses/105/106/105106188/>

Unit II

Geometric Design: Introduction to highway geometric design, highway cross sectional elements. Sight distances, Horizontal alignment design, Vertical alignment design, Geometrical specification for hill roads.

Traffic Engineering: Scope, road user characteristics, traffic characteristics, volume studies, speed studies, O & D studies, PCU and highway capacity, Level of service, Accident Studies.

- Pedagogy / Course delivery tools: Chalk and talk, Powerpoint Presentation
- Link for geometric design of roads using open roads(Bentley):
https://www.youtube.com/watch?v=fh_P8vAMHoQ
- Link for Intersection design using PTV:
<https://www.youtube.com/embed/qm8c6cvwWS>

Unit III

Pavement Materials: Significance and requirements of subgrade soil, soil classification, plate load test and CBR test on soil, Numerical problems, properties, requirements and tests on aggregates and bitumen, tar and emulsions, Rheology of bitumen, Use of new and marginal materials in road construction.

Bituminous Mix Design: Introduction, Proportionating of aggregates-Numerical

Problems, Methods of mix design, Marshall Method- Numerical Problems, Superpave mix design.

- Pedagogy / Course delivery tools: Chalk and talk, Powerpoint Presentation
- Link for Aggregate and Bitumen Experiments:
<http://www.nitttrchd.ac.in/sitenew1/nctel/civil.php>
- Link for Marshall Mix Design:<https://www.youtube.com/watch?v=M1vKNrcRtbU>

Unit IV

Pavement Design: Requirements of highway pavements - Types and design factors, ESWL, design of flexible pavements by IRC method, Mechanistic empirical pavement design, stresses in rigid pavements - wheel load stresses, temperature and frictional stresses, combination of stresses, Numerical Problems, design of rigid pavements by IRC method Numerical Problems. Failures and causes in flexible and rigid pavements and remedial measures.

- Pedagogy / Course delivery tools: Chalk and talk, Powerpoint Presentation
- Link for Flexible pavement design as per IRC 37:2018:
<https://www.youtube.com/watch?v=HLVjhGDdsSM>
- Link for Rigid Pavement design as per IRC 58: 2015:
<https://www.youtube.com/watch?v=nXIXz3vMinU>

Unit V

Highway Construction: Specifications of materials, construction method and field control checks for various types of pavement layers, Highway Equipments.

Pavement evaluation: Structural Evaluation of pavements, Functional evaluation of pavements, Overlay Design Numerical Problems.

Highway Drainage: Significance and requirements of highway drainage design of surface and subsurface system, Numerical Problems, Drainage work in hill roads.

- Pedagogy / Course delivery tools: Chalk and talk, Powerpoint Presentation
- Link for Flexible Pavement Construction:
https://www.youtube.com/watch?v=egfRXi8t6WQ&list=UU__JX7j7HYXROO6jCAUmHIw&index=322
- Link for Rigid Pavement Construction:
<https://www.youtube.com/watch?v=CJkeHrlp9tU>

Text Books:

1. **Khanna S.K. and Justo C.E.G**, “Highway Engineering”, NemChand and Bros, Roorkee.
2. **Kadiyali L.R**, “Highway Engineering”, Khanna Publishers, NewDelhi

3. **Subramanyam. K.P**, “Transportation Engineering”, Scitech Publications, Chennai.
4. **Khanna SK and Justo CEG, A. Veeraraghavan**, “Highway Material Testing Laboratory Manual”, Nem Chand and Bros

Reference Books:

1. **Yoder E J and Witczak**, “Principles of Pavement Design”, Edition, John Wiley and sons,1975.
2. **Yang H Huang** “Pavement Analysis and Design”, Pearson Publications, 2008.
3. **Roger P. Roess, Elena S. Prassas, William R. McShane**, “Traffic Engineering”, Pearson Publications, 2019.
4. **Fred L. Mannering, Scott S. Washburn** “Principles of Highway Engineering and Traffic Analysis”, Wiley 2020.
5. **M. Rashad Islam, Rafiqul.A. Tarefder**, “Pavement Design: Materials, Analysis, and Highways”, Mc Graw Hill Publications ,2020.

IRC Codes

1. IRC 37:2018 “Guidelines for the design of Flexible Pavements”, Fourth Revision.
2. IRC 58:2015 “Guidelines for the design of Plain Jointed Rigid Pavements for Highways”, Fourth Revision.
3. IRC SP 30 2019 “Manual on Economic evaluation of highways in India” Third Revision.

Web links and video Lectures (e- Resources):

1. Link for Superpave Mix Design:
<https://www.youtube.com/watch?v=111RRETEvxk>
2. Link for failures in Flexible Pavement:
<https://www.youtube.com/watch?v=poDl2b4g5c8>
3. Link for failures in Rigid Pavements:
<https://www.youtube.com/watch?v=poDl2b4g5c8>
4. Link for BBD Studies:
<https://www.youtube.com/watch?v=8FPrD28kIVM>
5. Link for FWD Studies:
<https://www.youtube.com/watch?v=yMdp9H57FWo>
6. Link for Romdas Survey:
<https://www.youtube.com/watch?v=ISHTIu17OxY&t=2s>

Course Outcomes (COs):

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

1. Describe transportation systems and carry out economic feasibility analysis for road projects (PO -1,2,3)
2. Define highway geometrics and traffic engineering. (PO -1,2,3)
3. Characterize materials for pavement construction and design bituminous mixes (PO -1,2,3)
4. Design the flexible and rigid pavements. (PO -1,2,3,8)
5. Illustrate the various methods in pavement construction, evaluate pavements and design drainage systems. (PO -1,2,3)

Course Assessment and Evaluation:

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

WASTEWATER ENGINEERING & MANAGEMENT

Course Code: CV45	Credits: 3:0:0
Pre – requisites: -	Contact Hours: 42L
Course Coordinator: Dr. Jyothi Roopa. S K	

Course Content

Unit I

Introduction to Wastewater

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

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

Unit II

Collection of 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. Sewers- limiting velocities, effects of variation of flow. Design of circular sewer section using Manning's equation (Circular section with half and full flow conditions only). Sewer materials, construction of sewers, sewer maintenance and cleaning. Sewer Appurtenances: Street inlets, catch basins, infiltration pits in storm water drains. Manholes along with drop manholes.

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

Unit III

Characteristics of 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, Powerpoint Presentation, video.
- Links: waste water 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, Powerpoint Presentation, video, 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, Powerpoint Presentation, video, 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.BC. 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)

Course Assessment and Evaluation:

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

HIGHWAY MATERIALS LABORATORY

Course Code: CVL46

Credits: 0:0:1

Pre – requisites: -

Contact Hours: 14P

Course Coordinator: Mr. Niranjan G H

1. Tests on Aggregates:

- I. Aggregate crushing value test
- II. Stone polishing value test
- III. Aggregate impact test
- IV. Shape tests (Flakiness Test, Elongation Test, Combined Index, Angularity number test)
- V. Specific gravity and Water absorption test

2. Tests on Bituminous Materials and Mixes:

- I. Specific Gravity test
- II. Viscoelastic behaviour of bitumen
- III. Ductility test
- IV. Softening point test
- V. Flash and fire point test
- VI. Marshall stability tests

3. Tests on Subgrade Materials:

- I. California Bearing Ratio test on subgrade soil
- II. Wet Sieve Analysis for soil

4. Traffic studies:

- I. Volume and Speed studies.

5. Pavement Evaluation:

- I. Pavement Unevenness- MERLIN

Text Books:

1. **S. K. Khanna, C. E. G. Justo and A. Veeraragavan** , Highway Materials And Pavement Testing, Nem Chand & Bros
2. **G. Venkatappa Rao ,K. Ramachandra Rao ,Kausik Pahari & D.V. Bhavanna Rao**, Highway Material Testing and Quality Control, IK International Pvt Ltd.

Reference Books:

1. **S.K Khanna, C.E.G. Justo, and A. Veeraragavan**, “Highway Material and Pavement Testing Laboratory Manual” Revised 5th Edition 2009, Nemi Chand & Bros.
2. **L R Kadiyali**, “Traffic Engineering and Transport Planning”, Khanna Publishers.

IS Codes:

1. Bureau of Indian Standards, Indian Standard Methods of Test for Soils (Part 4) Grain Size Analysis (Second Revision)-1985(Reaffirmed 1995)
2. Bureau of Indian Standards, Indian Standard Methods of Test for Soils (Part 16) laboratory determination of CBR, IS:2720 (Second Revision)-1987 (Reaffirmed 1997)
3. Bureau of Indian Standards, Indian Standard Method of Test for Aggregates for Concrete, IS:2386(Part-4) -1963 (Reaffirmed 1997)
4. Bureau of Indian Standards, Indian Standard Methods for Testing Tar and Bituminous Materials, IS-1205-1978.
5. The American Society for Testing and Materials, ASTM: D-1559 -Test for resistance to plastic flow of bituminous mixtures using Marshall apparatus

Web Links:

1. Link for material testing (aggregate and bitumen):
<http://www.nitttrchd.ac.in/sitenew1/nctel/civil.php>
2. Link for Marshal Mix Design:
<https://www.youtube.com/watch?v=M1vKNrcRtbU>
3. Link for CBR test:
https://www.youtube.com/watch?v=fCmMW73rP64&list=UU__JX7j7HYXROO6jCAUmHIw&index=324
4. Link for Traffic Volume Study:
<https://www.youtube.com/watch?v=jM4nfgo4MQ4>

Course Outcomes (COs):

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

1. Characterize aggregates based on mechanical properties. (PO -1,8)
2. Characterize and evaluate bitumen properties for pavement construction (PO -1,8)
3. Evaluate soil for gradation and strength parameters (PO -1,8)
4. Design bituminous mix based on Marshall mix properties (PO -1,8)
5. Conduct suitable traffic study to estimate level of service (PO -1,8)

Course Assessment and Evaluation:

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

DIGITAL TERRAIN MAPPING LABORATORY

Course Code: CVL47	Credits: 0:0:1
Pre – requisites: -	Contact Hours: 14P
Course Coordinator: Dr. H U Raghavendra	

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. Digitization & layouting of image data
7. Digital processing of high-resolution satellite images
8. Delineation of watershed, drainage network using DEM
9. Generation of Hill shade, aspect & analysis of slope from DEM
10. LU/LC Mapping for urban application
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)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 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	CO1, CO2, CO3, CO4 & CO5

FLUID MECHANICS LABORATORY

Course Code: CVL48	Credits: 0:0:1
Pre – requisites: -	Contact Hours: 14P
Course Coordinator: Dr. Santhosh L G	

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:

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

Reference Books:

1. **Streeter, Wylie and Bedford-** Fluid Mechanics, Tata McGraw Hill
2. **Parashar A.K.,** Fluid mechanics Lab manual, B P International, 2022.
3. **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=B7U0rBIR0sU>
2. Link for Estimation of losses in pipes
<https://www.youtube.com/watch?v=hNtQMu57j44>
3. Link for Calibration of V-Notch: <https://www.youtube.com/watch?v=iycu-8BKIDo>

4. Link for Determination of Impact of Jet on Vanes:
<https://www.youtube.com/watch?v=2anjwbSakbQ>

Course Outcomes (COs):

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

1. 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).

Course Assessment and Evaluation:

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

KANNADA KALI

Course Code: HS491K

Credits: 1:0:0

Pre – requisites: Nil

Contact Hours: 14L

Course Coordinator: Mrs. Kanya Kumari S

Unit I

(Parichaya) - Introduction

Kannada Bhashe - About Kannada Language, Eight Kannada Authors – JnanpiTh Awardies

Introduction to Kannada Language, Karnataka State and Literature.

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

Unit II

naamapadagaLu – Sarva namapadagaLu – (Nouns -Pronouns) and it’s usage in Kannada

Kannada namavisheshanagaLu - (Adjectives-Interrogatives)

kriyapadagaLu, kriya visheshaNagaLu- (verb-adverb)

Sambhashaneyalli Prashnarthaka padagalu –vaakyagaLu mattu kriyapadagaLu-visheshaNagaLu (Kannada- Interrogative words & Sentences and verb-adverb in Conversation)

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

Unit III

Samanya Sambhashaneyalli Kannadada Padagalu mattu Vaakyagalu

(Kannada Words and Sentences in General Conversation with activities)

sambhashaNe: (Conversation with Friends- Teachers, between Friends)

(Conversation in Shop, Hostel, Market, Bus and Train)

Shabdakosha: Vocabulary – chaTuvaTike: Exercises

Vicharaneya / Bedikeya vakyagalu(Enquiry /Request sentences in Conversation)

Sambhashane Conversation with House Owner and Room mate

Shabdakosha – Vocabulary - Exercises to test their knowledge of understanding the Language.

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

Unit IV

Kannada padagaLu (eakavachana,bahuvachanagaLu,virudda padagaLu dina nityadalli baLasuva padagaLu mattu sankya vyavaste

Sambhashaneyalli Eakavachana mattu Bhahuvachana- (Singular and Plural nouns)

Conversation- Sambhashaneyalli Linga rupagaLu- Genders in Conversation

Viruddha padagalu /Virodathaka padagalu (Antonyms) Asamanjasa Uchcharane (Inappropriate Pronunciation)

Sankhya Vyavasthe(Numbers system) -Samaya /Kalakke Sambhandhisida padhagalu (Words Relating to time) – Dikkugalige sambhadisida padhagalu (Words Relating to Directions)

Aaharakke sambandisida padagaLu(Names connected with food)

Manavana shareerada bhagagalu / Angagalu (Parts of the Human body) Manava Sambhandhada da padhagalu (Terms Relating to Human Relationship)

Manavana Bhavanegalige sambandisida Padagalu (Words Relating to Human's feelings and Emotions)

Vaasada staLakke sambhandisidanthaha padhagalu (Words Relating to place of leaving)

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

Unit V

Kannada akshara maale (Kannada alphabets and their practices with pronunciations)

swara aksharagaLu –vyanjanaksharagaLu- gunitaksharagaLu, tantragnana mattu AaDalita padagaLu-Technical and administrative worlds in Kannada

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

Text Book:

1. Dr. L. Thimmesh, Prof. Keshava murthy, 'BaLake kannada' prasarangaa, VTU,2020.

Reference Book:

1. Smt. KanyaKumari.S –'Kannada Kali ' Kinnari publications' First edition, Bengaluru,2022
2. Lingadevaru Halemane – 'Kannada Kali', Prasaranga kannada University Hampi, 6th Edition. 2019

Course Outcomes (COs):

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

1. Develop vocabulary (PO-10)
2. Identify the basic Kannada language skill (PO-10)
3. Develop listening & speaking skill in Kannada language. (PO-6, PO-12)
4. Enrich language skill. (PO-12)
5. Apply Kannada language skill for various purpose (PO-12)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 marks		
Assessment tool	Marks	Course outcome attained
Internal test-1	30	CO1, CO2, CO3
Internal test-II	30	CO4, CO5
Average of the Two Internal Test Two will be Taken for 30 Marks		
Other components		
Assignment	10	CO1, CO2
quiz	10	CO3, CO4, CO5
Semester end examination (SEE) Scaled to 50 Marks	100	CO1, CO2, CO3, CO4, CO5

ಕನ್ನಡ ಮನಸು

Course Code: HS491M	Credits: 1:0:0
Pre – requisites: Nil	Contact Hours: 14L
Program: B.E(Common to all the Branches)	Semester: IV
Course Coordinator: Mrs. Kanya Kumari S	

ಘಟಕ – 1 (Unit I)

ಲೇಖನಗಳು (Articles)– ಕಾವ್ಯಭಾಗ (poetry)

ಕನ್ನಡ ಭಾಷೆ ನಾಡು – ನುಡಿ

ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ

ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ

ವಚನಗಳು–ಅಕ್ಕಮಹಾದೇವಿ–ಬಸವಣ್ಣ–ಅಲ್ಲಮಪ್ರಭು

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

ಘಟಕ – 2 (Unit II)

ಕೀರ್ತನೆ ಮತ್ತು ತತ್ವ ಪದಗಳು

ಪುರಂದರ ದಾಸರು ಮತ್ತು ಕನಕದಾಸರ ಪದಗಳು

ಶಿಶುನಾಳ ಶರೀಫರು ಮಹಾಂತ ಶಿವಯೋಗಿಗಳ ಪದಗಳು

ಜನಪದ ಗೀತೆ

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

ಘಟಕ – 3 (Unit III)

ಆಧುನಿಕ ಕಾವ್ಯಗಳು

ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗ

ಕುರುಡು ಕಾಂಚಾಣ

ಚೋಮನ ಮಕ್ಕಳ ಹಾಡು

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

ಘಟಕ –4 (Unit IV)

ತಾಂತ್ರಿಕ ಧುರೀಣರು(ವ್ಯಕ್ತಿ ಪರಿಚಯ) ಕಥೆ–ಪ್ರವಾಸ ಕಥನ

ಡಾ.ಸರ್.ಎಂ.ವಿಶ್ವೇಶ್ವರಯ್ಯ– ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ – ಎ,ಎನ್.ಮೂರ್ತಿರಾಯರು

ಯುಗಾದಿ –ವಸುಧೇಂದ್ರ

ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ -ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯ

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

ಘಟಕ- ೫ (Unit V)

ಕರಕುಶಲ ಕಲೆಗಳು -ತಾಂತ್ರಿಕ ವಿಜ್ಞಾನ (technical science)

ಕರಕುಶಲ ಕಲೆಗಳು -ಮತ್ತು ಪರಂಪರೆ ವಿಜ್ಞಾನ- ಕರಿಗೌಡ ಬೇಚನ ಹಳ್ಳಿ

ಕಂಫ್ಯೂಟರ್ ಹಾಗೂ ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ-

ಕೆ'ಮತ್ತು ಬ ಬರಹ ತಂತ್ರಾಂಶಗಳು ಮತ್ತು .ಕಂಫ್ಯೂಟರ್ ಮುಖಾಂತರ ಕನ್ನಡ ಟೈಪಿಂಗ್
ತಾಂತ್ರಿಕ ಪದಕೋಶ ತಾಂತ್ರಿಕ ಹಾಗೂ ಪಾರಿಭಾಷಿಕ ಕನ್ನಡ ಪದಗಳು

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

ಪಠ್ಯ ಪುಸ್ತಕ (text book):

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ'

ಸಂಪಾದಕರು : ಡಾ.ಹಿ.ಚಿ, ಬೋರಲಿಂಗಯ್ಯ -ವಿಶ್ರಾಂತ ಕುಲಪತಿಗಳು, ಕನ್ನಡ

ವಿಶ್ವವಿದ್ಯಾಲಯ ,ಹಂಪಿ,ಪ್ರಸಾರಂಗ ವಿಶ್ವೇಶ್ವರಯ್ಯತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ,ಬೆಳಗಾವಿ,ಪ್ರಥಮ
ಮುದ್ರಣ-2020

ಪೂರಕ ಪಠ್ಯ (reference book)

ಕನ್ನಡ ಮನಸು, ಪ್ರಸಾರಂಗ - ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ-ಹಂಪಿ, ಆರನೇಮುದ್ರಣ 2016

ಕನ್ನಡ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

- ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡದ ಜೊತೆಗೆ ಕ್ರಿಯಾತ್ಮಕ, ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿ ಮತ್ತು ನಾಡು-ನುಡಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು (PO-6)
- ಕನ್ನಡ ಭಾಷೆಯ ವ್ಯಾಕರಣ, ಭಾಷಾರಚನೆ ಯ ನಿಯಮಗಳನ್ನು ಪರಿಚಯಿಸುವುದು(PO-10)
- ಕನ್ನಡ ಭಾಷಾಬರಹದಲ್ಲಿ ಕಂಡು ಬರುವ ದೋಷಗಳು ಮತ್ತು ಅವುಗಳ ನಿವಾರಣೆ(PO10)
- ಸಾಮಾನ್ಯ ಅರ್ಜಿಗಳು, ಸರ್ಕಾರಿ ಹಾಗೂ ಸರ್ಕಾರಿ ಪತ್ರವ್ಯವಹಾರದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡಿಸುವುದು(PO-12)
- ಭಾಷಾಂತರ ಮತ್ತು ಪ್ರಬಂಧ ರಚನೆ ಬಗ್ಗೆ ಅರಿವು ಮೂಡಿಸುವುದು ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ,ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗೂ ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು. (PO-12)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 marks		
Assessment tool	Marks	Course outcome attained
Internal test-I	30	CO1, CO2, CO3
Internal test-II	30	CO4, CO5
Average of the Two Internal Test Two will be Taken for 30 Marks		
Other components		
Assignment	10	CO1, CO2
quiz	10	CO3, CO4, CO5
Semester end examination (SEE) Scaled to 50 Marks	100	CO1, CO2, CO3, CO4, CO5

ABILITY ENHANCEMENT COURSE - IV

Course Code: AEC410	Credits: 1:0:0
Pre – requisites: Nil	Contact Hours: 14L
Course Coordinator: Dr. Rama Shivakiran Reddy	

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

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

ADDITIONAL MATHEMATICS - II

Course Code: AM41	Credits: 0:0:0
Pre – requisites: Nil	Contact Hours: 42L
Course Coordinator: Dr. Veena B N	

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
- Online tools: 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.
2. **Erwin Kreyszig** – Advanced Engineering Mathematics – Wiley Publication, 10th Edition, 2015.

Reference Books:

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

Course Outcomes (COs):

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

1. To carryout differentiation of function of several variables.
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.