

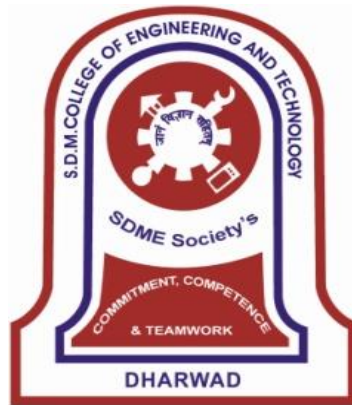
Academic Program: UG

Academic Year 2023-24

Syllabus

III & IV Semester B.E.

Civil Engineering



**SHRI DHARMASTHALA MANJUNATHESHWARA COLLEGE OF ENGINEERING
& TECHNOLOGY,**

DHARWAD – 580 002

(An Autonomous Institution approved by AICTE & Affiliated to VTU, Belagavi)

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SDM College of Engineering & Technology, Dharwad

It is certified that the scheme and syllabus for III & IV semester of UG program in Civil Engineering is recommended by Board of Studies of Civil Engineering Department and approved by the Academic Council, SDM College of Engineering & Technology, Dharwad. This scheme and syllabus will be in force from the academic year 2023 - 24 till further revision.

Principal

Chairman BoS & HoD

SDM College of Engineering & Technology, Dharwad

Vision and Mission of the Institute

Vision:

To develop competent professionals with human values.

Mission:

- To have contextually relevant Curricula.
- To promote effective Teaching Learning Practices supported by Modern Educational Tools and Techniques.
- To enhance Research Culture.
- To involve the Industrial Expertise for connecting Classroom contents to real-life situations.
- To inculcate Ethics and soft skills leading to overall personality development.

DEPARTMENT OF CIVIL ENGINEERING

VISION AND MISSION

Vision:

To be the center of excellence providing the state of art civil engineering education developing competent engineers responsible for serving modern society.

Mission:

The stated vision can be achieved through:

- The development of robust curricula to meet industrial expectations.
- Interactive teaching-learning process with modern educational tools and soft skills.
- Establishing synergy between teaching and research
- Industry-Institute interaction.

Program Educational Objectives (PEOs)

I. Technical adeptness: The Civil Engineering Graduates will be technically adept to specific fields and other disciplines. Management towards Planning, Design, and Costing. Their technical skills and knowledge will enable them to perform their work with commitment and quality, timeliness with continuous improvement.

II. Interpersonal Skills: Civil Engineering Graduates will exhibit effective interpersonal skills in teams and at the workplace.

III. Awareness of Social impact: Graduates will be made aware of causes of impacts due to the development and to identify remedial measures if necessary.

IV. Professionalism: Understanding of professionalism, ethics, quality performance, sustainability and allow them to be professional leaders and contributors to society through their problem-solving capabilities and executing the work.

V. Continuous Learning: Civil Engineering Graduates will exhibit interest in lifelong learning including studies leading to professional licensure or higher studies in engineering that provides for continued development of their technical ability and management skills.

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

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 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 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 engineering practice.

PO9.Individual and teamwork: Function effectively as an individual and as a

member or leader in diverse teams and in multi-disciplinary 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 the set one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.

PO12.Lifelong learning: Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context to technological change.

PROGRAM SPECIFIC OUTCOMES(PSOs)

PSO13.Project inception and design: Conceptualize projects related to different fields of Civil Engineering, collect relevant data by direct and indirect methods, analyze the project requirement and design the project.

PSO14.Draft specification: Select material, prepare estimates/costing, schedule work plans.

PSO15.Experimentation: Apply knowledge of different fields of Civil Engineering, conduct experiments, analyze, interpret data, and design the system components.

SDM COLLEGE OF ENGINEERING AND TECHNOLOGY DHARWAD
Department of Civil Engineering
Third Semester
Scheme of Teaching and Examinations 2023-24

					Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	Credits
					L	T	P					
1	ASC	22UMAC300	Engineering Mathematics-III	MATHS	3	0	0	03	50	100	100	3
2	PCC	22UCVC300	Mechanics of Materials	CV	4	0	0	04	50	100	100	4
3	PCC	22UCVC301	Building Construction	CV	3	0	0	03	50	100	100	3
4	PCC	22UCVC302	Surveying	CV	3	0	0	03	50	100	100	3
5	PCCL	22UCVL303	Basic Material Testing Laboratory	CV	0	0	2	03	50	50	100	1
6	PCCL	22UCVL304	Surveying Practice Laboratory	CV	0	0	2	03	50	50	100	1
7	ESC	22USCVC305	Fluid Mechanics	CV	3	0	0	03	50	100	100	3
8	UHV	22UHVK306	Universal Human Values-I	CV	1	0	0	01	50	50	100	1
9	AEC	22UCVE321	Building Planning & Drawing - I	CV	0	0	2	03	50	50	100	1
10	ASC	22UMBA301	Mathematics	MATHS	3	0	0		50	-	50	Audit
11	MC	22UNSK307	National Service Scheme (NSS)	NSS	0	0	2	-	50	-	50	Audit
		22UPYK307	Physical Education & Yoga	PE								
Total											1000	20

ASC: Applied science course, **PCC:** Professional Core Course, **PCCL:** Professional Core Course laboratory, **ESC:** Engineering Science Course, **ETC:** Emerging Technology Course, **PLC:** Programming Language Course, **UHV:** Universal Human Value Course, **AEC:** Ability Enhancement Course, **SEC:** Skill Enhancement Course, **MC:** Mandatory Course, **L:** Lecture, **T:** Tutorial, **P:** Practical, **CIE:** Continuous Internal Evaluation, **SEE:** Semester End Evaluation. **MC:** Mandatory Course. This letter in the course code indicates common to all the stream of engineering. **TD:** Teaching department, **PSB:** Paper Setting Board.

National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE) (Sports and Athletics), and Yoga (YOG) with the concerned course coordinator during the first week of respective semester. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory

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for the award of degree.

AICTE activity point: 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. The activity points earned by the student shall be reflected on the student's VIII semester grade card. The activities to earn points can be spread over the duration of the program. However, the 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 a student fails 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.

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SDM COLLEGE OF ENGINEERING AND TECHNOLOGY DHARWAD

Department of Civil Engineering

Fourth Semester

Scheme of Teaching and Examinations 2023-24

Sl. No	Course	Course code	Course Title	TD/PSB	Teaching Hours/Week			Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	ASC	22UMAC400	Engineering Mathematics-IV	MATHS	3	0	0	03	50	100	100	3
2	PCC	22UCVC400	Structural Analysis-I	CV	3	0	0	03	50	100	100	3
3	PCC	22UCVC401	Highway Engineering	CV	3	0	0	03	50	100	100	3
4	PCC	22UCVC402	Water Supply Engineering	CV	3	0	0	03	50	100	100	3
5	PCCL	22UCVL403	Fluid Mechanics Laboratory	CV	0	0	2	03	50	50	100	1
6	PCCL	22UCVL404	Computer Aided building drawing	CV	0	0	2	03	50	50	100	1
7	ESC	22USCVC405	Concrete Technology	CV	3	0	0	03	50	100	100	3
8	UHV	22UHVK406	Universal Human Values-II	CV	1	0	0	01	50	50	100	1
9	AEC	22UCVE421	Building planning drawing - II	CV	0	0	2	03	50	50	100	1
10	MC	22UBEK407	Biology for Engineers	CV	1	0	0	01	50	50	100	1
11	ASC	22UMBA401	Mathematics	MATHS	3	0	0	-	50	-	50	Audit
12	MC	22UNSK408	National Service Scheme (NSS)	NSS	0	0	2	-	50	-	50	Audit
		22UPYK408	Physical Education & Yoga	PE								
Total											1100	20

Note: Mention in the course whichever is opted by the department as ESC/ETC/PLC.

1	ESC	22USCVC405	Concrete Technology	CV	3	0	0	03	50	100	100	3
Ability Enhancement Course/Skill Enhancement Course												
1	AEC	22UCVE421	Building planning drawing - II	CV	0	0	2	02	50	50	100	1

Fill -- with your branch code CV, ME, EE, EC, CS, IS, CH, AI

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Course, **MC**: Mandatory Course, **L**: Lecture, **T**: Tutorial, **P**: Practical, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. **MC**: Mandatory Course. This letter in the course code indicates common to all the stream of engineering. **TD**: Teaching department, **PSB**: Paper Setting Board.

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AICTE activity point: 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. The activity points earned by the student shall be reflected on the student's VIII semester grade card. The activities to earn points can be spread over the duration of the program. However, the 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 a student fails 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.

Contact Hours:39

Course Learning Objectives (CLOs):

To have an insight into Fourier series, Fourier transforms, Z-transforms. To develop proficiency in variational calculus. To solve algebraic, transcendental, and ordinary differential equation arising in engineering applications using numerical methods.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs (1-12)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Express periodic function as a Fourier series and obtain the various harmonics of the Fourier series expansion for the given numerical data.			1,2
CO-2	Transform the given function using Fourier transforms depending on the nature of engineering applications. Apply Z-transform for series of mathematical conversion to mathematical framework used as digital filter. Solve difference equations using Z-transform.			1,2
CO-3	Solve first and second order ordinary differential equations arising in engineering problems using single step and multi-step numerical methods.			1,2
CO-4	Determine the extremals of functional using calculus of variations and solve problems arising in engineering.			1,2
CO-5	Apply the knowledge of numerical methods to fit an interpolating curve to the experimental data and obtain solution of transcendental equation.			1,2

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POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	1	1													

Contents:

Unit - I

Fourier Series: Periodic functions, Dirichlet's condition. Fourier series of periodic functions of period 2π and arbitrary period. Half- range Fourier series. Practical harmonic analysis, examples from engineering field. **7L+1T**

Unit - II

Fourier Transforms: Infinite Fourier transforms, Fourier sine and cosine transforms. Inverse Fourier transforms. (Simple problems).

Z-Transforms and Difference Equations: Z-transform- definition, Standard Z-transforms, Damping and shifting rules, Initial value and Final value theorems (without proof) problems. Inverse Z-transform. Simple problems. Difference equations-basic definition. Application of Z-transform to solve Difference equations. **7L+2T**

Unit - III

Special functions: Series solution of Bessel's differential equation leading to $J_n(x)$ - Bessel's function of first kind, Recurrence relations, Generating function of Bessel's functions, orthogonality of Bessel's function. **7L+1T**

Unit - IV

Curve Fitting: Curve fitting by the method of least squares- fitting the curves of the form $y = ax + b$; $y = ax^2 + bx + c$; $y = ax^b$.

Statistical Methods: Correlation and regression-Karl Pearson's coefficient of correlation -problems. Regression analysis- lines of regression-problems. **6L + 1T**

Unit - V

Linear and Non-Linear programming: Introduction, Mathematical formulation of a L.P.P, basic solution. Geometric (or graphical) method, Simplex method.

Non-Linear Programming – Constrained extremal problems-Lagrange's multiplier method. **6L + 1T**

Reference Books:

1. **B.S. Grewal:** Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2017.
2. **E.Kreyszig:** Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed.(Reprint).2016.
3. **Srimanta Pal et al:** Engineering Mathematics, Oxford University Press, 3rd Edition, 2016.
4. **B. V. Ramana,** "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.

Contact Hours: 52

Course Learning Objectives (CLOs): Mechanics of Materials is taught as a core course in Civil Engineering program. In this course, topics on Simple stresses and strains, Compound stresses, BMD and SFD for determinate beams, bending and shear stresses in beams, deflection of beams, Torsion of circular shafts, stability of columns and thin and thick cylinders are dealt. The evaluation is made by means of the internal assessment tests and semester end examination.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs (1-12)/ PSO (13-15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Analyze and calculate simple stresses and strains, Elastic constants, thermal stresses.	1,2		
CO-2	Analyze and calculate Compound stresses by analytical and graphical method.	1,2		
CO-3	Analyze the Simply supported, Cantilever, overhanging beams and draw BMD and SFD	1,2	3	
CO-4	Analyze bending and shear stresses in rectangular and flanged sections. Stresses and strains in circular shafts subjected to torsion and thin and thick cylinders subjected to internal pressures.	1,2		
CO-5	Analyze and calculate Slopes and deflections of beams & columns and buckling loads for long columns	1,2	3	

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	3	3	2												

Contents:

Unit - I

Simple stresses and strains: Simple Stresses & Strains, Elastic constants, compound bars, thermal effects.

10 Hrs.

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Unit - II

Compound stresses: Inter-relations of direct and shear stresses, Mohr's circle of stresses **10 Hrs.**

Unit - III

Bending Moment and Shear Force: Simply supported, Cantilever, overhanging beams for standard and general loadings. **10 Hrs**

Unit - IV

Pure Bending Theory: Calculation of bending and shear stresses in rectangular and flanged sections.

Long Columns: Elastic stability of Columns, Euler's theory, Rankine's formula. **12 Hrs.**

Unit - V

Slopes and deflections: Calculation of slopes and deflections in determinate beams by Double Integration Method and Macaulay's method for cantilever beams, simply supported beams and overhanging beams. **10 Hrs.**

Reference Books:

- 1) R.K. Bansal, "Strength of materials", Laxmi Publications, 6th edition, 2020.
- 2) S S Bhavikatti, "Strength of materials", Vikas publishing House Pvt. Ltd. 4th edition, 2013.
- 3) Ramamruthum and R Narayan, "Strength of materials", Dhanpat Rai Publishing company, 18th edition, 2014.
- 4) Gere and Timoshenko, "Mechanics of materials", published by CBS publishers, 2nd edition, 2004.

22UCVC301

Building Construction

(3-0-0)3

Contact Hours: 39

Course Learning Objective (CLOs): Building Construction is taught as a core course in Civil Engineering program. In this course, topics on introduction and exposure to traditional and modern building materials, types of soils and foundations, brick/stone masonry, floorings, stairs, damp proofing and termite proofing, roofs, building services and cost-effective construction techniques are covered. Lintels and arches are included for self-study by students. The delivery of the topics is achieved through lecture classes and preparation of working drawings for building components and for building services. The evaluation is made by means of the internal assessment tests and semester end examination.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs (1-12)/ PSOs (13-15)		
	Substantial Level (3)	Moderate Level (2)	Slight Level (1)

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CO-1	Explain the traditional / modern building materials. Identify different types of foundations, doors, windows and ventilators.		1, 7	6, 12
CO-2	Define the technical terms related to masonry works and differentiate between different types of brick, stone and composite masonry		1	6, 12
CO-3	Discuss damp proofing and termite proofing using different methods & different materials and identify different types of flooring materials and different types of floors and their suitability		1	6, 12
CO-4	Explain different components of stairs. Explain different types of roofs and roofing materials.		1	6, 12
CO-5	Classify and select different mortars, paints, plumbing and electrical materials for different applications.		1	6, 12

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	2					1	2					1			

Contents:

Unit - I

Introduction: General, building materials, Types of buildings, design loads on buildings.

Components of building: Introduction, types of foundations, location, types and sizes of doors, windows and ventilators. **9 Hrs.**

Unit - II

Brick and stone Masonry: Definition of terms used in masonry, English and Flemish Bond for partition and main walls of building.

Composite Masonry: Brick stone composite masonry, Reinforced brickwork, hollow clay block masonry. **8 Hrs.**

Unit - III

Damp proofing and Termite proofing: Causes, effects, methods, materials and treatment.

Floorings: Types of floorings, materials and method of laying of ceramic, marble, polished granite and industrial flooring. **8 Hrs.**

Unit - IV

Staircase: Classification and types, technical terms, requirements of a good stair.

Roofs and roofing systems: RCC roofing systems, Lean-to-roof, trusses (King post and queen post truss), roof coverings. **7 Hrs.**

Unit - V

Plastering, pointing & painting: Introduction to plastering and pointing, methods of plastering, defects in plasters, characteristics of an ideal paint, classification, and types of paints.

Building services: Water supply & sanitation and electrification. **7 Hrs.**

Self-study:

Lintels and Arches: Classification, materials and method of construction, stability of arches.

Introduction to cost effective construction: Materials and methods of construction; Green buildings.

Reference Books:

- 1) Dr. B.C. Punmia, Er. Ashok Kumar Jain, Dr. Arun Kumar Jain, "Building Construction", Laxmi Publication (P) Ltd., New Delhi, 11th Edition, 2016.
- 2) S. K. Duggal, "Building Materials", New Age Publishers, New Delhi, 5th Edition, 2019
- 3) Sushil Kumar, "Building Construction", Standard Publishers, New Delhi, Revised Edition, 2020.
- 4) National Building Code, Volume 1 & 2, BIS, New Delhi, 2016.

22UCVC302

Surveying

(3-0-0)3

Contact Hours: 39

Course Learning Objective (CLOs): Surveying is taught as a core course in Civil Engineering program. The course deals with topics on measurement of distances, angles and elevations. The usage of instruments like chains, tapes, dumpy level and theodolite are dealt with. The delivery of topics will be made through lecture classes and demonstrations. The evaluation is made by means of the internal assessment tests and semester end examination.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs (1-12)/ PSOs (13-15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Explain basic principles of surveying, carry out leveling operations.	1		
CO-2	Carry out theodolite survey and	1	9	

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	determine heights and distances by trigonometrical methods.			
CO-3	Determine heights and distances by tacheometric principle and understand the concept of contours.	1	9	
CO-4	Design different types of curves based on suitability.	3	9, 6, 15	
CO-5	Calculate areas, set out works and use modern equipment like GPS and Total Station.	5	9, 8	10

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	3		3		3	2		2	2	1					2

Contents:

Unit - I

Introduction: Definition and classification of surveying, Basic principles of surveying. Measurement of horizontal distances: Chains and Tapes, Ranging of lines-Direct and Indirect

Levelling: Principles and basic definitions, Fundamental axes and part of a dumpy level, Temporary adjustments of a dumpy level, Types of levelling

Compass Surveying: Prismatic and Surveyor's compasses, Calculation of bearings and included angles. **8 Hrs.**

Unit - II

Theodolite Survey: Types of theodolites, Measurement of horizontal and vertical angles by repetition and reiteration methods.

Trigonometric Levelling: Determination of heights and distances. **8 Hrs.**

Unit - III

Tacheometry: Principles of tacheometry, measurement of heights and distances

Contouring: Contours, characteristics and uses **8 Hrs.**

Unit - IV

Curve Setting: Curves-Necessity-Types of curves, Simple curves, Compound curves, Reverse curves, transition curves and vertical curves. Setting of simple circular curves by successive bisection of chords, offsets from long chord, Rankin's method. **8 Hrs.**

Unit - V

Construction Survey: Setting out of works for buildings and tunnels.

Modern surveying instruments: GPS and Total station and Drone survey

Total station survey: Open land survey for the determination of areas and plotting the features. **7Hrs.**

Reference Books:

1. B.C. Punmia, Jain Ashok K., Jain Arun K, 'Surveying (Volume-1),' Laxmi Publications, Seventeenth Edition, (2018).

2. B.C. Punmia, Jain Ashok K., Jain Arun K.," Surveying (Volume-2)," Laxmi Publications, Sixteenth Edition, (2019).
3. Arora K.R., 'Surveying (Volume – 1)," Standard Book House, Seventeenth Edition, (2019).
4. Duggal, S. K.,"Surveying - Vol. 1," McGraw Hill Education, Fourth edition, (2017).
5. Chandra A. M. Plane Surveying, New Age International Private Limited, Third Edition, (2015).

22UCVL303 Basic Material Testing Laboratory (0-0-2) 1

Contact Hours: 24

Course Learning Objectives (CLOs) Basic Material Testing Laboratory is taught as one of the regular labs for III Semester Civil Engineering students. In this course various tests on steel, aggregates, cement, bricks, concrete blocks are dealt. The delivery of topics will be made through instruction classes, demonstration and laboratory works as per IS codes. The evaluation will be carried out through continuous evaluation & end semester practical examination.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs (1-12)/ PSO (13-15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Perform tests on metals and Interpret results.	4	9	8
CO-2	Perform tests on fine and coarse aggregate and arrive at suitability of aggregates based on test results.	4	9	8
CO-3	Perform test on Cement, interpret results. and Identify grade of cement.	4	9	8
CO-4	Perform tests on Bricks and classify based on results.	4	9	8

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level				3				1	2						

Contents:

- 1) **Test on steel & metals:** Tension, compression, shear, Hardness and impact test.
- 2) **Test on fine aggregate:** Specific gravity, Bulk density, Silt and deleterious materials.
- 3) **Test on Coarse aggregate:** Specific gravity, Bulk density, water absorption.

- 4) **Test on Cement:** Specific gravity, Fineness, Normal Consistency, Initial and Final setting time.
- 5) **Tests on Bricks:** Size, water absorption, Compression strength.

Reference Books:

- 1) Duggal S.K, “Materials Testing Laboratory Manual”, Tata McGraw Hill Publishers, New Delhi.
- 2) IS 5242 :1979, “Method of Test for Determining. Shear Strength of Metals”.
- 3) IS 1786: 2008 - High Strength Deformed Steel Bars and Wires for Concrete Reinforcement.
- 4) IS 1598: 1977, “Method for Izod Impact Test of Metals”.
- 5) IS 1757: 1988, “Method for Charpy Impact Test (V Notch) for Metallic Material”.
- 6) IS 2386: 1963 “Methods of Test for Aggregates for Concrete”.
- 7) IS 4031-1988, “Methods of Physical Tests for Hydraulic Cement”.
- 8) IS 3494 – 1992, “Methods of Tests of Burnt Clay Building Bricks”.

22UCVL304	Surveying Practice Laboratory	(0-0-2) 1
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Contact Hours: 24

Course Learning Objectives (CLOs): Surveying practice laboratory is taught as a laboratory course for Civil Engineering Program. In this course, measurement of distances, angles, heights, elevations and contouring are dealt. The delivery of topics will be made through instruction classes, demonstration and Laboratory work. The evaluation will be carried out through continuous evaluation & end semester practical examination.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs (1-12)/ PSO (13-15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Measure horizontal distance, vertical distance and angle.	5, 15	9	
CO-2	Construct simple curve by different methods.	5, 15	9	
CO-3	Measure heights and distances, verify plumb and set out Civil Engineering works using Total station..	5, 15	9	

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level					3				2						3

Contents:

- 1) **Chain surveying:** To measure distance between two points using direct ranging, indirect ranging and to set out perpendiculars.
- 2) **Levelling:** To determine difference in elevation between two points and to conduct fly back levelling; profile levelling.
- 3) **Theodolite surveying:** Measurement of horizontal angles by the method of repetition and reiteration using theodolite/total station. Measurement of vertical angles using theodolite/total station.
- 4) **Trigonometric levelling:** To determine heights and distances by single plane method.
- 5) **Curve setting:** To set out simple curves using linear methods.
- 6) **Total station survey:** Open land survey for the determination of areas and plotting the features.
 - a) Heights and distances.
 - b) Checking of plumb.
 - c) Setting out of civil works.

Reference Books:

1. B.C. Punmia, Jain Ashok K., Jain Arun K "Surveying (Volume-1)," Laxmi Publications, Seventeenth Edition, (2018).
2. B.C. Punmia, Jain Ashok K., Jain Arun K.," Surveying (Volume-2)," Laxmi Publications, Sixteenth Edition, (2019).
3. Arora K.R., 'Surveying (Volume – 1)," Standard Book House, Seventeenth Edition, (2019).
4. Duggal, S. K.,"Surveying - Vol. 1," McGraw Hill Education, Fourth edition, (2017).
5. Chandra A. M. Plane Surveying, New Age International Private Limited, Third Edition, (2015).

22USCVC305	Fluid Mechanics	(3-0-0)3
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Contact Hours: 39

Course Learning Objectives (CLOs): Fluid Mechanics is taught as a core course in Civil Engineering program. In this course, topics on Fluid Mechanics development, Properties of fluid, Fluid Pressure and its measurement, Hydrostatics, Kinematics of fluids, Dynamics of fluid flow and flow measurement. The delivery of topics will be made through lecture classes and demonstration. The evaluation is made by means of the internal assessment tests and semester end examination.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs (1-12)/ PSOs (13-15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Explain fundamental properties of		1	

SDMCET: Syllabus

	fluids and calculate pressure.			
CO-2	Apply fundamental laws of fluid mechanics and Bernoulli's principle for practical applications.		1	
CO-3	Compute the discharge through pipes, notches and weirs.	2		1
CO-4	Compute major and minor losses in pipes.	2		1
CO-5	Explain open channel hydraulics and its types.	2		1

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	1.4	3													

Contents:

Unit - I

Fluid Properties: Mass density, Specific weight, Specific gravity, Viscosity, Cohesion, Adhesion, Surface tension & Capillarity.

Fluid Pressure and Its Measurements: Types, Pascal's law, Hydrostatic law; Variation of pressure with depth. Measurement of pressure using simple, differential & inclined manometers (theory & problems).

Hydrostatics: Total pressure, center of pressure in vertical and inclined plane surface. **8 Hrs.**

Unit - II

Fluid Kinematics: Types of flow, Velocity and acceleration, Continuity equation.

Fluid Dynamics: Euler's equation of motion along a streamline and Bernoulli's equation. Problems on applications of Bernoulli's equation, Application-Venturimeter, Orifice meter, Pitot tube. Momentum equation and problems on pipe bends. **8 Hrs.**

Unit - III

Flow measurements: Orifice and Mouthpiece, classification, hydraulic coefficients. Discharge over notches and Weirs: rectangular, triangular, trapezoidal notches, Cipolletti notch, broad crested weirs, Numerical problems. **7 Hrs**

Unit - IV

Flow through Pipes: Introduction. Major and minor losses in pipe flow. Darcy-Weisbach equation, Pipes in series, pipes in parallel, equivalent pipe-problems. Minor losses in pipe flow. **8 Hrs**

Unit - V

Open Channel Hydraulics: Classification of flow, Velocity, discharge.

Most economical channel sections: Rectangular and trapezoidal sections

Specific energy curve, Gradually varied flow equation, Hydraulic jump. **8 Hrs.**

Reference Books:

1. Modi P. N and Seth S. M., "Hydraulics and Fluid Mechanics", Standard Book House, Delhi. 22nd Edition, 2019.
2. Dr. Bansal R. K., "Fluid Mechanics and Hydraulic Machines", Lakshmi Publications 10th Edition, 2019.
3. Dr. Jain A. K., "Fluid Mechanics", Khanna Publishers, Delhi. 12th Edition, 2014.
4. Subramanya K., "1000 Solved Problems in Fluid Mechanics", Tata McGraw Hill Publishers, New Delhi. 3rd Edition, 2005.
5. Sarbjit Singh, "Experiments in Fluid Mechanics" -PHI Pvt. Ltd., New Delhi. 2nd Edition, 2012.
6. Mohd. Kaleem Khan, "Fluid mechanics and Machinery", Oxford University Press. 1st Edition, 2015.
7. P. N. Modi and S. M. Seth, "Hydraulics and Fluid Mechanics, including Hydraulic Machines", Standard Book House, New Delhi. 22nd Edition, 2019.

22UHVK306

Universal Human Values I

(1-0-0)1

Contact Hours: 13

Course Learning Objectives (CLOs):

This course provides an opportunity for the students to enhance their life skills like right understanding leading to the harmonious living in relationship with the self and family enhancing holistic development of the students.

Course Outcomes (COs):

Description of the course outcome: At the end of course, the student should be able to:		Mapping to POs (1-12)/ PSOs (13-15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Recite and follow interpersonal relations with peers and the others	6		
CO-2	Comprehend happiness, prosperity and distinguish between body and self		6,9	
CO-3	Comprehend harmony and practice Sanyam and Svasthya		9	
CO-4	Demonstrate the values of human-human interaction and universal values such as <i>Nyaya</i> , <i>Visvasa</i> , and <i>Sammana</i>	7		
CO-5	Clearly visualize the co-relation between lack of Human Values and the prevailing problems and use tangible steps and a roadmap for moving in the cherished direction.	8	9	

POs	1	2	3	4	5	6	7	8	9	10	11	12
Mapping level	-	-	-	-	-	2.5	3	3	2	-	-	-

Contents:

UNIT - I

Introduction to Value Education:

Understanding Value Education: Living a Fulfilling Life, Education for Fulfilling Life, Priority of Values over Skills, Appreciating the Need and Implications of Value Education, Guidelines for Value Education - Self-exploration – its content and process; 'Natural Acceptance', Basic Human Aspirations and their fulfilment.

04 Hrs.

UNIT - II

Understanding Happiness and Prosperity

Exploring the meaning of Happiness and Prosperity, Programme for continuity of Happiness, A look at the prevailing Notions of Happiness, The programme for Happiness, Natural outcome of the programme.

02 Hrs.

UNIT - III

Understanding Harmony at Various Levels: Harmony in the Self – Understanding Myself

Understanding human being as a co-existence of the sentient 'I' and the material 'Body' and the needs of Self ('I') and 'Body' - Sukh and Suvidhā, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer).

03 Hrs.

UNIT - IV

Harmony in the Family- Understanding the Values in Human Relationships:

Understanding the Family as the basic unit of human interaction, Understanding values in human-human relationship; meaning of Nyāya and program for its fulfilment to ensure Ubhaya –tripti; Trust (Visvāsa) and Respect (Sammāna) as the foundational values of relationship.

02 Hrs.

UNIT - V

Understanding Intention and Competence

Distinguish between Intention and Competence, Understanding the meaning of Nine Values.

02 Hrs

Reference Book:

- 1) R.R.Gaur, R Asthana, and G.P Bagaria. **A Foundation Course in HUMAN VALUES and professional Ethics: 2nd Revised Edn.** EXCEL BOOKS, New Delhi. 2019

Contact Hours: 26

Course Learning Objective (CLOs): Building Planning and Drawing-I is taught as one of the ability enhancements courses in Civil Engineering program. In this course, topics on Introduction to planning, principles of planning, scales for drawing, drawing of building components are dealt. The delivering of topics will be made through lecture classes and drawing sessions. The evaluation is made by means of the internal assessment tests and semester end examination.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs (1-12)/ PSOs (13-15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level(1)
CO-1	Explain principles of planning and scales for various drawings.	3	2	1
CO-2	Plan and develop drawings for building components.	3	2	1

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	1	2	3												

Contents:

Unit - I

Introduction: Principles of planning, scales for various drawings. **13 Hrs.**

Unit - II

Planning and drawing of building components: Design and drawing of plan and cross sections of staircase, foundation and doors. **13 Hrs.**

Note: Scheme of evaluation for CIE: 3 IAs of 1 ½ hour duration each (best two) 40 marks.

Drawings to be prepared: Building components – 4 sheets. The drawing sheets prepared during the drawing sessions will be evaluated for 10 marks as CTA.

Pattern of question paper for SEE: Duration is 2 hours. There shall be two questions, one from Unit I carrying 15 marks and another from Unit II carrying 35 marks. In Unit II, two questions will be given, and the candidate shall answer anyone.

Reference Books:

- 1) Shah M.G and Kale C.M., Patki S.Y., “Building Drawing with an Integrated Approach to Built Environment”, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 5th edition, 2017.
- 2) Malik R S and Meo G S, “Civil Engineering Drawing”, Asian Publishers / Computech Publications Pvt. Ltd., Revised Edition, 2021.
- 3) IS: 962-1989 (Code of practice for architectural and building drawings), 2nd Revision, 2001.
- 4) National Building Code, Volume 1 & 2, BIS, New Delhi, 2016.
- 5) Building byelaws of local authority: Zonal Regulations, Hubballi Dharwad Urban Development Authority, Revision 2, 2021.

22UMBA301

Engineering Mathematics

(3-0-0) Audit

Contact Hours: 39 Hrs

Course Learning Objectives (CLOs):

This course will enable students to master the basic tools of differential & integral calculus, differential equations, and partial differential equations. and become skilled to formulate, solve and analyze science and engineering problems.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs (1-12)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Apply the knowledge of calculus to solve problems related to polar curves, curvature and its applications in determining the bentness of a curve.	-	-	1,2
CO-2	Solve multiple integration and use Beta and Gamma function to solve definite integrals	-	1,2	
CO-3	Solve first order linear differential equations analytically using standard methods.	-	1,2	
CO-4	Solve higher order differential equations with constant co-efficient and variable co-efficient.	-	1,2	-
CO-5	Learn partial differentiation to calculate rates of change of	-		1,2

	multivariate functions. Solve problems related to composite functions and Jacobians. Solve problems on partial differential equations by method of separation of variables.			
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POs	1	2	3	4	5	6	7	8	9	10	11	12
Mapping Level	1.6	1.6										

Course Content:

Unit I

Differential Calculus:

n^{th} order differentiation of standard functions. Leibnitz theorem (Statement only & illustrative examples), Taylor's series for single variable (Statement only & illustrative examples), Maclaurin's series for single variable (Statement only & illustrative examples).

Polar curves-angle between the radius vector and tangent (Formula & illustrative examples), angle between two curves (Formula & illustrative examples). Definition of Curvature and radius of curvature. -Radius of curvature for Cartesian and polar curves (Formulas & illustrative examples). **10 hrs.**

Unit II

Integral Calculus:

Reduction formula for $\int_0^{\pi/2} \sin^n x \, dx$, $\int_0^{\pi/2} \cos^n x \, dx$ and $\int_0^{\pi/2} \sin^n x \cos^m x \, dx$ (Formula & illustrative examples). Definition of Beta and Gamma functions (illustrative examples). Relation between Beta and Gamma functions (No Proof) (illustrative examples). Evaluation of Double integral (direct and region given), Change of variables. Evaluation of Triple integral (direct examples). **10 hrs.**

Unit III

Ordinary Differential Equations of first order: -

Libnitz's Linear differential equation, Bernoulli's differential equation, Exact differential equations. Orthogonal trajectories. **5 hrs.**

Unit IV

Differential Equations of higher order

Solution of Second order Linear ordinary differential equation with constant coefficients. Method of variation of parameters. Legendre's homogeneous equations. **8 hrs.**

Unit V

Partial Differentiation:

Definition of Partial derivative (illustrative examples), Total differentiation (illustrative examples), Differentiation of Composite functions (illustrative examples). Jacobians and its properties (No Proof) (illustrative examples).

Partial Differential Equations (PDE's):

Formation of PDE's by elimination of arbitrary constants / functions. Solution of PDE by variable separable method. **6 hrs.**

Reference Books:

1. **B.S. Grewal:** Higher Engineering Mathematics, Khanna Publishers, 44th edition, 2017.
2. **H.K. Dass & Rajnish Verma,** Higher Engineering Mathematics, 3rd edition, 2014.

- Note: 1. Grades (i) PP (ii) NP
 2. No semester End Examination
 3. Audit (Bridge course).

22UNSK307	National Service Scheme	(0-0-2) Audit
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Contact Hours: 24

Course Learning Objectives:

1. Understand the community in which they work.
2. Identify the needs and problems of the community and involve them in problem-solving.
3. Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
4. Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.
5. Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony.

Pre-requisites:

1. Students should have a service-oriented mind set and social concern.
2. Students should have dedication to work at any remote place, anytime with available resources and proper time management for the other works.
3. Students should be ready to sacrifice some of the time and wishes to achieve service-oriented targets on time.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1-12)		
	Substantial Level (3)	Moderate Level (2)	Slight Level (1)

SDMCET: Syllabus

CO1	Understand the importance of his / her responsibilities towards society.	12	6	8
CO2	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.	12	6	8
CO3	Evaluate the existing system and to propose practical solutions for the same for sustainable development.	12	6	8
CO4	Implement government or self-driven projects effectively in the field.	12	6	8

POs	1	2	3	4	5	6	7	8	9	10	11	12
Mapping Level	-	-	-	-	-	2	-	1	-	-	-	3

Contents

1. Waste management– Public, Private and Govt organization.
2. Setting of the information imparting club for women leading to contribution in social and economic issues.
3. Water conservation techniques – Role of different stakeholders– Implementation.
4. Preparing an actionable business proposal for enhancing the village income and approach for implementation.
5. Helping local schools to achieve good results and enhance their enrolment in Higher/ technical/ vocational education.
6. Developing Sustainable Water management system for rural areas and implementation approaches.
7. Contribution to any national level initiative of Government of India. For eg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc.
8. Spreading public awareness under rural outreach programs. (Minimum 2 programs).
9. Social connect and responsibilities.
10. Plantation and adoption of plants. Know your plants.
11. Organize National integration and social harmony events /workshops /seminars. (Minimum 02 programs).
12. Govt. school Rejuvenation and helping them to achieve good infrastructure.

AND

ONE NSS – CAMP @ College /University /State or Central Govt Level /NGO's /General Social Camps

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Students must take up anyone activity on the above said topics and have to prepare content for awareness and technical contents for implementation of the projects and have to present strategies for implementation of the same. Compulsorily students must attend one camp.

CIE will be evaluated based on their presentation, approach and implementation strategies.

Reference Books:

NSS Course Manual, Published by NSS Cell, VTU Belagavi

22UPYK307	Physical Education and Yoga	(0-0-2) Audit
		Contact Hours: 24

Course Learning Objectives:

1. The course focuses on overall development and important of Physical Education & Yoga day to day life.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO1	Gaining the importance of Physical Education & yoga.	12		8, 9
CO2	Understanding the benefits & preventive measures of health.	12	6	8, 9
CO3	Gaining the knowledge of yoga.	12		8, 9
CO4	Understanding the importance of Human Body conditioning.	12		8, 9
CO5	Get awareness of Modern technology in sports.	12		5, 8, 9

POs	1	2	3	4	5	6	7	8	9	10	11	12
Mapping Level	-	-	-	-	1	2	-	1	1	-	-	3

Contents

Unit - I

Introduction to physical education: Meaning and importance, definition, components, benefits of physical education. **04Hrs**

Unit - II

Health and wellness, Anatomy and Physiology: Meaning and importance, definition, components, benefits, health habits, basics of diseases and preventive

measures, mental health, physical health, social health, spiritual health. Meaning and definition, first aid, injuries and preventions. **05Hrs**

Unit - III

Introduction of yoga: Origin and history of Yoga, meaning and definition, benefits, importance & Methods of prayer, asana, pranayama, mudras (Suryanamaskara, Standing Asanas, Sitting Asanas, Pron Asanas, Supine Asanas, Pranayama & Mudras) **05Hrs**

Unit - IV

Sports training: Meaning and definitions, warming up, cooldown, methods of exercises, stretching, speed, endurance, flexibility, agility and coordination , types of sports training and recovery, Fitness Components, Sports training, Sports & Games.(Speed, Strength, Endurance, Agility, Flexibility, Athletics, Basketball, Kabaddi, Kho Kho, Volleyball, Throwball, Football, Cricket, Handball, Hockey & Indoor games.) **05 Hrs**

Unit - V

Modern technology in sports and games: Meaning and definitions, objectives, assisting umpires/ referees, hawk-eye technology, sports specific, computer software, technology in playfields, athletes clothing and equipment, graphics of sports and games, artificial intelligence. **05Hrs**

Reference Books:

- 1) Petipus, et al., Athlete's Guide to Career Planning, Human Kinetics, 1997
- 2) The Human Body in Health and Disease with Access 8th Edition 2023.
- 3) Anatomy and Physiology, Shri K.G. Nadgir College of Physical Education. Dharwad.
- 4) Health & Wellness Shri K.G. Nadgir College of Physical Education. Dharwad.
- 5) Nagendra HR., The art and science of Pranayama, 2009
- 6) Iyengar BKS., The illustrated Light on Yoga (English), 2005

Course Learning Objectives (CLOs):

To provide an insight into applications of conformal mapping, integration of complex functions and application of probability distributions in Engineering.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Construct and use the concepts of analytic function to solve the problems arising in Engineering field.			1
CO-2	Utilize conformal transformation and complex integral to transform irregular domain onto a relatively simple domain.		1	
CO-3	Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.		1,2	
CO-4	Apply discrete and continuous probability distributions in analyzing the probability models arising in the engineering field.		1,2	
CO-5	Recite Markov chains and describe stochastic process.			1,2

POs	1	2	3	4	5	6	7	8	9	10	11	12
Mapping Level	1.6	1.7										

Contents:

Unit - I

Calculus of complex functions: Review of function of a complex variable, limits, continuity, and differentiability. Analytic functions: Cauchy-Riemann equations in Cartesian and polar forms. Construction of analytic functions: Milne-Thomson method-Problems. **7 hrs.**

Unit - II

Conformal transformations: Introduction. Discussion of transformations: $w = e^z$; $w = z^2$, $w = z + \frac{1}{z}$, $z \neq 0$) Bilinear transformations- Problems.

Complex integration: Line integral of a complex function, Cauchy's theorem and Cauchy's Integral theorem. **8 hrs.**

Unit - III

Statistical Methods: Correlation and Lines of regression-problems - Fitting the curves of the form $y = ax + b$; $y = ax^2 + bx + c$; $y = ax^b$ by the method of least squares. **8 hrs.**

Unit - IV

Probability Distributions: Random variables (discrete and continuous), probability mass/density functions. Binomial, Poisson, exponential and normal distributions-problems (No derivation for mean and standard deviation)-Illustrative examples. **8 hrs.**

Unit - V

Joint probability distribution: Joint Probability distribution for two discrete random variables, expectation and covariance.

Markov chains – Introduction, probability vectors, Stochastic Matrices, Fixed points and Regular stochastic matrices, Markov chains, higher transition probabilities, stationary distribution of regular Markov chains and absorbing states. **8 hrs.**

Reference Books:

1. **B.S. Grewal**, "Higher Engineering Mathematics, Khanna Publishers", 44th Ed., 2017.
2. **E. Kreyszig**, "Advanced Engineering Mathematics, John Wiley & Sons", 10th Ed. (Reprint), 2016.
3. **Peter V.O'Neil**, "Advanced Engineering Mathematics", International students edition, 2011.
4. **Kishor S. Trivedi**, "Probability & Statistics with Reliability, Queuing, and Computer Science Applications", Prentice-Hall of India, 2nd Edition, 2016.

22UCVC400

Structural Analysis-I

(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): Structural Analysis-I is taught as one of the core courses in Civil Engineering program. In this course, topics on Structural systems, Deflection of beams, Strain Energy, Arches and Cables, Influence Line Diagram for Beams and Analysis of Indeterminate beams are dealt. The delivery of topics will be made through lecture classes. The evaluation is made by means of the internal assessment tests and semester end examination.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs (1-12)/ PSO (13-15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Classify the different Structural	1,2		

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	Systems and Calculate the deflection in beams by Moment Area Method, Conjugate Beam Method,			
CO-2	Analyze beams, frames and trusses using energy principles and energy theorems.	1,2		
CO-3	Calculate the forces in arches and cables.	1,2		
CO-4	Calculate and sketch the bending moment and shear force in the beam under moving load using ILD.	1,2		
CO-5	Analyze the indeterminate beams by consistent deformation method and Clapeyron's theorem of three moments.	1,2		

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	3	3													

Contents:

Unit - I

Introduction to Structural Systems: Forms of structures, conditions of equilibrium, degree of freedom, linear and non-linear structures, one, two and three-dimensional structural systems, determinate and indeterminate structures [Static and Kinematics].

Deflection of beams: Moment area method, conjugate beam method. **8 Hrs.**

Unit - II

Energy Principles and Energy Theorems: Strain energy and complimentary strain energy, strain energy due to axial load, bending and shear, theorem of minimum potential energy, Law of conservation of energy, principle of virtual work, the first theorem of Castigliano, Betti's law, Clarke -Maxwell's theorem of reciprocal deflection, deflection of beams and trusses using strain energy and unit load methods. **8 Hrs.**

Unit - III

Arches: Three hinged circular and parabolic arches with support at same levels, determination of thrust, shear and bending moment. **7 Hrs.**

Unit - IV

Influence line diagrams for beams: Influence line for maximum shear force, maximum bending moment for simply supported, cantilever and overhanging beams. **8 Hrs.**

Unit - V

Analysis of beams: Consistent deformation method -propped cantilever and fixed beams, strain energy method -propped cantilever and fixed beams Clapeyron's theorem of three moments -continuous beams. **8 Hrs.**

Reference Books:

1. Ramamruthum and R Narayan, "Theory of structures", Dhanpat Rai Publishing company, 9th Edition, 2014.
2. S. S. Bhavikatti, "Structural analysis Volume 1", Vikas publishing House Pvt. Ltd 5th edition, 2021.
3. R Vaidyanathan and P Perumal," Structural analysis vol 1", Laxmi Publications, 3rd edition, 2016.
4. S.K. Roy and S Chakraborty, "Fundamentals of structural analysis", S. Chand, 2nd edition, 2003.
5. C. S. Reddy," Basic structural Analysis", Mc Graw Hill education, 3rd edition, 2017.

22UCVC401	Highway Engineering	(3-0-0) 3
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Contact Hours: 39

Course Learning Objectives (CLOs): Highway Engineering is taught as one of the core subjects of Civil Engineering in which the basic knowledge of Highway alignment, design of pavement imparted to the students. Topics covered include the Highway Planning and alignment, geometric design, pavement design, highway economics, pavement maintenance and highway drainage along with numerical problems. The delivery of the topics is achieved through lecture classes, problem solving and demonstrations. The evaluation is made by means of the internal assessment tests and semester end examination.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs (1-12)/ PSO (13-15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Explain historical development of roads in India and recognize ideal highway alignment through a systematic highway planning.			1
CO-2	Design the Geometrical features of highway.	1,2,3		
CO-3	Design the pavement layers of Flexible pavement and Rigid pavement.	1,2,3		
CO-4	Comprehend the construction of			1,12

SDMCET: Syllabus

	various types of roads.			
CO-5	Evaluate the structural and functional behavior of highway.		1,12	

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	2	3	3									1			

Contents:

Unit - I

Introduction: Importance of transportation, modes, characteristics, comparison of different modes, Jayakar Committee recommendation and implementation, present scenario of road development in India.

Highway Planning and Alignment: Road patterns, planning surveys, master plan, saturation system of road planning with problems, factors affecting alignment, ideal alignment, surveys and drawings for new and realignment projects (As per IRC).

7 Hrs.

Unit - II

Highway geometric design: Importance cross sectional elements, width of carriage way, camber, shoulder width, design speed, sight distances, design of horizontal and vertical alignment, problems on above.

9 Hrs.

Unit - III

Pavement Design: Types of pavements, design factors, determination of ESWL and EWL factors and problems, IRC method of flexible pavement design based on CSA method, IRC 37: 2018. Rigid pavement joints, Tie bars, dowel bars.

9 Hrs.

Unit - IV

Pavement Construction: Construction procedure of WBM, WMM, Bituminous and concrete roads, quality control measures.

7 Hrs.

Unit - V

Pavement Maintenance: Functional & Structural deterioration of pavements, principles of pavement evaluation, types of pavement failures, cases, maintenance measures for road drainage system & pavements.

7 Hrs.

Reference Books:

- 1) Khanna S.K. and Justo C E G., "Highway Engineering", Nemchand and Bros, Roorkee, Revised Tenth Edition, 2017.
- 2) Kadiyali L.R., "Traffic Engineering And Transport Planning", Khanna Publishers, New Delhi, Ninth Edition, 2017.
- 3) Srinivasa Kumar S., "Textbook of Highway Engineering", Universities Press, Hyderabad, 2011.

Contact Hours: 39

Course Learning Objective (CLOs): Water Supply Engineering is taught as one of the core courses in Civil Engineering program. In this course, basic knowledge of drinking water, its requirement, effects on health & utility, source finding, its quality and quantity, transportation of raw water to the treatment plant, water treatment as per IS codes & design of distribution system are dealt. The delivery of topics will be made through lecture classes, demonstrations and field visits. The delivery of topics will be made through lecture classes. The evaluation is made by means of the internal assessment tests and semester end examination.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs (1-12)/ PSOs (13-15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level(1)
CO-1	Characterize the sources of drinking water with respect to quantity and quality. Compute water demand by population forecasting methods.	3,4	12	
CO-2	Explain the quality parameters of water and their effects on human health.		3,4	
CO-3	Identify suitable source for water supply scheme and Design a system for transporting water to the treatment plant.		3,4	
CO-4	Design water treatment plant.	11		
CO-5	Explain miscellaneous water treatment techniques and design distribution system.		5	

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level			2.33	2.33	2						3	2			

Contents:

Unit - I

Introduction: Human activities and environmental pollution. Water for various beneficial uses and quality requirements. Need for protected water supply.

Demand of water: Types of water demands- domestic demand in detail, institutional and commercial, public uses, fire demand. Per capita consumption – factors affecting per capita demand, population forecasting, different methods with merits & demerits- variations in demand of water. peak factors, design periods & factors governing the design periods. **8 Hrs.**

Unit - II

Quality of water: Objectives of water quality management, water borne diseases. Water quality parameters – Physical, chemical and Microbiological. Sampling of water for examination. Drinking water standards BIS & WHO guidelines. Health significance of Fluoride, Nitrates and heavy metals like Mercury, Chromium, Cadmium, Arsenic etc. **07 Hrs.**

Unit - III

Sources of water: Surface and subsurface sources – suitability about quality and quantity.

Collection and conveyance of water: Intake structures – different types of intakes; factor of selection and location of intakes. Pumps- Necessity, types – power of pumps; factors for the selection of a pump. Pipes – Design of the economical diameter for the rising main; Pipe appurtenances. **07 Hrs.**

Unit - IV

Water treatment: Objectives – Treatment flow-chart. Aeration Principles, types of Aerators. sedimentation: Theory, settling tanks, types, design. Coagulant aided sedimentation, jar test.

Filtration: Mechanism – theory of filtration, types of filters, slow sand, rapid sand including construction, operation, cleaning and their design – excluding under drainage system – back washing of filters. Operational problems in filters.

Disinfection: Theory of disinfection, types of disinfection, Chlorination, chlorine demand, residual chlorine, use of bleaching powder. **9 Hrs.**

Unit - V

Miscellaneous treatment: Softening – definition, methods of removal of hardness by lime soda process and zeolite process, Removal of color, odor, taste, use of copper sulfate, fluoridation and de-fluoridation.

Distribution systems: System of supply, service reservoirs and their capacity determination, methods of layout of distribution systems network analysis using Hardy Cross method. Pipe appurtenances, various valves, pipefitting, Layout of water supply pipes in buildings. **8 Hrs.**

Reference Books:

- 1) S. K. Garg., “Water Supply Engineering”, Khanna Publishers. 32nd Edition, 2018.
- 2) B. C. Punmia and Ashok Jain, “Environmental Engineering I”, Laxmi Publication, 2nd Edition, 2005.

- 3) K N Duggal, "Elements of Environmental Engineering", S Chand Publishing. 3rd Edition, 2007.
- 4) Metcalf and Eddy, "Wastewater Engineering, Treatment and Reuse", Tata McGraw Hill Publishing Co. Ltd. 4th Edition, 2017.
- 5) Peavy H.S., Rowe D.R., and Tchobanoglous G., "Environmental Engineering", McGraw Hill Book Co., 4th Edition, 2013.

22UCVL403

Fluid Mechanics Laboratory

(0-0-2)1

Contact Hours: 26

Course learning objectives (CLOs): Fluid Mechanics laboratory is taught as a laboratory course in Civil Engineering program. In this course, use flow measuring devices as per the requirements, calculate major and minor losses in pipe and pipe fittings, calibration of triangular and trapezoidal notches, calibration of venture meter, determination of hydraulic coefficients for orifices and mouthpieces, calibration of broad crested weir and ogee weir, calibration of venture flume experiments are dealt. The delivery of topics will be made through demonstration and Laboratory work. The evaluation will be carried out through continuous evaluation & Semester End practical examination.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs (1-12)/ PSOs (13-15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Calculate coefficient of discharge for flow measuring equipment in open channels and closed conduits.		15	9
CO-2	Calculate friction factor and major & minor losses in pipes.		15	9
CO-3	Test and verify Bernoulli's theorem.		15	9

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level									1						2

Contents:

- 1) Calibration of notches in open channel flow.
- 2) Calibration of Venturimeter and Orificemeter in pipe.
- 3) Determination of hydraulic coefficients for orifices and mouthpieces (external cylindrical only).
- 4) Calibration of broad crested weir.
- 5) Calibration of Venturiflume.
- 6) Estimate major and minor losses in pipe and pipe fittings.

7) Verification of Bernoulli's theorem.

Reference Books:

1. Sarbjit Singh, "Experiments in Fluid Mechanics" -PHI Pvt. Ltd., New Delhi. 2nd Edition, 2012.
2. Mohd. Kaleem Khan, "Fluid mechanics and Machinery", Oxford University Press. 1st Edition, 2015.
3. P. N. Modi and S. M. Seth, "Hydraulics and Fluid Mechanics, including Hydraulic Machines", Standard Book House, New Delhi. 22nd Edition, 2019.

22UCVL404

Computer Aided Building Drawing

(0-0-2)1

Total Hrs: 26

Course Learning Objective (CLO): Computer Aided Building Planning and Drawing is taught as a laboratory subject for Civil Engineering Program. Objectives of the course is to provide students with understanding to gain skill set to prepare Computer Aided Engineering Drawings, Understanding the details of construction of different building elements, visualize the completed form of the building and the intricacies of construction based on the engineering drawings, get familiarization of practices used in Industry. The evaluation will be carried out through continuous evaluation & end semester practical examination.

Course Outcomes (CO):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs (1-12)/ PSOs (13-15)		
		Substantial Level (3)	Moderate level (2)	Slight Level (1)
CO-1	Prepare, read, and interpret the drawings in a professional set up.	5	6	
CO-2	Know the procedures of submission of drawings and Develop working and submission drawings for building.	9	6	8
CO-3	Plan and design of residential or public building as per the given requirements.	10	12	

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level					3	2		1	3	3		2			

Course Contents:

- 1) Drawing Basics: Selection of scales for various drawings, thickness of lines, dimensioning, abbreviations, and conventional representations as per IS:962 (Code of practice for architectural and building drawings). **5 hrs**

2) Simple Engineering Drawings with CAD Drawing Tools: Lines, Circle, Arc, Poly line, Multiline, Polygon, Rectangle, Spline, Ellipse. Modify tools: Erase, Copy, Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Trim, Extend, Break, Chamfer and Fillet. Using Text: Single line text, Multiline text, Spelling, Edit text. Special Features: View tools, Layers concept, Dimension tools, Hatching, Customizing Toolbars, Working with multiple drawings. **7 hrs**

3) Drawings of Different Building Elements: Following drawings are to be prepared for the data given using CAD Software a) Cross section of Foundations, b) Dog legged staircase.

Note: Students should sketch to dimension the above in a sketch book before doing the computer drawing. **12 hrs**

4) Building Drawings: Principles of planning, planning regulations and building byelaws, factors affecting site selection, Functional planning of residential buildings. Recommendations of NBC. Drawing of plan, elevation, and sectional elevation for residential building. **12 hrs**

Note: Students should sketch to dimension the above in a sketch book before doing the computer drawing. Single line diagrams to be given in the examination.

Reference Books:

- 1) M.G. Shah, C.M. Kale, S.Y. Patki, "Building drawing with an integrated approach to Built Environment Drawing", Tata McGraw Hill Publishing Co. Ltd, New Delhi. 5th Edition, 2017.
- 2) Gurucharan Singh, "Building Construction", Standard Publishers & distributors, New Delhi. 17th Edition, 2019.
- 3) Malik R.S. and A Meo G.S., "Civil Engineering Drawing", Asian Publishers/ Computech Publication Pvt Ltd. Revised Edition, 2021.
- 4) IS: 962-1989 (Code of practice for architectural and building drawing).
- 5) National Building Code 2016, BIS, New Delhi.

22USCVC405

Concrete Technology

(3-0-0)3

Contact Hours: 39

Course Learning Objective (CLOs): Concrete Technology is taught as one of core subjects for Civil Engineering Program. In this course, topics on ingredients of concrete, manufacture of concrete, properties of fresh and hardened concrete, special concrete, non-destructive testing of concrete and concrete mix design are dealt. The delivery of topics will be made through lecture classes and demonstration. The evaluation is made by means of the internal assessment tests and semester end examination.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs (1-12)/ PSOs (13-15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Explain various properties of ingredients of concrete.		1,2,6	
CO-2	Select materials and follow procedures to manufacture concrete and evaluate the properties of concrete in fresh state.	3,4	9	7,12
CO-3	Evaluate properties of concrete in hardened state and explain non-destructive tests.	3,4,5	6,7,9	12
CO-4	Identify suitable type of concretes based on site conditions for specific purpose of works.	13	7	12
CO-5	Design concrete mix as per IS 456: 2000 and IS10262: 2019.	3,13	4	6,12

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	2	2	3	2.7	3	1.7	1.7		2			1	3		

Contents:

Unit - I

Ingredients of concrete:

Cement: Manufacture of Portland cement, chemical composition, hydration of cement, classification and types of cement, tests on cement.

Aggregate: Classification, mechanical and physical properties, deleterious materials, soundness, alkali-aggregate reaction, grading of aggregate, tests on aggregate, artificial and recycled aggregate.

Water: Quality of Water, mixing water, curing water.

09 Hrs.

Unit - II

Manufacture of concrete: Batching, mixing, transporting, placing, compaction, finishing, curing.

Properties of concrete in fresh state: Factors affecting workability, segregation and bleeding, harshness, measurement of workability, admixture, plasticizers, accelerators, retarders and air entraining agents.

07 Hrs.

Unit - III

Properties of concrete in hardened state: Unit weight, strength characteristics, impermeability, durability, dimensional changes.

Non-destructive testing of concrete: Importance, methods-Rebound hammer test, penetration and pullout test, Ultrasonic pulse velocity test-Principles, applications and limitations. **07 Hrs.**

Unit - IV

Special concretes:

Light weight concrete, polymer concrete, fiber reinforced concrete, ready mix concrete, Ferro cement concrete, mass concrete, high strength/performance concrete, pumped concrete, no fines concrete. Under water concreting / hot and cold weather concreting / shotcreting. Introduction to self-compacting concrete.

07 Hrs.

Unit - V

Concrete Mix design: Concept of Mix design, variables in proportioning, Exposure conditions, Procedure of mix design as per IS 10262-2019, numerical examples of mix design with and without mineral admixtures. **09 Hrs.**

Reference Books:

- 1) Shetty M.S., "Concrete Technology" -Theory and Practice, S. Chand and company, New Delhi. 8th Edition, 2019.
- 2) Neville A.M. & Brooks J.J., "Concrete Technology", Trans-Atlantic Publications, Philadelphia, USA. 2nd Edition, 2019.
- 3) Gambhir M.L., "Concrete Technology", Tata McGraw Hill, Education, New Delhi. 5th Edition, 2017.
- 4) IS 10262: 2019, "Recommended guidelines for concrete mix design", BIS publication, New Delhi.
- 5) IS 456: 2000., "Plain and Reinforced Concrete – Code of practice".

22UHVK406

Universal Human Values - II

(1-0-0) 1

Contact Hours: 13

Course Learning Objectives (CLOs):

This course provides an opportunity for the students to enhance their life skills like right understanding leading to the harmonious living in relationship with the society and environment enhancing holistic development of the students.

Course Outcomes (COs):

Description of the course outcome: At the end of course, the student should be able to:		Mapping to POs (1-12)/ PSOs (13-15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Recite and follow interpersonal relations with peers and the society.	6		
CO-2	Demonstrate the concept of harmony in nature and need of self-regulation.		6,9	
CO-3	Recite and follow Natural Acceptance		9	

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	and Differentiate between Intention and Competence.			
CO-4	Differentiate between the characteristics and activities of different orders existing in Nature and demonstrate the role of human beings in mutual fulfillment with all the orders of Nature.	7		
CO-5	Visualize and involve in the strategic preparation for Universal Human Order.	8	9	

POs	1	2	3	4	5	6	7	8	9	10	11	12
Mapping level	-	-	-	-	-	2.5	3	3	2	-	-	-

Contents:

UNIT - I

Harmony in the Society: Understanding Universal Human Order

Understanding Human Goal, Appraisal of the Current Status, The Way Ahead, Dimensions of Human Order.

02 Hrs

UNIT - II

Harmony in the Nature

Nature as Collection of Units: Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature – recyclability and self-regulation in nature, understanding existence as co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Dependence of the Human Being on the Other Three Orders.

03 Hrs.

UNIT - III

Harmony in Existence: Understanding Co-existence at Various Levels

Existence as Units in Space, Understanding Submergence, Existence as Co-existence – Units Submerged in Space, Development in the Existential Sense, Expression of Co-existence at Different Levels, Understanding Role of Human Being in Existence.

03 Hrs.

UNIT - IV

Ethical Human Conduct and Professional Ethics in the Light of Right Understanding

Universal Values Naturally Emerging from the Right Understanding, Definitiveness of Ethical Human Conduct, Development of Human Consciousness, Implications of Value-based Living, Profession – in Context with the Comprehensive Human Goal, Ensuring Ethical Competence, Issues in Professional Ethics – The Current

Scenario, Prevailing Approaches towards, Promotion of Professional Ethics – their Inadequacy, Inherent Contradictions and Dilemmas and Their Resolution. **03 Hrs.**

UNIT - V

Holistic Development towards Universal Human Order

Visualization of Comprehensive Human Goal, Vision for Holistic Technologies, Production Systems and Management Models, Journey towards Universal Human Order – The Road Ahead **02 Hrs.**

Reference Book:

- 1) R.R.Gaur, R Asthana, and G.P Bagaria. “**A Foundation Course in HUMAN VALUES and professional Ethics**”, 2nd Revised Edn. EXCEL BOOKS, New Delhi. 2019.

22UCVE421 Building Planning and Drawing - II (0-0-2)1

Contact Hours: 26

Course Learning Objective (CLOs): Building Planning and Drawing-II is taught as one of the core courses in Civil Engineering program. In this course, topics on designing residential buildings following the principles of planning and rules of regular setback are dealt. The delivery of topics will be made through lecture classes and drawing sessions. The evaluation is made by means of the internal assessment tests and semester end examination.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs (1-12)/ PSOs (13-15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level(1)
CO-1	Explain principles of planning and rules of setback.	3	2	1
CO-2	Design and develop architectural plan for residential buildings.	3	2	1

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	1	2	3												

Contents:

Unit - I

Introduction: Rules of regular setbacks, Zoning regulations and Dimensions of building components. **13 Hrs.**

Unit - II

Planning and designing of Buildings: Planning and architectural design of 1BHK, 2 BHK residential buildings following principles of planning. **13 Hrs.**

Note: Scheme of evaluation for CIE: 3 IAs of 1 ½ hour duration each (best two) 40 marks.

Drawings to be prepared: Residential buildings - 4 sheets. The drawing sheets prepared during the drawing sessions will be evaluated for 10 marks as CTA.

Pattern of question paper for SEE: Duration is 2 hours. There shall be two questions, one from Unit I carrying 15 marks and another from Unit II carrying 35 marks. In Unit II, two questions will be given, and the candidate shall answer anyone.

Reference Books:

- 1) Shah M.G and Kale C.M., Patki S.Y., “Building Drawing with an Integrated Approach to Built Environment”, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 5th edition, 2017.
- 2) Malik R S and Meo G S, “Civil Engineering Drawing”, Asian Publishers / Computech Publications Pvt. Ltd., Revised Edition, 2021.
- 3) IS: 962-1989 (Code of practice for architectural and building drawings), 2nd Revision, 2001.
- 4) National Building Code, Volume 1 & 2, BIS, New Delhi, 2016.
- 5) Building byelaws of local authority: Zonal Regulations, Hubballi Dharwad Urban Development Authority, Revision 2, 2021.

22UBEK407

Biology for Engineers

(1-0-0) 1

Contact Hours: 13

Course Learning Objective (CLO):

1. Gain a fundamental understanding of basic biological concepts and their relevance to engineering applications.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to		Mapping to POs (1-12) /PSOs (13-15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Demonstrate an understanding of the diverse applications of biomolecules.	1	2,3	13
CO-2	Demonstrate an understanding of the architecture and functioning of the brain, eye, and heart as integral systems in the human body.	2,3	1	-

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CO-3	Understand the structure, functions, and bioengineering approaches related to the lungs, kidneys, muscular system, and skeletal system.	13	2,3	1
CO-4	Understand nature-inspired materials and mechanisms.	13	2,3	1
CO-5	Understand the latest trends in bioengineering.	2,3	1	13

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	1.8	2.4	2.4	-	-	-	-	-	-	-	-	-	2	-	-

Course content:

Unit - I

Biomolecules and their applications: Carbohydrates, Nucleic acids, Proteins, lipids, and Enzymes. **03 Hrs.**

Unit - II

Human organ systems and bio designs - 1: Brain as a CPU system, Eye as a Camera system, Heart as a pump system. **03 Hrs.**

Unit - III

Human organ systems and bio-designs - 2: Lungs as purification system, Kidney as a filtration system, Muscular and Skeletal Systems as scaffolds. **02 Hrs.**

Unit - IV

Nature-bioinspired materials and mechanisms: Echolocation, Photosynthesis, Bird flying (GPS and aircrafts), Shark skin (Friction reducing swimsuits), Kingfisher beak (Bullet train). Human Blood substitutes. **03 Hrs.**

Unit - V

Trends in bioengineering: Bioprinting techniques and materials, 3D printing of ear, bone, and skin. Electrical tongue and electrical nose in food science, Bioimaging and Artificial Intelligence for disease diagnosis. **02 Hrs.**

Reference Books:

- Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022
- Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012.

3. Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011. • Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.
4. Bioremediation of heavy metals: bacterial participation, by C R Sunilkumar, N Geetha A. C. Udayashankar Lambert Academic Publishing, 2019.
5. Electronic Noses and Tongues in Food Science, Maria Rodriguez Mende, Academic Press, 2016

22UMBA401 Engineering Mathematics (3-0-0) Audit
Contact Hours: 39 Hrs.

Course Learning Objectives (CLOs):

This course will enable students to use Laplace transform to solve differential equations. Analyze and Solve system of linear equation. Understand the concept of vector differentiation and vector integration.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs (1-12)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Transform the given function using Laplace transforms and study their properties.	-	-	1,2
CO-2	Apply Laplace transform to solve differential equations.	-	-	1,2
CO-3	Compute the solution of system of equations. Evaluate Eigen values and Eigen vectors for a matrix.	-	1,2	
CO-4	Study vector calculus and compute gradient, divergence, curl of a single valued function.	-		1,2
CO-5	Study vector integration and evaluate Line integrals, Surface integrals and Volume integrals	-		1,2

POs	1	2	3	4	5	6	7	8	9	10	11	12
Mapping Level	1.2	1.2										

Course Content:**Unit - I****Laplace Transforms:**

Definition and Properties. Laplace transforms of elementary functions. Laplace transform of $e^{at}f(t)$ Laplace transform of $t^n f(t)$, Laplace transform of $\frac{f(t)}{t}$,Laplace transforms of Periodic functions and Unit - step function–problems. **8 hrs.**

Unit - II**Inverse Laplace Transforms**

Inverse Laplace transform -problems with standard, Convolution theorem (without proof) to find the inverse Laplace transform and problems. Solution of linear differential equations using Laplace transform. **8 hrs.**

Unit - III**Elementary Linear Algebra:**

Rank of a matrix - Row Echelon form. Test for consistency for system of linear equations. Solution of system of linear equations – Gauss-elimination method(consistency), Gauss-Seidel iterative method. Eigen values and Eigen vectors- Rayleigh’s power method. **8 hrs.**

Unit - IV**Vector Calculus:**

Vector Differentiation: Scalar point function and vector point functions. Gradient, Directional Derivative; Curl and Divergence-physical interpretation. Solenoidal and irrotational vectors. Illustrative problems. **8 hrs.**

Unit - V**Vector Integration:**

Line integrals, Surface integrals and Volume integrals. Green’s theorem, Gauss divergence theorem and Stoke’s theorem (only statements). **7 hrs.**

Reference books

1. B.S. Grewal, “Higher Engineering Mathematics, Khanna Publishers”, 44th edition, 2017.
2. Rajesh Verma & H.K. Dass, “Higher Engineering Mathematics”, 3rd edition. 2014.

Note: 1. Grades (i) PP (ii) NP
2. No semester End Examination
3. Audit (Bridge course)

22UNSK408**National Service Scheme****(0-0-2) Audit****Contact Hours: 24****Course Learning Objectives:**

1. Understand the community in which they work.

2. Identify the needs and problems of the community and involve them in problem-solving.
3. Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
4. Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.
5. Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony.

Pre-requisites:

1. Students should have a service-oriented mind set and social concern.
2. Students should have dedication to work at any remote place, anytime with available resources and proper time management for the other works.
3. Students should be ready to sacrifice some of the time and wishes to achieve service-oriented targets on time.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO1	Understand the importance of his / her responsibilities towards society.	12	6	8
CO2	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.	12	6	8
CO3	Evaluate the existing system and to propose practical solutions for the same for sustainable development.	12	6	8,
CO4	Implement government or self-driven projects effectively in the field.	12	6	8

POs	1	2	3	4	5	6	7	8	9	10	11	12
Mapping Level	-	-	-	-	-	2	-	1	-	-	-	3

Contents

1. Waste management– Public, Private and Govt organization.
2. Setting of the information imparting club for women leading to contribution in social and economic issues.

3. Water conservation techniques – Role of different stakeholders– Implementation.
4. Preparing an actionable business proposal for enhancing the village income and approach for implementation.
5. Helping local schools to achieve good results and enhance their enrolment in Higher/ technical/ vocational education.
6. Developing Sustainable Water management system for rural areas and implementation approaches.
7. Contribution to any national level initiative of Government of India. For e.g. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc.
8. Spreading public awareness under rural outreach programs. (Minimum 2 programs).
9. Social connect and responsibilities.
10. Plantation and adoption of plants. Know your plants.
11. Organize National integration and social harmony events /workshops /seminars. (Minimum 02 programs).
12. Govt. school Rejuvenation and helping them to achieve good infrastructure.

AND

ONE NSS – CAMP @ College /University /State or Central Govt Level

/NGO’s /General Social Camps

Students must take up anyone activity on the above said topics and have to prepare content for awareness and technical contents for implementation of the projects and have to present strategies for implementation of the same. Compulsorily students must attend one camp.

CIE will be evaluated based on their presentation, approach and implementation strategies.

Reference Books:

NSS Course Manual, Published by NSS Cell, VTU Belagavi

22UPYK408 Physical Education and Yoga (0-0-2) Audit

Contact Hours: 24

Course Learning Objectives:

1. The course focuses on overall development and the importance of Physical Education & Yoga Day to day life.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO1	Gaining the importance of Physical Education & yoga.	12		8, 9

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CO2	Understanding the benefits & preventive measures of health.	12	6	8, 9
CO3	Gaining the knowledge of yoga.	12		8, 9
CO4	Understanding the importance of Human Body conditioning.	12		8, 9
CO5	Get awareness of Modern technology in sports.	12		5, 8, 9

POs	1	2	3	4	5	6	7	8	9	10	11	12
Mapping Level	-	-	-	-	1	2	-	1	1	-	-	3

Contents:

Unit - I

Introduction to physical education: Meaning and importance, definition, components, benefits of physical education. **04Hrs**

Unit - II

Health and wellness, Anatomy and Physiology: Meaning and importance, definition, components, benefits, health habits, basics of diseases and preventive measures, mental health, physical health, social health, spiritual health. Meaning and definition, first aid, injuries and preventions. **05Hrs**

Unit - III

Introduction of yoga: Origin and history of Yoga, meaning and definition, benefits, importance & Methods of prayer, asana, pranayama, mudras (Suryanamaskara, Standing Asanas, Sitting Asanas, Pron Asanas, Supine Asanas, Pranayama & Mudras) **05Hrs**

Unit - IV

Sports training: Meaning and definitions, warming up, cooldown, methods of exercises, stretching, speed, endurance, flexibility, agility and coordination, types of sports training and recovery, Fitness Components, Sports training, Sports & Games. (Speed, Strength, Endurance, Agility, Flexibility, Athletics, Basketball, Kabaddi, Kho Kho, Volleyball, Throwball, Football, Cricket, Handball, Hockey & Indoor games.) **05 Hrs**

Unit - V

Modern technology in sports and games: Meaning and definitions, objectives, assisting umpires/ referees, hawk-eye technology, sports specific, computer software, technology in playfields, athletes clothing and equipment, graphics of sports and games, artificial intelligence. **05Hrs**

Reference Books:

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- 1) Petipus, et al., Athlete's Guide to Career Planning, Human Kinetics, 1997
- 2) The Human Body in Health and Disease with Access 8th Edition 2023.
- 3) Anatomy and Physiology, Shri K.G. Nadgir College of Physical Education. Dharwad.
- 4) Health & Wellness Shri K.G. Nadgir College of Physical Education. Dharwad.
- 5) Nagendra HR., The art and science of Pranayama, 2009.
- 6) Iyengar BKS., The illustrated Light on Yoga (English), 2005.

Courses with LTP 3-0-0 and 4-0-0 or 2-2-0/3-2-0

Continuous Internal Evaluation (CIE):

- Two Internal Assessment and one Improvement test each of 20 marks and one hour duration.
- Two higher scores from three tests are taken representing 40 marks.
- Question Paper pattern for Internal Assessment: 3 questions of 10 marks each with maximum of two subdivisions. Q.3 is compulsory and one question to be answered from Q.1 and Q.2.
- Course Teacher Assessment (CTA): Minimum two components such as quiz, seminar, written assignment, any technical activity related to course each of 5marks. Total CTA marks-10
- CIE=40 (from tests) +10(from CTA) =50 marks

Semester End Examination (SEE):

- SEE is conducted for 100 marks with 3 hours duration. It is reduced to 50 marks.
- Question Paper pattern for SEE: Five units with built in choice. Each question has a maximum of three subdivisions.
- Two questions are to be set from each unit with built in choice, for example Q1 or Q2 in unit –I, Q 3 or Q 4 in unit-II and so on.
- A total of 5 full questions to be answered choosing one full question from each unit. All five units are to be answered compulsorily.
- Each question is of 20 marks.
- The Question paper is to be set for duration of 3 hours both for 3 and 4 credits courses.
- The Question paper is to be set for 100 marks for 3 and 4 credits courses.

ASC(IC)/PCC with LTP 2-0-2, 3-0-2 and 2-2-2

Continuous Internal Evaluation (CIE):

Theory CIE component:

- Two Internal Assessment and one Improvement test each of 20 marks and one hour duration.
- Two higher scores from three tests are taken representing 40 marks.
- Question Paper pattern for Internal Assessment: 3 questions of 10 marks each with maximum of two subdivisions. Q.3 is compulsory and one question to be answered from Q.1 and Q.2.

Course Teacher Assessment (CTA): Totally based on conduction of experiments as set by the course teacher.

Laboratory component assessment:

- 5 marks: for conduction, regularity, involvement, journal writing, etc. A minimum of 75% of attendance is compulsory. If the performance is not satisfactory in the laboratory the student shall be detained and required to reregister for the course whenever offered next.
- 5 marks: Lab Test. A Lab test as per the class timetable has to be conducted at the end for 50 marks and scale down to 5 marks.
- CIE for integrated course =40 (from IA tests) +10 (from CTA i.e. lab component) =50 marks.
- There will not be any remuneration for the Final Lab Test since it is CTA of integrated course.
- Copy of the Marks list to be sent to the concerned course instructor immediately after the completion of test for that batch. Original Marks list to be maintained in the department.
- CIE=40(from tests) +10(from CTA i.e., lab component) =50 marks

Semester End Examination (SEE):

- SEE is conducted for 100 marks with 3 hours duration. It is reduced to 50 marks.
- Question Paper pattern for SEE: Five units with built in choice. Each question has a maximum of three subdivisions.
- Two questions are to be set from each unit with built in choice, for example Q1 or Q2 in unit –I, Q 3 or Q 4 in unit-II and so on.
- A total of 5 full questions to be answered choosing one full question from each unit. All five units are to be answered compulsorily.
- Each question is of 20 marks.
- The Question paper is to be set for duration of 3 hours both for 3 and 4 credits courses.
- The Question paper is to be set for 100 marks for 3 and 4 credits courses.

AEC/HSMS/UHV Courses with LTP 1-0-0:

Continuous Internal Evaluation (CIE)

- Two Internal Assessment and one Improvement test each of 20 marks and one hour duration.
- Two higher scores from three tests are taken representing 40 marks.
- Question Paper pattern for Internal Assessment: MCQ 20 questions
- Course Teacher Assessment (CTA): Minimum two components such as quiz, seminar, written assignment, any technical activity related to course etc. each of 5marks. Total CTA marks-10
- CIE=40(from tests) +10(from CTA) =50 marks

Semester End Examination (SEE):

- SEE is conducted for 50 marks of 1 hour duration. There will be 50 MCQs.
- Question Paper pattern for SEE: The question paper will contain 12 MCQ questions drawn from each Unit.
- Students must answer a maximum of 10 questions from each unit.
- All five units are to be answered compulsorily.

For NSS/Physical Education/Yoga Audit Courses with LTP 0-0-2

Continuous Internal Evaluation (CIE)

- All students must register for any one course in each semester of III to VI with concerned course instructor.
- The department must make a faculty coordinator for the above audit courses and the details of the students must be maintained.
- The concerned course instructor must define the set of activities and its schedule of the conduction in NSS, PE and Yoga by getting approval from Dean Academic Program.
- The course instructor must conduct the events as per the schedule and maintain the attendance for the same. 75% attendance is mandatory.
- The course instructor must assess the students by conducting the MCQ test for 50 marks to be conducted during the improvement test for other courses.
- The course instructor must send the marks and attendance register to the respective departments.
- The faculty coordinator of the department must maintain the same and arrange for sending the marks to CoE.