Scheme & Syllabus (1st Year)

Bachelor Degree in Engineering
(Common to all Branches)

(With effect from 2021 Academic Year)

Out Come Based Education
With
Choice Based Credit System

P.D.A. College of Engineering, Aiwan-E-Shahi Area, Kalaburagi-585102, Karnataka
(An Autonomous Institution Affiliated to VTU, Belagavi.)

Grant-in- Aid Institution
(Government of Karnataka)
Accredited by NBA, New Delhi.
Approved by AICTE, New Delhi.

Ph.08472-224360, Fax: 255685, Website: www.pdaengg.com Email ID: principal@pdaengg.com

CONTENTS			
Sl. No	Particulars/Course Title	Code	Page No.

POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING, KALABURAGI
Scheme of Teaching and Examination 2021 – 22
Choice Based Credit System (CBCS)
(Effective from the academic year 2021 – 22)

I SEMESTER B.E./B.Tech (PHYSICS GROUP)

Sl. No.	Course and Course Code		Course Title	Teaching Department	Paper Setting Board	Teaching Hours/Week			Examination				Credits
						Theory Lecture	Tutorial	Practical/Drawing	Duration in hours	SEE Marks	CIE Marks	Total Marks	
1.	BS	21MA11	Calculus and Linear Algebra	Mathematics	Mathematics	3	-	--	03	50	50	100	3
2.	BS	21 PH12	Engineering Physics	Physics	Physics	3	-	--	03	50	50	100	3
3.	HU	21HU13	Technical English 1	Humanities	Humanities	2	--	--	02	50	50	100	2
4.	ES	21EE14	Basic Electrical Engineering	E and E Engineering	E and E Engineering	3	-	--	03	50	50	100	3
5.	ES	21ME15	Computer Aided Engineering and Drawing	Mechanical Engineering	Mechanical Engineering	2	--	2	03	50	50	100	3
6.	ES	21EC17	Basic Electronics	ECE Dept	ECE Dept	3	-	-	03	50	50	100	3
7.	BS	21PHL11	Engineering Physics Laboratory	Physics	Physics Dept	--	--	2	03	50	50	100	1
8.	ES	21EEL12	Basic Electrical Engineering Laboratory	E and E Engineering	E and E Engineering	--	--	2	03	50	50	100	1
9.	AE	21AE19X	Ability Enhancement/Skill Enhancement Course								100	100	1
Total						**16**	**--**	**06**	**23**	**400**	**500**	**900**	**20**

Note: BS: Basic Science, ES: Engineering Science, Hu: Humanities

POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING, KALABURAGI
Scheme of Teaching and Examination 2021 – 22
Choice Based Credit System (CBCS)
(Effective from the academic year 2021 – 22)

I SEMESTER B.E./B.Tech (CHEMISTRY GROUP)

Sl. No.	Course and Course Code		Course Title	Teaching Department	Paper Setting Board	Teaching Hours/Week			Examination				Credits
						Theory Lecture	Tutorial	Practical/Drawing	Duration in hours	SEE Marks	CIE Marks	Total Marks	
1	BS	21MA11	Calculus and Linear Algebra	Mathematics	Mathematics Dept.	3	-	--	03	50	50	100	3
2	BS	21CH12	Engineering Chemistry	Chemistry	Chemistry Dept.	3	-	--	03	50	50	100	3
3	HU	21HU13	Technical English-I	Humanities	Humanities	2	--	--	2	50	50	100	2
4	ES	21CS14	C Programming for Problem Solving	Computer Science & Engineering	Computer Science & Engineering	3	-	--	03	50	50	100	3
5	ES	21ME16	Mechanical Engineering Science	Mechanical Engg. Dept.	Mechanical Engineering	2	--	2	03	50	50	100	3
6	ES	21CV17	Engineering Mechanics	Civil Engineering	Civil Engineering	3	--	--	03	50	50	100	3
7	BS	21CHL11	Engineering Chemistry Laboratory	Chemistry	Chemistry Dept.	_	--	2	03	50	50	100	1
8	ES	21CSL12	Computer Programming Laboratory	Computer Science & Engineering	Computer Science & Engineering	--	--	2	03	50	50	100	1
9		21AE19X	Ability Enhancement/ Skill Enhancement Course								100	100	1
					Total	**16**	**--**	**06**	**23**	**400**	**500**	**900**	**20**

POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING, KALABURAGI
Scheme of Teaching and Examination 2019 – 20
Choice Based Credit System (CBCS)
(Effective from the academic year 19 – 20)

II SEMESTER B.E./B.Tech (PHYSICS GROUP)

Sl. No.	Course and Course Code		Course Title	Teaching Department	Paper Setting Board	Teaching Hours/Week			Examination				Credits
						Theory Lecture	Tutorial	Practical/Drawing	Duration in hours	SEE Marks	CIE Marks	Total Marks	
1.	BS	21MA21	Differential Equations and Laplace Transforms	Mathematics Dept	Mathematics Dept	3	-	--	03	50	50	100	3
2.	BS	21 PH22	Engineering Physics	Physics Dept	Physics Dept	3	-	--	03	50	50	100	3
3.	ES	21EE24	Basic Electrical Engineering	E and E Engineering	E and E Engineering	3	-	--	03	50	50	100	3
4.	Hu	21HU23	Technical English-II	Humanities	Humanities	2	--	--	02	50	50	100	2
5.	ES	21ME25	Computer Aided Engineering and Drawing	Mechanical Engineering	Mechanical Engineering	2	--	2	03	50	50	100	3
6.	ES	21EC27	Basic Electronics	ECE Dept	ECE Dept	3	-	-	03	50	50	100	3
7.	BS	21PHL21	Engineering Physics Laboratory	Physics Dept	Physics Dept	--	--	2	03	50	50	100	1
8.	ES	21EEL22	Basic Electrical Engineering Laboratory	E and E Engineering	E and E Engineering	--	--	2	03	50	50	100	1
9.		21AE29X	Ability Enhancement / Skill based course								100	100	1
Total						**16**	**--**	**06**	**23**	**400**	**500**	**900**	**20**

Note: BS: Basic Science, ES: Engineering Science, Hu: Humanities

POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING, KALABURAGI
Scheme of Teaching and Examination 2021 – 22
Choice Based Credit System (CBCS)
(Effective from the academic year 2021 – 22)

II SEMESTER B.E./B.Tech (CHEMISTRYGROUP)

Sl. No.	Course and Course Code		Course Title	Teaching Department	Paper Setting Board	Teaching Hours/Week			Examination				Credits
						Theory Lecture	Tutorial	Practical/Drawing	Duration in hours	SEE Marks	CIE Marks	Total Marks	
	BS	21MA21	Differential Equations and Laplace Transforms	Mathematics Dept	Mathematics Dept.	3	-	--	03	50	50	100	3
	BS	21CH22	Engineering Chemistry	Chemistry Dept	Chemistry Dept.	3	-	--	03	50	50	100	3
	HU	21HU23	Technical English-II	Humanities	Humanities	2	--	--	2	50	50	100	2
	ES	21CS24	C Programming for Problem Solving	Computer Science & Engineering	Computer Science & Engineering	3	-	--	03	50	50	100	3
	ES	21ME26	Mechanical Engineering Science	Mechanical Engg. Dept.	Mechanical Engineering	2	--	2	03	50	50	100	3
	BS	21CV27	Engineering Mechanics	Civil Engg Dept	Civil Engg. Dept	3	--	--	03	50	50	100	3
	BS	21CHL21	Engineering Chemistry Laboratory	Chemistry Dept	Chemistry Dept.	–	--	2	03	50	50	100	1
	ES	21CSL22	Computer Programming Laboratory	Computer Science & Engineering	Computer Science & Engineering	--	--	2	03	50	50	100	1
		21AE29X	Ability Enhancement/Skill based Course								100	100	1
					Total	**16**	**--**	**06**	**23**	**400**	**500**	**900**	**20**

PREFACE

Poojya Doddappa Appa College of Engineering, Kalaburagi was established in the year 1958 by Hyderabad Karnataka Education society (HKES), founded by Late Shri Mahadevappa Rampure. The KHE Society runs 48 education institutions.

The College campus is spread over 71 acres of land. The college was started with 50% central assistance and 50% state assistance. The initial intake was 120 with degree offered in three branches of engineering viz, Civil, Mechanical and Electrical Engineering. Now it houses 13 undergraduate courses, 10 post Graduate courses and 13 Research centers. All the courses are affiliated to Visvesvaraya Technological University, Belagavi. At present the total intake at UG level is 980 and at PG level is 193. There are 237 teachers in the College out of which 60 are getting salary from the State Government and rest of them are paid by the College management.

The college receives grant in aid funds from the state government. The National Board of Accreditation, New Delhi, accredited the College in the year 2005 for 09 UG courses out of which 08 courses were accredited for three years and 01 Course for 5 years. Six UG courses were accredited in the year 2009 for 03 years. Now the college has been accredited by NBA for 5 programs the accreditation is valid up to June 2022. Further 5 other program have applied and waiting for inspection by NBA.

The college is one among the 14 colleges selected under TEQIP, sponsored by World Bank. It has received a grant of Rs 10.45 Crores under this scheme for its development. The institution is selected for TEQIP phase II in year 2011 for four years. Institution received a grant of Rs 12.50 Crores under TEQIP phase-II scheme for its development. Further the college is selected for TEQIP phase III scheme and received a grant of Rs. 7 Crores under TEQIP Phase-III.

The College was granted autonomous status by the UGC for six years from 2009-10 to 2014-15. Granted the extension for 2014-15 to 2016-17 and further received the extension for 2017-18 to 2018-19.

Vision of the Institution

To be an institute of excellence in technical education and research to serve the needs of the industry and society at local and global levels.

Mission of the Institution

- To provide a high-quality educational experience for students with values and ethics that enables them to become leaders in their chosen professions.
- To explore, create and develop innovations in engineering and science through research and development activities.
- To provide beneficial service to national and multinational industries and communities through educational, technical and professional activities.

CALCULUS AND LINEAR ALGEBRA

(Common to all branches)

[As per Choice Based Credit System (CBCS) scheme]

(From the academic year 2021-22)

Course Code	21MA11	CIE Marks	50
Credits	03	SEE Marks	50
Contact Hours/Week (L-T-P)	3-0-0	Total Marks	100
Contact Hours	42	Exam Hours	03

Course Learning Objectives: This course (**21MA11**) will enable students to master the basic tools of differential & integral calculus, differential equations and elementary linear algebra and become skilled for solving problems in science and engineering.

MODULE-I **Differential Calculus-1** Polar curves - angle between the radius vector and tangent, angle between two curves, pedal equation. Curvature and radius of curvature in Cartesian and polar forms and simple examples. Taylor's and Maclaurin's series expansions for one variable (statements only)and examples. Evaluation of Indeterminate forms.	**8 Hours**
MODULE-II **Differential Calculus-2:-** Partial differentiation; Definition and simple problems, Euler's theorem (without proof) and examples, Total derivatives, differentiation of composite functions. Jacobians-Simple problems. Taylor's theorem for function of two variables (statement only) and simple examples. Maxima and minima for a function of two variables with illustrative examples	**9 Hours**
MODULE-III **Integral Calculus-I** Reduction formulae for the integration of $\sin^n x$, $\cos^n x$, $\tan^n x$ *and* $\sin^m x \cos^n x$ evaluation of these with standard limits- illustrative problems **Tracing of curves:** Cartesian, Parametric and Polar form. Evaluation of arc length, Surface area and Volume.	**8 Hours**
MODULE-IV **Integral Calculus-II** **Multiple integrals:** Evaluation of double and triple integrals. Evaluation of double integrals by change of order of integration and changing into polar co-ordinates. Applications to find area by double integration and volume by double and triple integration **Beta and Gamma functions:** definitions, Relation between beta and gamma functions and simple problems	**9 Hours**
MODULE-V **Elementary Linear Algebra:** Rank of a matrix-echelon form. Solution of system of linear equations – consistency. Gauss-elimination method, Gauss –Jordan method. Definition of Eigen values and Eigen vectors and simple examples **Infinite Series:** Convergence and divergence of infinite series-**P-series test Comparison test,** D'Alembert'sratio test, Cauchy's root test (without proof)- Illustrative examples.	**8 Hours**

Text Books:

1.B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed.,2015.

2.E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10thEd.(Reprint),2016.

Reference books:

1. Early Transcendental Calculus- James Stewart, Thomson Books, 5e 2007
2. N.P.Bali and Manish Goyal: A Text Book of Engineering Mathematics, Laxmi Publishers, 7th Ed., 2010.
3. B.V.Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. Veerarajan T.," Engineering Mathematics for First year", Tata McGraw-Hill, 2008.
5. Thomas G.B. and Finney R.L."Calculus and Analytical Geometry"9th Edition, Pearson,

E-Books and Online resources:

- http://.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/

Pedagogy (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop student's theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples
3. Support and guide the students for self–study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways: ● As an introduction to new topics (pre-lecture activity).

- As a revision of topics (post-lecture activity).
- As additional examples (post-lecture activity).
- As an additional material of challenging topics (pre-and post-lecture activity).

● As a model solution of some exercises (post-lecture activity).

Course Outcomes: On completion of this course, students are able to:

Course Code	CO #	Course Outcome (CO): At the end of the course student will be able to:
21MA11	CO1	Apply the knowledge of calculus to solve problems related to polar curves and its applications and expand functions using Taylor's and Mechaurin's series.
	CO2	Apply the partial differentiation to calculate rate of change of multivariate functions and solve the problems related to composite functions and Jacobeans
	CO3	Apply reduction formulae and solve the problem related to arc length, surface area and volume generated by revolving the curve

	CO4	Apply the concept of multiple integrals and their usage in computing the area and volume
	CO5	Make use of matrix theory for solving system of linear equation and compute Eigen values and Eigen vectors

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1										1
CO2	3	1										1
CO3	3	2										1
CO4	3	1										1
CO5	3	1										1
AVG	3	1.2										1

Engineering Physics
(Common to all branches)
[As per Choice Based Credit System (CBCS) scheme]
(From the academic year 2021-22)

Course Code	21PH12/22	CIE Marks	50
Credits	03	SEE Marks	50
Contact Hours/Week (L-T-P)	3-0-0	Total Marks	100
Contact Hours	42	Exam Hours	03

Course Learning Objectives:

1. Depreciate the learning of phenomenon of electrical polarization and dielectrics Prescribe the effect of external electrical field on dielectric materials.
2. Develop the implications of Quantum theory on the classical free electron theory and introduces the concept of Fermi energy through the Fermi Dirac statistics.
3. Superconductors and its applications through different effects.
4. Annalyse the basic account of the functioning of laser systems with applications.
5. Explain the propagations of light through the optical fibre and the applications of optical fibres.
6. To familiarize students with the concepts of elasticity and recognize the elastic properties of materials for engg. Applications.

MODULE-I **Applied Optics:** Basic principles of lasers, Requisites of laser system. Condition for laser action. Boltzmann factor. Numerical. Construction and working of Nd-YAG and semiconductor lasers. Application of lasers: LIDAR, Industrial, Medical, and Holography: Principle of recording and reconstruction of images. Optical fibers; propagation mechanism. Acceptance angle, numerical aperture. Condition for propagation. Fractional index change, relation between NA and fractional index change, V-number. Types of optical fibers. Attenuation Co-efficient, Application of fiber optics: Endoscopy, Temperature sensor. Numericals	**9 Hours**
MODULE-II **Crystallography** Space lattice, lattice parameters, unit cell. Crystal systems, sketch of Bravias lattice. Miller indices - procedure for finding miller indices. Planes in cubic unit cell. Expression for interplanar distance. Packing factor for SC, BCC and FCC. Crystal structure of NaCl. Numerical. Bragg‟s law, Braggs X-ray diffractometer and application for determination of wavelength & crystal structure. Crystal imperfection-point, line & planar defects(Qualitative**).** Numericals.	**8 Hours**
MODULE-III **Elastic Properties Of Materials:** Review of stress, strain, Hooke's law, Elasticity, plasticity, strain hardening, strain softening and failure (fracture/fatigue).Different elastic moduli and derivation of their inter relationships, Poisson's	**9Hours**

ratio. Bending of beams: Neutral surface and neutral plane, expression for bending moment of a beam (Derivation), Application example: single cantilever (Derivation), I-Shaped griders & twisting couples. Numericals.	
MODULE-IV **Dielectric properties of materials:** Dielectric materials: polar and non-polar dielectrics. Dielectric constant and loss. Types of polarization mechanism. Equation for internal field in liquids and solids (1D case & 3D solid). Classius-Mossoti equation. Description of solid, liquid & gaseous dielectrics with one example.Qualitative explanation of application of dielectrics in transformer. Numericals.	**8 Hours**
MODULE-V **Conductor and Superconductors:** Classification of solids, Electrical conduction, Classification of conducting materials. Concept of Fermi energy & Fermi level in solids, Expression for density of states. Fermi-Dirac statistics (Qualitative), Temperature dependence of resistivity in super conductors, Meissner effect, Types of super conductors, High temperature super conductors, applications of super conductors: Magnetic Levitation. Numerical	**8 Hours**

Text Books:

1.Engineering physics – S. P. Basavraju, Subhas Stores- 2011 Edition

2.V Rajendran, "Engineering Physics", Tata McGraw Hill Company Ltd, New Delhi-2012

Reference books:

1. S Mani Naidu, "Engineering Physics", Pearson India Limited-2014.
2. Engineering Physics-Gaur and Gupta-Dhanpat rai Publications-2017
3. A Marikani, "Engineering Physics", PHI Learning Private Limited Delhi-2013.
4. Wiley Precise Text, "Engineering Physics", Wiley India Private Ltd, New Delhi. Book Series-2014.

S. O. Pillai" Solid State Physics" New Age International Sixth Edition.

Course outcomes: On completion of the course, the student will have the ability to:

Course Code	CO #	**Course Outcome (CO):** At the end of the course student will be able to:
21PH12/22	CO1	Annalize the working principle of laser and optical fibers, explain the construction and working of laser and types of optical fibers, ,formulate and evaluate the numerical aperture , summarise the application of laser and optical fibers.(PO-1)
	CO2	Classify peculiar properties of crystal structure. Apply them in crystallography using X-ray diffraction technique. (PO-2)
	CO3	Analyze elastic modulii in different cases, understand various types of oscillations and their implications and recognize the elastic properties of materials for engg. Applications.
	CO4	Interprete the fundamental properties of dielectric and ferroelectric materials. Assess internal field for solids, Summarize its applications.

	CO5	Categorize properties of materials on band theory and evaluate the density of states in solids. Discuss the properties of superconductors. Explore technological applications

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										2
CO2	3	3										2
CO3	3	2										2
CO4	3	3										2
CO5	3	3										2
AVG	3	2.8										2

Question paper pattern: The SEE question paper will be set for **100 marks** and the marks scored by the student will be finally reduced to **50**.

- The question paper will have ten full questions carrying 20 marks each.
- There will be two full questions (with a maximum of four sub questions) from each module

The students will have to answer five full questions selecting one from each module

TECHNICAL ENGLISH - I

(Common to all branches)

[As per Choice Based Credit System (CBCS) scheme]

(From the academic year 2021-22)

Course Code	21HU13	CIE Marks	50
Credits	02	SEE Marks	50
Contact Hours/Week (L-T-P)	2-0-0	Total Marks	100
Contact Hours	28	Exam Hours	02

Course Learning Objectives: To enable the students to obtain the basic knowledge about Communication Skills - I in the following topics:-

- The Meaning, definition, importance, purpose, process, types, barriers and essential of communication.
- Develop reading and understanding ability
- Learn effective writing
- Learn how to write different types of letter.
- Case method of learning

MODULE-I INTRODUCTION TO COMMUNICATION: Meaning, Definition, Importance & Purpose of Communication, Process of Communication, Types of Communication, Communication network in an organization, 7c's of communication, Barriers to Communication and Essential of good Communication.	**6 Hours**
MODULE-II READING AND UNDERSTANDING Reading Comprehension – Reading rate and reading comprehension, Paraphrasing, Interpretations of graphical information, Book reading and summarizing it.	**6 Hours**
MODULE-III EFFECTIVE WRITING. Purpose of Writing, Clarity in Writing, Principle of Effective Writing. Better writing using personal Experiences – Describing a person, situation, memorable events etc	**5Hours**
MODULE-IV DRAFTING OF LETTERS: Writing different types of letters – writing for employment, joining letter, complaints & follows up, Enquiries, representation etc. Official Communication – e-mail & Social Media	**6 Hours**
MODULE-V CASE METHOD OF LEARNING: Understand Case method of learning, different type of cases, overcoming the difficulties of the case method, analyzing the case. Do's & Don'ts for case preparation.	**5 Hours**

Text Books:

1. Scotofer, contemporary business communication, Biztant ra Hardcover – 23 January 1998
2. Chaturvedi P D & Mukesh chaturvedi - Business communication:Concepts, cases &

applications- 2/e, 2nd Edition pearson education.

3. Essential of Business communication – Rajendra Pal and J.S Korlhall – Sultan Chand & Sons, New Delhi.

Reference books:

1. 1 Business correspondence & report writing – R.C.Sharma, Krishna Mohan – Tata Megraww Hill Publising Company Ltd, New Delhi.
2. Business Communcation – K.K. Sinha – Galgotio Publishing Company, New Delhi.

E – BOOKS & ONLINE RESOURCES

https://www.skillsyouneed.com/ips/communication-skills.html
http://103.5.132.213:8080/jspui/bitstream/123456789/1122/1/Communication%20Skills.pdf
https://www.skillsyouneed.com/docs/communication-skills-PV.pdf

NPTEL/ SWAMYAM/MOOCS: **TECHNICAL ENGLISH FOR ENGINEERS (8 Weeks)**
Prof AYSHA IQBAL , Department of HSS, IIT MADRAS

Teaching methodology

Teacher/ student -Centered Approach to Learning, ICT Tools, Group Assignment, Case Study

Course Outcomes: On completion of this course, students are able to:

Course Code	CO #	Course Outcome (CO): At the end of the course student will be able to:
21HU13	CO1	Explain about basic of Communication
	CO2	Develop reading and understanding ability. ,
	CO3	Learn effective writing
	CO4	Learn how to write different types of letter
	CO5	Analyze a Case study and solve

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						2.00		2.00	2.00	3.00		3.00
CO2						2.00		2.00	2.00	3.00		3.00
CO3						2.00		2.00	2.00	3.00		3.00
CO4						2.00		2.00	2.00	3.00		3.00
CO5						2.00		0.00	2.00	3.00		2.00
AVG						2.00		1.60	2.00	3.00		2.80

BASIC ELECTRICAL ENGINEERING

(Common to all branches)

[As per Choice Based Credit System (CBCS) scheme]

(From the academic year 2021-22)

Course Code	**21EE14/24**	CIE Marks	50
Credits	03	SEE Marks	50
Contact Hours/Week (L-T-P)	3-0-0	Total Marks	100
Contact Hours	42	Exam Hours	03

Prerequisite: Students should have the knowledge of

1. Ohms Law, Kirchhoff's Current and Voltage Law.
2. Fundamentals of AC and DC Circuits.
3. Basics of Magnetism.

Course Learning Objectives: .

1. Understanding the concept and analysis of Single phase and Three phase AC circuits.
2. Study of construction and performance analysis of single phase transformer.
3. Study of construction and working principle of DC machines
4. Study of construction and working principle of Three phase AC Machines.
5. Study of Power Generation stations, Tariff, measuring instruments and electric safety measures.

MODULE-I **AC Circuits:** **Single Phase Circuits:** AC terminologies, Analysis of R,L,C,R-LSeries circuits, Disadvantages of low power factor, Measurement of power by VAW method. **ThreePhase Circuits:** Advantages, types of connections, Relation between phase & line values. 3 - phase power measurement by two-wattmeter method for balanced load.	**9 Hours**
MODULE-II **Electromagnetism and Single Phase Transformer:** **Electromagnetism:** Faraday Laws of Electromagnetic Induction, Fleming's rules, Lenz's law, types of EMF and numerical. **Transformer:** Principle, construction and working of single phase transformer, types (based on construction), EMF equation, losses, efficiency and Voltage regulation. (Numerical related to EMF equation and Efficiency)	**9 Hours**
MODULE-III **DC Machines**: **DC generator:** Principle, Construction, working, types and EMF equation. (Numerical on EMF equation) **DC Motor:**Principle, Working, back emf and its significance, torque equation, necessity of starter, 3-point starter. (Numerical on Torque & Voltage Equations)	**8 Hours**
MODULE-IV **Three Phase AC Machines:** **Alternator:** Principle of operation, types and constructional features, EMF equation of alternator.(Excluding the winding factors derivation) Numerical on EMF equation. **Three phase Induction Motor:** Construction, concept of rotating magnetic field, principleof operation, Star – Delta starter.(Numerical on Slip calculations only).	**8 Hours**
MODULE-V	

Generation, Tariff, Measuring Instruments and Electric Safety: **Generation of Power:** Block schematic representation of hydroelectric, thermal, nuclear and solar power generating stations (Self study component). **Tariff:** Objectives of Tariff, Desirable characteristics of Tariff, Three-part tariff. **Measuring Instruments:** Principle, Construction & working of Dynamometer type wattmeter &Single phase energy meter. **Electric Safety:** Necessity of earthing, plate & pipe earthing, Elementary discussion on Fuse & MCB. Electric Shock, Effects, Remedies & Precautions(Self study component).	**7 Hours**
Question paper pattern: Total ten questions will be asked,two from each module. The student has to answer five questions, selecting at least one from each module.	

Reference books:

1. J P Tiwari," Basic Electrical Engineering", New age Publications, 2nd edition, 2011.
2. Rajendra Prasad “Fundamentals of Electrical Engineering", PHI 3rd edition, 2014.
3. B L Theraja& A K Theraja" Electrical Technology", Vol 1 , 2nd edition.
4. B L Theraja& A K Theraja" ABC of Electrical Engineering", 2nd edition.
5. D.P. Kothari and Nagrath “Theory and Problems in electrical Engineering”, PHI edition 2011.
6. V. N. Mittal and Arvind Mittal;, “ Basic Electrical Engineering” McGraw Hill.
7. R.V. Srinivasa Murthy "Basic Electrical Engineering" Sanguine Technical Publisher2004.**E-**

Course Outcomes: On completion of this course, students are able to:

Course Code	CO #	Course Outcome (CO): At the end of the course student will be able to:
	CO1	State, illustrate electric circuits and solving the Networks
21EE14/24	CO2	State, illustrate magnetic circuit, solving the networks and identify the parts, explain the construction, working and examine the performance of Transformer.
	CO3	Identify the parts, explain the construction, working and examine the performance of DC Machines.
	CO4	Recognize the parts, give the illustration of construction and compute the performance of AC machines.
	CO5	Outline the Power Generating stations, analyze the tariff, synthesize the safety measures and explain the working of measuring instruments.

Computer Aided Engineering Drawing

(Common to all branches)

[As per Choice Based Credit System (CBCS) scheme]

(From the academic year 2021-22)

Course Code	21ME15/25	CIE Marks	50
Credits	03	SEE Marks	50
Contact Hours/Week (L-T-P)	2-0-2	Total Marks	100
Contact Hours	28 (THEORY) + 28 (PRACTICAL)	Exam Hours	03

Course Learning Objectives:

1. To understand the fundamentals of orthographic projections of different object in first angle projections method, using BIS standard specifications.
2. To prove that Drawing is the best communication tool.
3. To improve the imaginary skills and logical thinking capabilities.
4. To visualize three dimensions of simple machine components, by drawing Isometric projections.
5. To understand section points, section planes, frustums, truncated solids and to mark their Development.
6. To understand the solid edge software and the connected tool used to mark 2D drawings on a System.
7. To have the basic exposure to solid modeling using 3D solid edge software package.

MODULE-I **Introduction to CAD Software:** Learning the drawing commands such as point, line, arc, circle, ellipse, rectangle, polygons etc. Modify commands such as copy, move, mirror, rotate, pattern, scale etc. Dimensions - linear, aligned, radial, angular etc.	**2 Hours Practical**
MODULE-II **Orthographic projections**: Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes (No application problems and midpoint problems). **Projections of Plane Surfaces (First Angle Projection Only) :** Projection of Planes such as triangle, square, rectangle, pentagon, hexagon and circle in simple positions inclined to both the planes; planes in different positions by change of position method only. (No problems on punched plates and composite plates).	**8 Hours Theory+ 6 Hours Practical**
MODULE-III **Projections of Solids :**(First angle Projection only) Projection of Solids such as cube, prism, pyramid, cylinder and cone (No problems on tetrahedron ,octahedrons, and freely suspended solids). selection criteria area.(No numericals).	**8 Hours Theory+ 8 Hours Practical**
MODULE-IV **Development of Lateral Surfaces of Solids:** Introduction, introduction to section planes and sectional views, Development of lateral surfaces of right regular prisms, cylinders,pyramids,cones and their frustums resting with base on HP only. (No problems on lateral surfaces of trays, tetrahedrons, spheres and transition pieces).	**6 Hours Theory+ 6 Hours Practical**

MODULE-V	
Isometric Projection :(Using Isometric Scale Only) Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres. Isometric view of combination of two simple solids.	**6 Hours Theory+ 6 Hours Practical**

Text Books:

1) Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48th edition, 2005-Charotar Publishing House, Gujarat.
2) A Primer on Computer Aided Engineering Drawing-2006, Published by VTU, Belgaum

Reference books:

1. Computer Aided Engineering Drawing - S. Trymbaka Murthy, - I.K.International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition- 2006.
2. Engineering Graphics - K.R.Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.**E-Books and Online resources:**

NPTEL/SWAYAM/MOOCS:

The topic or concept-wise pedagogy (Teaching Methodology) of the curriculum shall be specified in the content.

Question paper pattern:

1. Module -1 is only for practice and not for examination.
2. The answer sheets will have to be jointly evaluated by the Internal & External examiners.
3. A maximum of THREE questions will be set as per the following pattern (No mixing of questions from different Modules).
4. Examination can be conducted in parallel batches, if necessary.

Q No	From Chapters	Marks Alloted (SEE)
1	Module 2 (Choice between Points+St lines or Planes)	15
2	Module 3	20
3	Module 4 or Module 5	15
	Total	50

Course Outcomes: On completion of this course, students are able to:

Course Code	CO #	Course Outcome (CO): At the end of the course student will be able to:
21ME15/25	CO1	Produce computer generated drawings using CAD software.
	CO2	Apply the knowledge of orthographic projections (Points, St lines and planes).
	CO3	Students will be able to visualize and draw projections of solids.
	CO4	Students will be able to visualize and draw development of Lateral Surfaces of
	CO5	Create isometric drawings of simple objects reading the orthographic project objects 3D drawings.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2		3							2
CO2	3	2	2		3							2
CO3	3	2	2		3							2
CO4	3	2	3		3							3
CO5	3	2	3		3							3
AVG	3	2	2		3							2

BASIC ELECTRONICS

(Common to all branches)

[As per Choice Based Credit System (CBCS) scheme]

(From the academic year 2021-22)

Course Code	21EC17/27	CIE Marks	50
Credits	03	SEE Marks	50
Contact Hours/Week (L-T-P)	4-0-0	Total Marks	100
Contact Hours	42	Exam Hours	03

Course objectives: This course will enable students to:

- Study fundamentals of semiconductors devices like diode, transistors and Operational Amplifier.
- Study basics of communication systems and different modulation types.
- Study Fundamentals of digital electronics.
- Study different transducers and using a CRO for the measurement of signal parameters.
- Build mathematical and numerical background for the design of electronic circuits
- Equipped with the knowledge provided in this course can design and develop electronic circuits

MODULE-I **Semiconductor Devices and applications:** P-N Junction diode and characteristics, Rectifiers:Halfwave rectifie,fullwave rectifier,capacitor filter,Zener diode characteristics,zener voltage regulator. Bipolar Junction Transistor:Transistor biasing and it's needs,transistor currents,configurations,CE characteristics,common emitter amplifier.	**9Hours**
MODULE-II **Field effect transistors and applications:**JFET,characteristics,DC biasing of JFET ,DC load line analysis,JFET on an IC chip,advantage of FETs. **MOSFET:**De type mosfet, enhancement mosfet, characteristics of De type mosfet FET as a switch, FET amplifier and oscillators.	**9 Hours**
MODULE-III **Basics of Communication Systems:**Introduction, radio frequency spectrum,need for modulation,radio broadcasting,modulation:amplitude modulation,power relations in AM wave,frequency modulation,superheterodyne AM receiver. **Op-Amp Applications:** Op-Amp basics**,** practical op-amp circuit (Inverting , Non Inverting, summer , integrator and Differentiator.)	**8 Hours**
MODULE-IV **Digital Electronics:** Number system, Number base conversions, Signed arithmetic: Binary addition &subtraction using 2's complement, Logics gates, Half Adder/Subtractor, Full Adder/Subtractor, Boolean algebra ,simplification of Boolean expressions, Realization of Boolean expressions using logic gates.	**8 Hours**
MODULE-V **Electronic System:** Block diagram of instrumentation system, Transducer: Strain Gauge, LVDT, Oscilloscope (CRO), CRO based measurements, Displays, Signal Generator case study: remote control and PA Systems.	**8 Hours**

Textbook:

1. Basic Electronics by B. L. Theraja, S. Chand Publications

2. Electronic devices and circuit theory by R L Boylestad, Louis N, 6TH edition, PHI.

Reference Books:

1. Digital logic and computer design by M Morris Mano.
2. Electronics devices & circuits by David Bell, 5th Edition, Oxford University Press.
3. Electronic Devices by Thomas L. Floyd, 8th Edition, Pearson Education, Inc., 2007

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 20marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Course Outcomes: On completion of this course, students are able to:

Course Code	CO	Course Outcome (CO): At the end of the course student will be able to:
21MA11	CO1	Understand the basics of semiconductor devices and their applications.
	CO2	Analyze biasing technique of JFET and MOSFET and their applications as a s amplifier and oscillator.
	CO3	Understand different modulation techniques and working of receiver circuit. A working of Op amp And it's Applications.
	CO4	To study number base conversion, understand laws of Boolean algebra, workin different logic gates.
	CO5	Understand the working of different transducers and use a CRO as a measurin instrument.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3									2
CO2	3	3	2									2
CO3	3	3	2									2
CO4	3	2	2									2
CO5	3	2	2									2
AVG	3	2.4	2.2									2

: **Engineering Physics Laboratory**
(Common to all branches)
[As per Choice Based Credit System (CBCS) scheme]
(From the academic year 2021-22)

Course Code	21PHL11/21	CIE Marks	50
Credits	01	SEE Marks	50
Contact Hours/Week (L-T-P)	0-0-2	Total Marks	100
Contact Hours	28	Exam Hours	03

Course Objectives:

1. Characteristics of diode and conductivity of semiconductor
2. Information of impedance, identfy passive components and transfer of resistance in electronic circuits.
3. Fundamental properties of light and emission of radiation with temperature along with the behavior of light in the phenomena of interference and diffraction.
4. Information of temperature dependance of resitivity.
5. Elastic proprties a material and Apprehend the concepts of interference of light, diffraction of light and Fermi energy
6. Understand the principles of operations of semiconductor devices such as semiconductor diode, and NPN transistor using simple circuits
7. Determine elastic moduli and moment of inertia of given materials with the help of suggested procedures
8. Recognize the resonance concept and its practical applications Understand the importance of measurement procedure, honest recording and representing the data, reproduction of final results

List of Experiments	**Module**
1. Y-by single Cantilever Method	Module 3
2. Co-efficiency of Viscosity by Stoke's method	Module 3
3. Sonometer (Frequency of Ac)	Module 4
4. Determination of Fermi Energy	Module 5
5. Newton‟s Rings	Module 1
6. Interference of Air wedge	Module 1
7. Diffraction grating by minimum deviation method	Module 1
8. Band Gap of Semiconductor	Module 1 and
9. Transistor Characteristics	Module 5
10. I-V Characteristics of Zener Diode.	General physics
11. Determination of Dielectric Constant using RC circuit.	General physics
12. Frequency response of series and parallel LCR circuit and study of quality factor.	Module 4 General physics
13. Verification of Stefan's law.	General physics
14. Torsional pendulum	Module 3
15. Fly wheel	Module 3

Reference Books:

Sl No.	Title	Author/s/ Editor	Publishers
1	Laboratory Manual in Applied Physics	H.Sathyaseelan	New Age International Second Edition

Course outcomes: On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO): At the end of the course student will be able to:
21PHL11/21	CO1	Demonstrate the concept the physics theory course through a series of expe
	CO2	Share responsibilities in small teams of four to five members for operating eq and collecting data.
	CO3	Determine the properties on optics, electrical, electronics, modern physics an physics through series of experiments.
	CO4	Analyze the data and interpret the results
	CO5	Write a well organized laboratory report presenting the results on a clear way

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2							1			2
CO2	3	3							3			
CO3	3	2		2					1			1
CO4	3	2							2			1
CO5	3	3								3		
AVG	3	2.4		2					1.75	3		1.333

BASIC ELECTRICAL ENGINEERING LAB

(Common to all branches)

[As per Choice Based Credit System (CBCS) scheme]

(From the academic year 2021-22)

Course Code	21EEL12/22	CIE Marks	50
Credits	01	SEE Marks	50
Contact Hours/Week (L-T-P)	0-0-2	Total Marks	100
Contact Hours		Exam Hours	03

Sl.No.	List of Experiments
1	Verification of Kirchoff's Laws.
2	Demonstration of two way control of lamps.
3	Measurement of Power by three voltmeter method.
4	Measurement of power in an inductive circuit using two wattmeter.
5	Calibration of single phase energy meter.
6	Study of MCB.
7	Tube light connection.
8	Measurement of power in a 3 phase circuit using two-wattmeter method.
9	Load test on single phase transformer.
10	Brake load test on 3 phase induction motor.
11	Speed Control of Fan.

Course Outcomes: On completion of the course, the student will have the ability to:

Course Code	CO	Course Outcome (CO): At the end of the course student will be able to:
	CO1	Apply Kirchhoff's law for the analysis of DC circuits.
	CO2	Illustrate two ways control lamp and tube light connections.

21EEL12/22	CO3	Measure power in single-phase and three phase circuits and energy using single-phase energy meter.
	CO4	Control load test on single-phase transformer to estimate losses and efficiency.
	CO5	Conduct brake load test on 3-phase induction motor to estimate slip and efficiency load.

Course Articulation Matrix for the Academic Year 2021-22

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3				3						1
CO2	3	3										
CO3	3	3										1
CO4	3	3				3						1
CO5	3	3				3						1
AVG	3	3				3						1

DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS

(Common to all branches)

[As per Choice Based Credit System (CBCS) scheme]

(From the academic year 2021-22)

Course Code	21MA21	CIE Marks	50
Credits	03	SEE Marks	50
Contact Hours/Week (L-T-P)	3-0-0	Total Marks	100
Contact Hours	42	Exam Hours	03

Course Learning Objectives: This course (**21MA21**) will enable students to master the basic tools of differential & integral calculus, differential equations and elementary linear algebra and become skilled for solving problems in science and engineering.

MODULE-I **Ordinary differential equations(ODE's)of first order:-** Linear and reducible to linear differential equation. Exact and reducible to exact differential equations. Applications of ODE's-orthogonal trajectories, Newton's law of cooling and L-R circuits. Nonlinear differential equations; introduction to general and singular solutions; solvable for p only; Clairaut's and reducible to Clairaut's equations only.	**8 Hours**
MODULE-II **Ordinary Differential Equations (ODE's) of higher order:-** Differential equation of higher order with constant coefficients and examples. **S**econd order linear ODE's with constant coefficients by the method of variation of parameters; Cauchy's and Legendre homogeneous differential equations. Initial and boundary value problems. **Applications to oscillations of a spring and L-C-R circuits**.	**9 Hours**
MODULE-III **Partial Differential Equations(PDE's):-** Formation of PDE's by elimination of arbitrary constants and arbitrary functions. Solution of non-homogeneous PDE by direct integration method. Homogeneous PDEs involving derivative with respect to one independent variable only. Solution of PDE's by the method of separation of variable. **Application of Partial Differential Equations(PDE's):-** Introduction, derivation of one dimensional wave equation and heat equation, various possible solutions of one dimensional wave equation and heat equation and Laplace equation by the method of separation variables and examples.	**9 Hours**
MODULE-IV **Vector Calculus:-** **Vector Differentiation:** Scalar and vector fields**.** Gradient, directional derivative; divergence and curl physical interpretation; solenoidal and irrotational vector fields-Illustrative problems. **Vector Integration:** Line integrals, Greens Theorem, Gauss Divergence Theorem and Stokes Theorem (Only Statements) Illustrative examples. Applications to work done by a force and flux.	**8 Hours**
MODULE-V **Laplace Transformations**: Defination, Transforms of elementary functions. Laplace transform of Derivatives and	**8 Hours**

integrals and problems, periodic function and Unit step function- Illustrative problems. Inverse Laplace transforms, properties - Illustrative problems, Solution of linear differential equations.

Text Books:

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed.,2015.
2. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10thEd.(Reprint),2016.

Reference books:

1. Early Transcendental Calculus- James Stewart, Thomson Books, 5e 2007
2. N.P.Bali and Manish Goyal: A Text Book of Engineering Mathematics, Laxmi Publishers, 7th Ed., 2010.
3. B.V.Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. Veerarajan T.," Engineering Mathematics for First year", Tata McGraw-Hill, 2008.
5. Thomas G.B. and Finney R.L."Calculus and Analytical Geometry"9th Edition, Pearson,

E-Books and Online resources:

- http://.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/

Pedagogy (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop student's theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples
3. Support and guide the students for self–study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:

- As an introduction to new topics (pre-lecture activity).
- As a revision of topics (post-lecture activity).
- As additional examples (post-lecture activity).
- As an additional material of challenging topics (pre-and post-lecture activity).

● As a model solution of some exercises (post-lecture activity).

Course Outcomes: On completion of this course, students are able to:

Course Code	CO #	Course Outcome (CO): At the end of the course student will be able to:
21MA21	CO1	Explain various physical models through first order and first degree ordinary differential equations and solve them by analytically
	CO2	Explain various physical models through second and higher order ordinary diff equations and solve them analytically
	CO3	Understand a variety of partial differential equations and solution by exact methods and apply methods of separation of variables to solve heat, wave, laplace equations.
	CO4	Illustrate the applications vector calculus to understand the solenoidal and irrotational vectors and also to exhibit the interdependence of line, surface and volume integrals.
	CO5	Apply the knowledge of Laplace transform and inverse Laplace transform to s differential equations.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1										1
CO2	3	1										1
CO3	3	2										1
CO4	3	1										1
CO5	3	1										1
AVG	3	1.2										1

Method of Examination:

Note:- The SEE question paper will be set for 100 marks and the marks scored by the student will be proportionately reduced to 50.

- The question paper will have **ten** full questions carrying equal marks.
- Each full question carries **20**marks.
- There will be **two** full questions (with a **maximum** of **four** sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.

The students will have to answer **five** full questions, selecting **one** full question from each module.

ENGINEERING CHEMISTRY
(Common to all branches)
[As per Choice Based Credit System (CBCS) scheme]
(From the academic year 2021-22)

Course Code	**21CH12/22**	CIE Marks	50
Credits	03	SEE Marks	50
Contact Hours/Week (L-T-P)	3-0-0	Total Marks	100
Contact Hours	42	Exam Hours	03

Course Learning Objectives:

*To recognize electrochemical process, evaluate electrodes and cells.

*To introduce the principle of corrosion, common corrosion forms, corrosion control methods and material selection to reduce corrosion cost.

*To provide a broad and fundamental knowledge of the polymer and their chemical and physical behaviour. Emphasis is on the processing technique along with the production of polymer. Towards the end the student is able to corelate structure-processing-properties relationship for polymers.

*To study various types of conventional and non-conventional energy sources including solid liquid and gaseous fuels.

*To provide knowledge of water quality, characteristics of water sources and purification of water

MODULE-I ELECTROCHEMICAL ENERGY Introduction, Electrode potential and EMF– definition, sign-convention., and notations. Standard electrode potential, Measurement of single electrode potential and emf. Electrochemical series table. Derivation of Nearns't equation. Classification of cells- primary, secondary and concentration cells.. Reference electrodes- calomel electrode. Ion-selective electrode-glass electrode, determination of pH using glass electrode. Numerical problems. Modern batteries – Construction working and application of Li-MnO2 and Ni – Metal Hydride battery **Pedagogy:** Chalk and talk method, power point presentation, solar Energy and Fuel cells, Handouts **Self-Study Material**: Recycling of Lithium-ion batteries	**9 Hours**
MODULE-II **CORROSION SCIENCE & SURFACE COATING** Definition, chemical and electrochemical mechanism. Types of corrosion – differential metal and differential aeration (pitting and water line), stress corrosion. Factors affecting the rate of corrosion. Corrosion control- Inorganic coating (Anodising and Phosphating) metal coating (Galvanization and tinning). Corrosion Inhibitors. Technological importance of metal finishing. Mechanism and difference between electroplating and electroless plating. Factors effecting electroplating and application of electroplating and electro-less plating. Electroplating of copper and electroless plating of nickel. **Pedagogy:** Chalk and talk method, power point presentation,-vedios Electroplating of coper and electro less plating of Nickel **Self-Study Material**: Electrochemical series, Organic coatings: paint, components of paints and their functions. Varnish, definition, differences between paints and varnishes.	**8 Hours**
MODULE-III **POLYMER TECHNOLOGY**	**9 Hours**

Definition, classification with examples. Polymerization, types of polymerization (Addition and condensation) Mechanism of polymerization – Free radical with ethylene as an example. Methods of polymerization – Bulk , solution, suspension and emulsion polymerization. Glass transition temperature, factors effecting, structure and property relationship. Synthesis, properties and application of Teflon , Polyethylene HDPE, PMMA, Polyurethane . Elastomer- deficiencies of natural rubber and advantages of synthetic rubber. Synthesis and application of Neoprene, Butyl and Nitrile rubber. Adhesives- Manufacturing and application of epoxy resin. Conducting polymers- definition, Synthesis, mechanism and application of conduction in polyacetylene. Introduction to biodegradable polymers. **Pedagogy:** Chalk and talk method, power point presentation, **Self-Study Material**: Importance and disadvantages of non-biodegradable polymers, composites and nanomaterials.	
MODULE-IV **FUELS & BATTERY TECHNOLOGY** Introduction , definition, classification, characteristics of fuels, calorific value – definition, gross and net calorific value. Determination of calorific value of a solid / liquid fuels using Bomb Calorimeter. Petroleum cracking – Fluidized catalytic cracking. Reforming of petrol. Power alcohol, Unleaded petrol and Bio-fuels Numerical problems. Fuel cells – Construction and working of $H_2 – O_2$ and Me – alcohol – O_2 (CH_3OH-O_2) cells. **Pedagogy:** Chalk and talk method, power point presentation, videos on Knocking, Working of fuel cells. Solar cells. Handouts. **Self-Study Material**: Construction and working of Dry battery.	**8 Hours**
MODULE-V **INSTRUMENTAL METHODS, WATER and WASTE MANAGEMENT** Instrumentation and application of potentiometry ,conductometry (strong acid and strong base, weak acid and strong base), Colorimetry –theory, Beer_Lambert,s Law and applications in uantitative analysis. Sources and Impurities in water, hardness and their types and Numerical Problems . BOD and COD, and their determination, numerical problems. Potable water- purification using chlorination, and reverse osmosis. Sources, characteristics and disposal methods of Solid waste and biomedical waste. **Pedagogy:** Chalk and talk method, power point presentation, Handouts Practical Topic: Conductometric titration of mixture of acids potentiometric estimation of FAS, Colorimetric estimation of copper, **Self-Study Material**: Principles of titrimetric analysis, requirement of titrimetric analysis, Classification of titrimetric analysis, Instrumental methods of analysis. Definitions of normality, molarity,ppm.	**8 Hours**
Text Books: Engg.Chemistry by R V Gadag and Nityanand Shetty Engg.Chemistry by J C Kuriacose and J Rajaram **Reference books**: 1. 1. Text book of Engg., chemistry by Jain and Jain. 2. Text book of Engg., chemistry by M.M Uppal. 3. Text book of Engg., chemistry by O.P Agrawal. 4. Principles of physical chemistry by Puri and Sharma. 5. Text book by polymer science by F.W.BillMeyer.	

6. Text book by polymer science by Gouriker.
7. Text book by Instrumental method of analysis by B K Sharma.

e-learning resources: : http://www.tndte.gov.in/site/wp-content/uploads/2016/08/Engineering-Chemistry.pdf

. http://nptel.ac.in/courses.php

. http://jntuk-coeerd.in/

Course Outcomes: On completion of this course, students are able to:

Course Code	**CO #**	**Course Outcome (CO):** At the end of the course student will be able to:
21CH12/22	CO1	Demonstrate fundamentals of electrochemistry,recognize the electrochemical process and apply the concept of electrochemistry in industrial water electrolysis, electrolysis and electrosynthesis.
	CO2	Detect type of corrosion & apply appropriate method for managing corrosion in industries.
	CO3	Differentiate modern chemical method of synthesis of polymer and their applications .
	CO4	Interpret the properties of Fuels commonly used and there economics, advantageous and limitations.
	CO5	Evaluate the properties of potable water, solid waste & biomedical waste with the help of instrumental methods .

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	3	2										
CO3	3	2										
CO4	3	2										
CO5	3	2										
AVG	3	2										

Question paper Pattern :

1. Each module will have two questions covering the syllabus
2. Each question consists of sub divisions (maximum four) and maximum marks is 20
3. Students have to answer one full question from each module.

TECHNICAL ENGLISH - II

(Common to all branches)

[As per Choice Based Credit System (CBCS) scheme]

(From the academic year 2021-22)

Course Code	21HU23	CIE Marks	50
Credits	02	SEE Marks	50
Contact Hours/Week (L-T-P)	2-0-0	Total Marks	100
Contact Hours	28	Exam Hours	02

Course Learning Objectives: To enable the students to obtain the basic knowledge about oral Communication Skills - II in the following topics:-

- Meaning, Principles, Barriers and modes of Oral communication.
- Developing Presentation skills
- Learn Group Communication.
- Learn Employment communication..
- Developing interpersonal communication skills

MODULE-I ORAL COMMUNICATION: Meaning, principles of successful oral communication, barriers to communication. modes of oral communication – listening as a communication skill, Non- verbal communication. Grapevine Communication – Meaning and Types of Grapevine.	**5 Hours**
MODULE-II PRESENTATION SKILLS : What is a presentation – Element of Presentation – Designing and delivering Presentation. Public Speaking, Effective power point presentation, body language , Non- verbal facial expressions, Eye Contact, audience research, questions from the audience, communication of emotional intelligence , creativity in oral communication. Communication through telephonic , videoconference & skype	**6 Hours**
MODULE-III GROUP COMMUNCATION : Group Discussion – Do and Don't in Group discussion, Group Presentation. Debate – Do and Don't in Debate. Group Communication- Meetings, Notice, Planning Meetings, objectives, timing, venue of meetings, leading meetings, Minutes of meeting, press conference.	**6 Hours**
MODULE-IV EMPLOYMENT COMMUNCATION : Writing Curriculum Vitae(CV), Interview – Types of interview, candidates preparation, Interviewers Preparation, time management, grooming and Just A Minute (JAM). Speaking for better communication – Speaking about yourself	**6 Hours**
MODULE-V	

INTERPERSONAL COMMUNICATION SKILLS :	**5 Hours**
Advantage and Disadvantages of utilizing the team work, Characteristic of Successful teams, Stages of the development of a team, team roles, challenges in team working, forms of Non- Team behavior.Types and source of conflicts, the influence of various cultures on the solving of conflicts.	

Pre requisites: None

Teacher/ student -Centered Approach to Learning, ICT Tools, Group Assignment, Case Study

Pattern of question paper

Solve all five full questions selecting atleast one question from each module

Text Books:

1 Murphy – Effective Business Communication – Mc Graw Hill. Publisher : McGraw Hill Education; 7th edition (1 July 2017)

2.Nageshwar Rao and Rajendra Das – Business Skills – January 2010 ,HPH.
3.Advance Business Communcation – Penrose, Rasberry, Myers, 5/e, cengage learning 2004.
4.Prasad P. Communication Skills, S.K. Kataria & Sons. 4 th edition 2016 , published 2009

Reference Books :

1.Mc Grath – Basic Mangerial Skills – New Delhi – Prentic Hall India learning pvt ltd.
2.Business Communcation – K.K. Sinha – Galgotio Publishing Company, New Delhi.
3.Sen, leena Communication Skills, Prentice Hall of India, New Delhi.

E – BOOKS & ONLINE RESOURCES

https://www.skillsyouneed.com/ips/communication-skills.html
http://103.5.132.213:8080/jspui/bitstream/123456789/1122/1/Communication%20Skills.pdf
https://www.skillsyouneed.com/docs/communication-skills-PV.pdf

NPTEL/ SWAMYAM/MOOCS: **TECHNICAL ENGLISH FOR ENGINEERS (8 Weeks)**
Prof AYSHA IQBAL , Department of HSS, IIT MADRAS

Course Outcomes: On completion of this course, students are able to:

Course Code	**CO #**	**Course Outcome (CO):** At the end of the course student will be able to:
21HU23	CO1	Explain about basic of oral Communication
	CO2	Develop presentation skills.
	CO3	Learn group communication
	CO4	Learn Employment communication
	CO5	Develop interpersonal communication skills

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						**2.00**		**2.00**	**2.00**	**3.00**		**3.00**
CO2						**2.00**		**2.00**	**2.00**	**3.00**		**3.00**
CO3						**2.00**		**2.00**	**2.00**	**3.00**		**3.00**
CO4						**2.00**		**2.00**	**2.00**	**3.00**		**3.00**
CO5						**2.00**		**2.00**	**2.00**	**3.00**		**2.00**
AVG						**2.00**		**2.00**	**2.00**	**3.00**		**2.80**

C PROGRAMMING FOR PROBLEM SOLVING

(Common to all branches)

[As per Choice Based Credit System (CBCS) scheme]

(From the academic year 2021-22)

Course Code	21CS14/24	CIE Marks	50
Credits	03	SEE Marks	50
Contact Hours/Week (L-T-P)	3-0-0	Total Marks	100
Contact Hours	42	Exam Hours	03

Course Learning Objectives:

- Learn the concepts of C Language.
- Develop skills to solve computational problems

MODULE-I **Algorithms, Flowcharts and Operators:** Algorithms, Flowcharts, Basic Structure of C Program, Executing a 'C' program. C tokens, Data types, Declaration of variables. **Expressions, Managing Input/ Output and Operators:** Arithmetic operators, relational operators, logical operators, assignment operators, increment/ decrement operators, conditional operators, bit wise operators, special operators. Evaluation of expression, precedence of arithmetic operators, type conversions in expression, operator precedence and associativity. Unformatted and Formatted Input and Output. Examples & exercises.	**8 Hours**
MODULE-II **Control Statements:** Decision Making with if statement, Simple if statement, the if else and nested if statements, the else if ladder, Switch statement, Unconditional control Statements. **Decision Making and Looping:** While statement, Do-While statement, For statement, jumps in loop. Examples & exercises.	**8 Hours**
MODULE-III **Arrays:** One dimensional Array, declaration, Initialization, Two dimensional Arrays notations and representations, manipulating with arrays, examples and exercises. **Pointers:** Accessing the address of a variable, Declaring pointer variables, Initializing of pointer variables, accessing a variable through its pointer ,pointer expressions, pointer arrays, pointer and character strings, arrays of pointer, pointer as function arguments, function returning pointer ,pointers to function, pointer and structure. Examples & exercises.	**9 Hours**
MODULE-IV **Strings:** Declaring and Initializing String Variables, Reading Strings from Terminal, Writing strings to Screen, Arithmetic Operations on Characters, String-handling functions, examples and exercises. **Functions and Recursion :** Need for User-defined Functions, A multi-function program, Elements of User-defined Functions, Definition of functions, Return value and their types, Function calls, Function declaration, Category of functions, Recursion, examples and exercises.	**9 Hours**
MODULE-V **Structures and Unions:** Initialization. Defining a Structures, Declaration of Structure	**8 Hours**

variables, Accessing Structure Members, Structure Initialization, Copying and comparing structure variables, operations on individual members **Unions**: Union**,** Size of Structures, bit fields , examples & exercises **File Management:** Defining and opening a file, closing file, input output operations on files, error handling during I/O operations. Examples & exercises.	

Question paper pattern:

The question paper will have ten questions.

There will be 2 questions from each module, covering all the topics from a module.

The students will have to answer 5 full questions, selecting one full question from each module**.**

Text Books:

1. E. Balagurusamy, "Programming in ANSI C", Tata Mcgraw Hill Education Private Limited– V Edition, 2016

Reference books:

1. 1E Balagurusamy, Computing Fundamentals and C Programming, McGraw-Hill Education, Reprint 2nd Edition 2008.
2. Herbert Schildt, **"**Complete Reference in C",Fourth Edition, Tata McGraw Hill Publication, 2017
3. Yashwant P. Kanetakar, "Let us C**",** Fifth Edition, BPB Publications, 2016.
4. Brian W Kernighan & Dennis M Ritchie **"** The C Programming Language", Prentice Hall Publisher, Second Edition, 2004.
5. Behrouz A.Forouzan and Richard F.Gilberg,"Computer Program: A structured programming Approach Using C.", Third edition, Thomson Learning, 2005.

E-Books and Online resources:

Course Outcomes: On completion of this course, students are able to:

Course Code	**CO #**	**Course Outcome (CO):** At the end of the course student will be able to:
21CS14/24	CO1	Develop Algorithm and flowcharts and understand the different data types an in C language
	CO2	Identify and use proper decision /control constructs for solving different type problems
	CO3	Apply arrays and pointers to develop programs for a given problem.
	CO4	Demonstrate the Strings and modular programming concepts
	CO5	Create a solutions for real world problem using Structures and file operations

MECHANICAL ENGINEERING SCIENCE

(Common to all branches)

[As per Choice Based Credit System (CBCS) scheme]

(From the academic year 2021-22)

Course Code	21ME16/26	CIE Marks	50
Credits	03	SEE Marks	50
Contact Hours/Week (L-T-P)	2-0-2	Total Marks	100
Contact Hours	(28H.Theory+28H .Practical)	Exam Hours	03

Course Learning Objectives:

1.Learn the fundamental concepts of energy, its source and conversion and basic concepts of thermodynamics.
2.Understand the, properties of stream and use of steam table.
3.Understand the working of IC engines and concepts of refrigeration.
4.Understand the working of conventional machine tools and welding process.
5.Learn the fundamentals of Mechatronics and its applications

MODULE-I **Energy source and basic thermodynamics:** Energy sources like fossil fuels, Hydel, nuclear, solar, wind, environmental issues like global warming and ozone depletion, remedies of global warming. Basic concept of thermodynamics: Laws of thermodynamics.	**5 Hours Theory**
MODULE-II **Properties of steam:** Formation of steam at constant pressure (temperature enthalpy diagram). Use of stream tables to calculate enthalpy, internal energy etc (simple problems).	**8 Hours Theory**
MODULE-III **IC Engines:** Otto and diesel cycle, 2 stroke and 4stroke, petrol and diesel engines, simple problems. **Refrigeration:** Unit of Refrigeration, C.O.P, vapour compression system and vapour Absorption systems, properties of refrigerants.	**7 Hours Theory+ 12 Hours Practical**
MODULE-IV **Conventional machining:** lathe-principle of working, lathe operations, drilling M/C-principle of operation of radial drilling M/C, drilling operations. Joining process, principle of arc and gas welding. Milling machine, working principle of milling machine, classification of milling machine.	**16 Hours Practical**
MODULE-V **Mechatronics:** Definitions, systems of Mechatronics, measurements systems, control systems. Examples of open loop and closed loop control systems, microprocessor based controller. **Computer Numerical Control (CNC):** Introduction components of CNC,open loop and closed loop systems, advantages of CNC,CNC machining centers and turning centers. **Robots:** Robot anatomy, joints and links, common robot configurations. Applications of robots in material handling, processing and assembly and inspection.	**8 Hours Theory**

Text Books:

1. A Text Book of Elements of Mechanical Engineering – KR Gopalkrishna, Subhash Publishers, Bengaluru.
2. Elements of Workshop Technology, Vol. I & II – SKH Choudrhy, AKH Chowdhary & Nirjar Roy, 11th Edn., Media Promoters & Publishers, Mumbai.

Reference books:

1. A Text Book of Elements of Heat Engines – RC Patel & CJ Karamchandani, Charotar Publishers, Anand.

E-Books and Online resources:

NPTEL/SWAYAM/MOOCS:

Pedagogy :-

The topic or concept-wise pedagogy (Teaching Methodology) of the curriculum shall be specified in the content.

Question paper pattern:

1. Total of Ten Questions with two from each MODULE to be set covering the entire syllabus.
2. Five full questions are to be answered choosing at least one from each MODULE.
3. Each question should not have more than 4 sub divisions.

Course Outcomes: On completion of this course, students are able to:

Course Code	CO #	Course Outcome (CO): At the end of the course student will be able to:
21ME16/26	CO1	Identify the different sources of energy, their conversion process and thermodynamics.
	CO2	Learn the using steam tables various properties of steam
	CO3	Know the working of IC Engines and concept of refrigeration.
	CO4	Know the working of conventional machine tools and welding process.
	CO5	Understand important of mechatronics and its applications and Describe t manufacturing system.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1					3					2
CO2	3	3										
CO3	3	3	1				3					1
CO4	3	2	2				1					2
CO5	3	2	1				1					2
AVG	3	2.2	1.3				2					1.75

ENGINEERNG MECHANICS

(Common to all branches)

[As per Choice Based Credit System (CBCS) scheme]

(From the academic year 2021-22)

Course Code	21CV17/27	CIE Marks	50
Credits	03	SEE Marks	50
Contact Hours/Week (L-T-P)	3-0-0	Total Marks	100
Contact Hours	42	Exam Hours	03

Prerequisite: Physics and Mathematics

Course Learning Objectives:

To enable the Student to acquire the knowledge in the following topics

1) Understanding and solving the problems involving forces, loads and reactions, Moments and its applications of concurrent force system.
2) Solving the problems of couples and equilibrium of bodies.
3) To determine support reactions and friction of rigid bodies on horizontal and inclined planes.
4) To determine the center of gravity and moment of inertia of planar sections.
5) To study the concept of work, power &energy.

MODULE-I Introduction to Engineering Mechanics, force Systems, Basic concepts, Particle equilibrium; Rigid Body equilibrium; System of Forces; Coplanar Concurrent Forces, Composition and resolution of force systems, Resultant force, Moment of Forces and its Application; law of transmissibility of forces, Application based numerical examples	**8 Hours**
MODULE-II Varignon's theorem of moments Couple system, equivalent force couple system, composition of coplanar non concurrent force system, Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and conditions of equilibrium law of superposition of forces. Application based Numerical examples	**9 Hours**
MODULE-III Types of supports, types of loads, concept of statically determinate and indeterminate beams, support reactions for statically determinate beams. Friction, Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Impending motion on horizontal and inclined planes, wedge friction, ladder friction. Application based Numerical examples	**8 Hours**
MODULE-IV Centroid of plane figures, Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; locating the centroid of triangle, semicircle, quadrant of a circle and sector of a circle, centroid of the simple built sections & composite sections, Moment of inertia concept, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections. Numerical examples	**9 Hours**
MODULE-V Work, Power & Energy, Introduction, Work of a force, Energy of a particle, principle of work & energy for a system of particles, Potential energy and conservative forces, principles of conservation of energy, Power. Application based Numerical example	**8 Hours**

Question paper pattern:

Two questions to be set from each Module by intermixing (in total 10). Students have to answer any five full questions by selecting one question from each module.

Text Books:

1. S.S.Bhavikatti,"Elementsofcivilengineering",Vikaspublishinghouse Pvt. Ltd., New Delhi.
2.Jagadeesh T.R. and Jayaram, "Elements of civil engineering", Sapna Book House,Bangalore.
3. A.K. Tayal, "Engineering mechanics (Statics & Dynamics)", Ninth edition, Umesh publications, New Delhi.

Reference books:

1. TimoshenkoandYoung,EngineeringMechanics",McGrawBookCompany, New Delhi.
2. Ferdinand P. Beer and E. Russel Johnston Jr., "Mechanics for Engineers: Statics" McGraw Book Company, NewDelhi.
3. K.L. Kumar, "Engineering Mechanics", Tata-McGraw-Hill Publishing company, New Delhi**E-Books and Online resources:**

E books and online course materials:

www.civilenggebooks.com

Nptel link: https://nptel.ac.in/courses/112/106/112106286/

Course Outcomes: On completion of this course, students are able to:

Course Code	CO	Course Outcome (CO): At the end of the course student will be able to:
21CV17/27	CO1	Determine the resultant of coplanar concurrent force system
	CO2	Determine the resultant of non-concurrentforce system and analyze the equilibrium of forces
	CO3	Determine support reactions and apply of laws of friction for solving engineering problems
	CO4	Determine the center of gravity and moment of inertia of plane figures
	CO5	Solve the numerical on work, power and energy

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										3
CO2	3	3										3
CO3	3	3										2
CO4	3	3										3
CO5	3	3										3
AVG	3	3										2.8

ENGINEERING CHEMISTRY LABORATORY

(Common to all branches)

[As per Choice Based Credit System (CBCS) scheme]

(From the academic year 2021-22)

Course Code	21CHL11/21	CIE Marks	50
Credits	01	SEE Marks	50
Contact Hours/Week (L-T-P)	0-0-2	Total Marks	100
Contact Hours	28	Exam Hours	03

Course Learning Objectives: To enable the students to obtain the knowledge of Engineering Chemistry Practical in the following topics.

- Hardness Determination
- Analysis of alloy, metal and cement
- Determination of COD
- Estimation of strength of acids

PART-A

1. Determination of total hardness of water using standard EDTA
2. Determination of percentage of copper in brass
3. Determination of iron using internal indicator method
4. Determination of COD of waste water
5. Determination of chloride in water by precipitation method

PART – B

1. Potentiometric method of estimating iron
2. Colorimetric determination of copper
3. Conductometric estimation of acid (HCl) using standard NaOH.
4. Determination of dissociation constant (pKa) of weak acid.
5. Determination of viscosity of Polymeric solution Ostwald viscometer.

Text Books:

1. Departmental Chemistry Manual.

Reference books:

1. Text book of Quantitative analysis by A. I. Vogel.
2. Practical's of physical Chemistry by J. B. Yadav

Examination Pattern :

1. Students have to perform two experiments one from part-A and one from part-B

Course Outcomes: On completion of this course, students are able to:

Course Code	CO	Course Outcome (CO): At the end of the course student will be able to:
21CHL11/21	CO1	Explain the concepts engineering chemistry theory course through series of experiments
	CO2	Share the responsibilities in small batches of 4-5 students in operating the instruments and conduct the experiments
	CO3	Determine the properties by conducting series of experiments.(L3)
	CO4	Analyze the data obtained from the experiments and interpret the results.(L4)
	CO5	Write a well organized laboratory report.(L3)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1	3	2											
CO2	3	2											
CO3	3	2											
CO4	3	2											
CO5	3	2											
AVG	3	2											

C PROGRAMMING FOR PROBLEM SOLVING LAB
(Common to all branches)
[As per Choice Based Credit System (CBCS) scheme]
(From the academic year 2021-22)

Course Code	21CSL12/22	CIE Marks	50
Credits	01	SEE Marks	50
Contact Hours/Week (L-T-P)	0-0-2	Total Marks	100
Contact Hours	28	Exam Hours	03

Prerequisites: NIL

- Course Learning Objectives:
- Develop C programs using appropriate data type, control / decision statement.
- Learn the usage files and structures to solve real-life applications.

List of Programs

Part A

1. Write a C program to print "Hello world"
2. Write a C Program to input integer, float and character values using one scanf() Statement in C
3. printf() examples/variations in C
4. Write a C program to find Sum, difference, product, quotient and reminder of two integer numbers
5. C program to swap two numbers using four different methods
6. Write a C program to print ASCII value of a character
7. Write a C program to calculate area of different shapes like triangle, Rectangle, square.
8. Program to check whether number is EVEN or ODD
9. Program to calculate simple interest
10. Program to find largest number among three numbers
11. C program to convert temperature from Fahrenheit to Celsius and vice versa
12. C program to calculate X^N (X to the power of N) using pow function
13. C program to calculate HCF of two numbers
14. C program to print value in Decimal, Octal, Hexadecimal using printf
15. Write a C program to print all Numbers from 1 to N using goto statement.
16. Write a C program to input an integer value and print with padding by Zeros in C.
17. Write a C program to input individual Characters using scanf() in C.
18. C program to check a given character is an uppercase character or not without using the library function
19. . Write a C program to read the content of a file using getc() function
20. Write a C program to declare, initialize an union ,example of union

PART B

1. Write a C program to find the roots of a quadratic equation using if else statement.
2. a. Write a C Program to check entered number is ZERO, POSTIVE or NEGATIVE and find sum of positive and negative for given N numbers using While and if statement.

b. Write a C program to find Fibonacci series using do-while

3. Write a C program to find sum of series (Natural numbers/Factorial of numbers of all natural numbers) from 1 to N using for loop.
   Series:1/1!+2/2!+3/3!+4/4!.....N/N!

4. Write a C program to print following pyramid using for loop

1
123
12345
1234567
123456789

5. a. Write a C program to check whether a character is VOWEL or CONSONANT using switch
   b. Write a C program to calculate area of different shapes like square, rectangle, triangle using switch.
6. Write a C program to find a smallest and Largest element in a one dimensional array.
7. Write a C program to perform linear search and find position using array.
8. Write a C program to read a Matrix, Print diagonal elements and find sum of diagonals.
9. Write a C program to count the number of lines, words, character in a given text
10. Write a C Program to compute the monthly pay of N Employees using each employee's name, basic Pay, DA HRA. The DA and HRA 80% and 30% of Basic Pay respectively. Gross salary is computed by adding DA, HRA to Basic Pay, Store all the details in an array of Structures and Print the name and Gross salary of Each employee
11. Write a C program to find largest element using pointers and functions
12. Write a C program to pass 2D array to a function and find product of two Matrices
13. Write a C program to perform conversion of decimal number to binary number using recursive function.
14. Consider the details of N faculty details consisting of Name, Employee Id, Department, address & salary. Create a file to store the above details. Retrieve the contents of file to perform the following details as

i) Display the details of the faculty based on salary range entered.
ii) Display the details of faculty based on employee id entered.
iii) Write a C program to input a Domain name of email id and search for the same in the file, contact.txt, and update the existing email id with new one.

Note:
1. All the programming exercises shall be conducted using C programming language under UBUNTU Operating System.
2. Part A programs for Practice.
3. Part B Programs for SEE

Course Outcomes: On completion of this course, students are able to:

Course Code	CO	Course Outcome (CO): At the end of the course student will be able to:
21CSL12/22	CO1	Identify the programming constructs and apply appropriate control / decision sta given problem
	CO2	Develop C programs to solve computational problems using Strings and Arrays.
	CO3	Develop application using pointer.
	CO4	Implement modular programming and user defined data types
	CO5	Develop solutions for real world problems using file operations

Course Title : Computer Hardware and Maintenance
(Ability Enhancement Course)
Common to all branches
[As per Choice Based Credit System (CBCS) scheme]
(From the academic year 2021-22)

Course Code	21AE191/291	CIE Marks	100
Credits	01	SEE Marks	
Contact Hours/Week (L-T-P)	0-0-2	Total Marks	100
Contact Hours	14	Exam Hours	03

Course Learning Objectives: Understand the basic concept and structure of Computer hardware. Identify the existing configuration of the computers & peripherals.

MODULE-I **Mother board** –Functional description of mother board; Specification and variation, **Types and features of Motherboard form factors**- ATX, Micro-ATX, Mini-ITX, Nano-ITX, and Pico-ITX. **Functional components of Motherboard:** CPU and CPU socket-Types of sockets; Overview of micro architecture of INTEL and AMD CPU.	3 Hours
MODULE-II **I/O devices and Interfaces** Types of I/O devices and ports on a standard PC for connecting I/O devices. Function of serial port, parallel port, and brief principle of communication through these ports, types of devices that can be connected and interface standards.	2 Hours
MODULE-III **Chipsets** Function,Types and Features. Buses- System bus architecture,importance of POST; UEFI – why is it required, possible configurations through UEFI. **IDE ports:** Methods of adding SCSI drives. CMOS battery: Why? Its specifications. Impact of removing the battery from motherboard. **Memory**– Memory Units (B, KB, MB,GB, TB), memory locations **RAM Technology**- SDRAM, DDR,DDR2, DDR3, DDR4. **Mass storage media-** Hard drive, Principle of working, Causes of Hard drive failure; Signs of failure; Backup and recovery of data.	3 Hours
MODULE-IV **Power supplies** Need for SMPS, Specifications, Rating of SMPS based on type of motherboard and devices used (AT/ATX, Micro ATX, mini ATX, higher watts PSU for gaming PC),color coding adopted, Types of connectors used- ATX, ATX12V, Molex, SATA, PCIe. **Symptoms of SMPS failure:** Common problems from a faulty SMPS, Trouble shooting Power supplies.	3 Hours
MODULE-V **Windows 8 /10 OS Installation:** Windows versions history, Installation, understanding Windows environment, installation of network, installation of drivers for camera, printers etc. Creating user accounts Installation of MS-Office and other general software. Backup/Restore Windows partition with the bootable image.	3 Hours

Course Outcomes: On completion of this course, students are able to:

Course Code	CO	Course Outcome (CO)
21AE191	CO1	Familiarize the Functional components of Motherboard
	CO2	Develop understanding of the I/O devices and Interfaces
	CO3	Identify the various Chipsets, Memory, RAM Technology Mass storage media
	CO4	Understand the features of Power supplies and troubleshot of SMPS failure
	CO5	Install the Windows 8 /10 OS Installation

Course Title : System and Database Administrator
(Ability Enhancement Course)
Common to all branches
[As per Choice Based Credit System (CBCS) scheme]
(From the academic year 2021-22)

Course Code	21AE192/292	CIE Marks	100
Credits	01	SEE Marks	
Contact Hours/Week (L-T-P)	0-0-2	Total Marks	100
Contact Hours	14	Exam Hours	

Prerequisite: NIL

Course Learning Objectives: **:** To enable the students to obtain the knowledge of System and Database Administrator in the following topics.

- System administrator roles and responsibility.
- Managing the files and monitoring disk files.
- Fundamentals of database.
- Data presentation.

MODULE-I System administration, roles and responsibility of system administrator, configuring the system, security concepts and data backups.	3 Hours
MODULE-II Managing the files, maintaining the drive status, and monitoring the disk files.	3 Hours
MODULE-III Fundamentals of database: Introduction to database, securing the database.	2 Hours
MODULE-IV Microsoft access and Excel, dealing with formulas, maintain and managing the data in table format,	3 Hours
MODULE-V Data presentation: Introduction to graphs, presenting the data using power point and web tools.	3 Hours

Question paper pattern:

1. The question paper will have TEN questions.
2. There will be TWO questions in each module, covering all the topics.

The student need to answer FIVE full questions, selecting ONE full question from each module.

Text books:

1.Essential System Administration, by by Aeleen Frisch, 3rd Edition

Reference Books:

1. Unix Linux System Administration Handbook by Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, and Dan Mackin
2. Database Reliability Engineering by Laine Campbell and Charity Majors

Course Outcomes: On completion of this course, students are able to:

Course Code	CO	Course Outcome (CO)
21AE192	CO1	Understand roles and responsibility of system administrator,
	CO2	Maintaining the drive status, and monitoring the disk files.
	CO3	Understand the fundamentals of database and securing.
	CO4	Understand the uses of Microsoft access and Excel
	CO5	Apply power point and web tools for data representation

Course Title : Electrical Safety
(Ability Enhancement Course)
Common to all
[As per Choice Based Credit System (CBCS) scheme]
(From the academic year 2021-22)

Course Code	21AE193/293	CIE Marks	100
Credits	01	SEE Marks	
Contact Hours/Week (L-T-P)	2-0-0	Total Marks	100
Contact Hours	14	Exam Hours	

Prerequisite: NIL

MODULE-I Electrical safety tips: Never put fingers or other objects in an outlet, Keep metal objects out of toasters, Never use anything with a cord or plug around water, Never pull a plug out by its cord, Stay away from substations and power lines, Don't climb on power poles, Never fly kites near power lines, Stay away from broken or fallen power lines, Never touch or climb trees that are near power lines, Never touch big, metal transformer boxes with warning signs, Obey warning signs	3 Hours
MODULE-II Precautions Against Electric Shocks: Unused wall outlets should be secured. Plastic inserts can be used but they can be pulled off and stuck in the mouth. Consider using safety outlets that prevent foreign objects from being inserted. You can also block outlets with the creative arrangement of furniture. If you're temporarily using extension cords, hide them behind furniture or use a hide-a-cord device. You can also put electrical tape over unused plug holes on cords. Put electrical devices such as DVD players on a shelf out of reach, or behind a barrier. Store bathroom and kitchen electrical appliances – like hair dryers and toasters – out of reach of curious children.	3 Hours
MODULE-III It's vitally important to take safety precautions when working with electricity. Safety must not be compromised and some ground rules need to be followed first. The basic guidelines regarding the safe handling of electricity documented below will help you while working with electricity. 1. Avoid water at all times when working with electricity. Never touch or try repairing any electrical equipment or circuits with wet hands. It increases the conductivity of the electric current. 2. Never use equipment with frayed cords, damaged insulation or broken plugs. 3. If you are working on any receptacle at your home then always turn off the mains. It is also a good idea to put up a sign on the service panel so that nobody turns the main switch ON by accident. 4. Always use insulated tools while working. 5. Electrical hazards include exposed energized parts and unguarded electrical equipment which may become energized unexpectedly. Such equipment always carries warning signs like "Shock Risk". Always be observant of such signs and follow the safety rules established by the electrical code followed by the country you're in.	3 Hours

6. Always use appropriate insulated rubber gloves and goggles while working on any branch circuit or any other electrical circuit. 7. Never try repairing energized equipment. Always check that it is de-energized first by using a tester. When an electric tester touches a live or hot wire, the bulb inside the tester lights up showing that an electrical current is flowing through the respective wire. Check all the wires, the outer metallic covering of the service panel and any other hanging wires with an electrical tester before proceeding with your work. 8. Never use an aluminum or steel ladder if you are working on any receptacle at height in your home. An electrical surge will ground you and the whole electric current will pass through your body. Use a bamboo, wooden or a fiberglass ladder instead. 9. Know the wire code of your country. 10. Always check all your GFCI's once a month. A GFCI (Ground Fault Circuit Interrupter) is a RCD (Residual Current Device). They have become very common in modern homes, especially damp areas like the bathroom and kitchen, as they help avoid electrical shock hazards. It is designed to disconnect quickly enough to avoid any injury caused by over current or short circuit faults.	
MODULE-IV Protection against Electrical Hazards: 1. Observe the system without touching it. The person may still be in contact with the electrical source. Touching the person may pass the current through you. 2. Call or have someone else call 911 or emergency medical **help**. 3. Turn off the source of electricity if possible. If not, move the source away from you and the affected person using a non-conducting object made of cardboard, plastic or wood. 4. Once the person is free of the source of electricity, check the person's breathing and pulse. If either has stopped or seems dangerously slow or shallow, begin cardiopulmonary resuscitation (CPR) immediately. 5. If the person is faint or pale or shows other signs of shock, lay him or her down with the head slightly lower than the trunk of the body and the legs elevated. 6. Don't touch burns, break blisters, or remove burned clothing. Electrical shock may cause burns inside the body, so be sure the person is taken to a doctor.	3 Hours
MODULE-V **Video Presentations on Electrical Safety.**	3 Hours

Question paper pattern:: Total ten questions will be asked. Two from each module. The student has to answer five questions, selecting at least one from each module.

Text books:

1.Essential System Administration, by by Aeleen Frisch, 3rd Edition

Reference Books:

1. Electrical Safety Hand book, John Cadick, Mc-Graw Hill Publications, 4th edition.
2. National Electrical Safety Code, David J and Marne, Mc-Graw Hill Publications.

Course Outcomes: On completion of this course, students are able to:

Course Code	CO	Course Outcome (CO)

21AE193	CO1	Learn about Indian electrical safety standards
	CO2	Demonstrate the precautions need to be taken during electrical shock and hazards
	CO3	Learn about electrical safety rules.
	CO4	Understand about the protections against electrical hazards.
	CO5	Understand the safety standard in residential, commercial, and agricultural

SWAYAM Courses (**Ability Enhancement Course**) **Common to all**

Sl No.	Course Title	Course Code	Duration	Credits	Category	Level	Website
1	Innovation by Design	21AE194/294	04 Weeks	01	Multidisciplinary	Undergraduate	https://swayam.gov.in/
2	Leadership	21AE195/295	04 Weeks	01	Management Studies	Undergraduate	https://swayam.gov.in/
3	Awareness Programme on solar water pumping System(Upcoming)	21AE196/296	04 Weeks	01	Agricultural and Food Engineering	Undergraduate	https://swayam.gov.in/

Note:-

1. The students are to be registered to one of these course using the link(https://swayam.gov.in/) As per the schedule
2. The course certificate is to be submitted to the concerned after completion.

Hyderabad Karnataka Education Society's

Poojya Doddappa Appa College of Engineering

(An Autonomous Institution &Affiliated to

Visvesvaraya Technological University, Belagavi)

Aiwan E-Shahi Area KALABURAGI 585 102 Karnataka India

CURRICULUM

FOR B.E.III SEMESTER AND IV SEMESTER

FOR THE ACADEMIC YEAR 2022-23

DEPARTMENT OF CIVIL ENGINEERING

About College:

Poojya Doddappa Appa College of Engineering (PDACE) is the first institution of Hyderabad Karnataka Education (HKE) Society, Kalaburagi, which was established in the year 1958. The foundation stone of this college was laid by the then Vice President of India Dr.Sarvapalli Radhakrishnan in 1958.

At present, PDA College of Engineering is offering 11 UG programs, 10 PG Programs and 12 Research centers, spreading and imparting technical education in North Karnataka Region. The college has state of the art laboratories, digitalized smart class rooms having highly qualified and experienced faculty with highest no. of Ph.D. and M. Tech degrees.

PDACE is the only Autonomous Institution in the region, which was sponsored under TEQIP I , TEQIP-II and TEQIP-III from World Bank and received grants of Rs.10.43 crores, Rs. 17.5 crores and 7 crores respectively. This is one among 12 institutions having TEQIP-I and TEQIP -II sponsorship. At present, college is selected in TEQIP-III as Mentor Institution for Bundelkhand Institute of Engineering & Technology, Jhansi.

The Vision and Mission of PDA College of Engineering are as mentioned below.

VISION

- To be an institute of excellence in technical education and research to serve the needs of the industry and society at local and global levels.

MISSION

- To provide a high-quality educational experience for students with values and ethics that enables them to become leaders in their chosen professions.
- To explore, create and develop innovations in engineering and science through research and development activities.
- To provide beneficial service to the national and multinational industries and communities through educational, technical and professional activities.

About Department of Civil Engineering

The Civil Engineering Department was established in the year 1958 with an intake of 60 students. In 1994 the intake was increased to 90 and further increased to 180 in the year 2014.Presentlythe department runs both UG and PG (Environmental Engineering and Structural Engineering) programs with intake of 180 in UG program and 18 in each PG program. Department is recognized as Research Centre by Visvesvaraya Technological University Belagavi in the year 2002 and at present 35 research scholars are pursuing their Ph.D. and seven research scholars have been awarded with Ph D degree.

The Department has signed MoU with various industries like Medini, Sharan Technical consultancy, Canter Technologies Pvt. Ltd, Sharan Chandra Consultant, JGD Consultants, Jalavahini Management Services Pvt. Ltd. Dharwad, Shah Technical Consultants Pvt. Ltd., PP Raju & Co., Design Consortium, KRIDL, Bharath Dal and Oil Industries, Ultratech, ACC, Alstom, Karnataka State Pollution Control Board & HCC. These MoUs have helped the students in getting exposure to industrial environment and also for conducting Industry Institute Interaction events.

The Vision, Mission and Program educational objectives of Civil Engineering Department are as follows:

VISION

- To be the preeminent department for imparting technical knowledge and skills in the Civil Engineering field to meet the social, industrial, environmental and research needs at local and global levels.

MISSION

- To provide technical education to meet the challenges in the profession through a well-structured curriculum.
- To inculcate innovation and research ideas for sustainable development with ethical background.
- To impart entrepreneurial skills for serving the needs of the society through technical and professional activities.
- To create Civil Engineering professionals to serve the needs of the industry at local and global levels.

PROGRAM EDUCATIONAL OBJECTIVES(PEO'S)

Program educational objectives are broad statements that describe the Career and Professional accomplishments that the program is preparing graduates to achieve. The program educational objectives of the B.E. in Civil Engineering Program at PDA College of Engineering, Kalaburagi are:

PEO1: To provide the knowledge of mathematics, science and engineering fundamentals for solving civil engineering problems.

PEO2: To enable the graduates to exhibit their technical knowledge and skills of recent practices to identify and solve civil engineering problems.

PEO3: To enable the graduates to conduct and interpret the results of laboratory/ field experiments in basic sciences, engineering sciences and civil engineering.

PEO4: To enable the graduate for pursuing higher education and lifelong learning.

PEO5: To enable the graduates to acquire communication, team work and entrepreneurial skills along with the values of professional ethics.

PROGRAM OUTCOMES

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

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

3. 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.

4. 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.

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

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

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

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

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

10. 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.

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

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

PROGRAM SPECIFIC OUTCOMES

The Civil Engineering graduates are able to:

PSO1: Plan, Analyze and Design buildings, Water supply and Sewerage systems, Hydraulic structures and Transportation infrastructure using sustainable materials and conceptual knowledge of Geotechnical engineering.

PSO2: Conduct survey and Laboratory experiments/ field investigations and interpret the data for application to real life problems.

PSO3: Prepare detailed estimate of civil Engineering works and Execute the civil Engineering Projects with optimum resources using effective communication skills and Professional ethics

	III semester										
Sl. No	**Category**	**Subject Code**	**Subject Title**	**Credits**	**HOURS /WEEK**			**EXAMINATION**			
					L	**T**	**P**	**Duration in hours**	**CIE Marks**	**SEE Marks**	**Total Marks**
1	BS	21MA31	Numerical Analysis & Statistical Methods	3	3			3	50	50	100
2	PC	21CV32	Strength Of Material	3	3			3	50	50	100
3	PC	21CV33	Fluid Mechanics	3	3			3	50	50	100
4	PC	21CV34	Surveying	3	3			3	50	50	100
5	HSMS	21KAK35	Samskrutika Kannada	1	2			1.5	50	50	100
		21KAN35	Balake Kannada						50	50	100
			OR					OR			
		21HU35	Constitution of India, Professional Ethics and Cyber Law					3	50	50	100
6	Internship	21INT36	Summer Internship – I	2				--	50	-	50
7	AEC	21CVAE36A	Ability Enhancement Course (AutoCAD)	1				3	50	50	100
8	UHV	21UHV36B	Courses On Universal Human Values	1		2		2	50	50	100
9	PC	21CVL31	Fm Lab	1			2	3	50	50	100
10	PC	21CVL32	Surveying Lab	1			2	3	50	50	100
11	PC	21CVL33	Building Planning & Drawing	2	1		2	4	50	50	100
TOTAL				**21**					**550**	**500**	**1050**

IV semester											
Sl. No	**Category**	**Subject Code**	**Subject Title**	**Credits**	**HOURS/ WEEK**			**EXAMINATION**			
					L	**T**	**P**	**Duration in hours**	**CIE Marks**	**SEE Marks**	**Total Marks**
1	PC/BS	21CV41	Structural Analysis	3	3		--	3	50	50	100
2	ES	21CV42	Concrete Technology	2	2		-	3	50	50	100
3	PC	21CV43	Water Resources Engineering	3	3		--	3	50	50	100
4	PC	21CV44	Building Materials & Construction Technology	3	3		--	3	50	50	100
5	HSMS	21KAK45	Samskrutika Kannada	1	2		--	1.5	50	50	100
		21KAN45	Balake Kannada								
			OR					OR			
		21HU45	Constitution Of India, Professional Ethics and Cyber Law					3			
6	AEC	21CVAE46A	Ability Enhancement Course (Life Sciences) (Environmental Science)	1	1			1.5	50	50	100
7	AEC	21CVAE46B	Ability Enhancement Courses (Total Station Survey)	2	--		2	3	50	50	100
8	UHV	21UHV46C	Courses On Universal Human Values	1	--	2		2	50	50	100
9	PC	21CVL41	Geology Lab	1	--		2	3	50	50	100
10	PC	21CVL42	SOM Lab	1	--		2	3	50	50	100
11	PC	21CVL43	Concrete Lab	1	--		2	3	50	50	100
TOTAL				19					550	550	1100

Course Title: **Numerical Analysis & Statistical Methods**		
Course Code	21MA31	CREDIT: 03
Lecture Hours/Week	3 Hrs. (Theory)	SEE: 50
Total Lecture Hours: 42	CIE: 50	SEE: 03 Hours
Prerequisite: Differential calculus, Integral calculus and Differential equations.		

Course Learning Objectives: To enable the students to obtain the knowledge of Engineering Mathematics in the following topics

1. Numerical methods to solve algebraic and Transcendental equations
2. Interpolation methods, Numerical differentiation and Numerical integration
3. Numerical solutions ordinary differential equations
4. Curve fitting by the method of least squares and correlation
5. Introduction to theories of functions of complex variables and contour integration

Modules	**Teaching Hours**
Module-I **Solution of Algebraic and Transcendental Equations**: Bisection method, Newton's-Raphson method and Regula falsi method. **Finite differences:** Forward and Backward differences, Interpolation, Newton's Forward and Backward interpolation formulae and examples. Langrange's interpolation and inverse interpolation formulae and examples. (All formulae and rules without proof). **RBT Levels: L1, L2 & L3**	9 hours
Module II **Numerical differentiation:** Numerical differentiation using Newton's forward and backward interpolation formulae and problems. **Numerical integration**: Introduction, Trapezoidal rule, Simpson's $1/3^{rd}$, Simpson's $3/8^{th}$ rule and Weddle's rule. (all rules without proof). **Numerical solutions of first order and first degree ordinary differential equations**: Taylors series method, Runge –Kutta method of fourth order, modified Euler's method and Milne's-Thomson's predictor and corrector methods and problems.(all formulae without proof **RBT Levels: L1, L2 & L3**	9 hours
Module III	8 hours

Statistical methods: Curve fitting by the method of least squares: Straight-line, second-degree parabola and the curves of the form $y = ab^x$, $y = ax^b$ and $y = ae^{bx}$. Correlation and lines of regression, angle between two regression lines and Rank correlation **RBT Levels: L1, L2 & L3**	
Module IV **Functions of Complex variables:** Introduction, limit, continuity, differentiability—Definitions. Analytic function, Cauchy-Riemann equations in Cartesian and polar forms. Applications of analytic function. Conformal transformation. Discussion of transformations: $W=z^2$, $W=e^z$. Bilinear transformations and problems **RBT Levels: L1, L2 & L3**	8 hours
Module V **Complex integration:** line integrals, Cauchy's theorem, Cauchy's integral formula. Taylor's and Laurent's series (Statements only). Singularities, poles, residues, Cauchy's residue theorem. (Statement only) and problems **RBT Levels: L1, L2 & L3**	9 hours

Assessment and Evaluation

The Scheme of Assessment will have two parts, namely;

I. Continuous Internal Assessment (CIE) and
II. Semester End Examination (SEE)

Assessment and Evaluation of each Course shall be for 100 marks. Continuous Internal Assessment (CIE) and Semester End Examination (SEE) of UG Engineering programs shall carry 50:50 marks respectively (i.e., 50 marks internal assessment; 50 marks semester end examination).

The 50 marks of internal assessment shall comprise of: Internal Test 40 marks and Assignments / Seminars / Slip test / Quizzes etc. 10 marks

There shall be three Internal Tests conducted as per the calendar of events. The students shall attend all the Tests compulsorily.

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored by the student will be proportionately reduced to 50.

- The question paper will have ten full questions carrying equal marks.
- Each full question carries 20marks.
- There will be two full questions (with a maximum of four sub questions) from each module.

- Each full question will have sub question covering all the topics under a module.

The students will have to answer five full questions, selecting one full question from each module.

Text book:

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed.,2015.
2. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed.(Reprint),2016

Reference books:

1. 1. Early Transcendental Calculus- James Stewart, Thomson Books, 5e 2007
2. N.P.Bali and Manish Goyal: A Text Book of Engineering Mathematics, Laxmi Publishers, 7th Ed., 2010.
3. B.V.Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. Statistical Methods Authored By Gupta S.P. Publisher: Sultan Chand & Sons. Publishing Year: 2021
5. Fundamentals of Mathematical Statistics Authored By Gupta S.C.& Kapoor V.K. Publisher: Sultan Chand & Sons. Publishing Year: 2020

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
21MA31	CO1	Solve algebraic and transcendental equations by numerical methods and computation of interpolating polynomials using given data.
	CO2	Compute derivatives of the functions numerically using given data and Evaluate integrations numerically. Apply numerical methods to solve ordinary differential equations.
	CO3	Apply the method of least square to estimate the parameters in regression model
	CO4	Understand C-R equations, analytic functions and its properties
	CO5	Evaluation of complex integrals using the residue theorem and represent functions as Taylor's and Laurent's series.

Course Title: STRENGTH OF MATERIALS		
Course Code	21CV32	CREDIT: 03
Lecture Hours/Week	3 Hrs. (Theory)	SEE: 50
Total Lecture Hours: 42	CIE: 50	SEE: 03 Hours
Prerequisite: Elements of Civil Engineering and Engineering mechanics.		

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. To understand the behavior of materials under stress and strain.
2. To analyse an element subjected to compound stress to assess the various stresses in thin and thick cylinders.
3. To understand the concept of shear force and bending moments for beams subjected to various system.
4. To evaluate the bending and shear stress in beam to understand the behavior and design of columns.
5. Strength evaluation and design of circular shaft subjected to torsion and to evaluate the deflection of beams.

Modules	Teaching Hours
Module I **SIMPLE STRESSES AND STRAINS**: Introduction to various strengths of material, concept and definition of stress and strain, types of stresses and strains, Assumptions in strength of materials, stress-strain diagrams for mil for mild steel, ferrous and non-ferrous materials, St Venant's Principle, Hook's Law, Modulus of Elasticity, Poission's ratio, Deformation of bars of uniform cross section, varying cross section. Elongation due to self-weight. Compound bars, Temperature stresses, Elastic constants and their relationship, volumetric strain, application problems.	10 hours
Module II **COMPOUND STRESSES:** Determination of stresses on oblique/inclined plane due to uniaxial, biaxial and general 2D stresses, (Analytical method), Determination of Principal Planes and Principal Stresses, Maximum Shear Stress and their plane (Analytical method)	8 hours

THIN AND THICK CYLINDERS: THIN CYLINDERS: Determination of Longitudinal and Circumferential/Hoop's stress, change in dimensions and volume THICK CYINDERS: Assumptions, Lami's equation derivation and problems, radial pressure and hoop stress distribution diagrams.	
Module III **SHEAR FORCE AND BENDING MOMENT IN BEAMS:** Introduction to types of loads, beams and support with reaction. Definition of Shear force and bending moment, sign conventions. Relationship between load intensity, bending moment and shear force. Shear force diagram (SFD) and Bending moment diagram (BMD) for simply supported beams (both without overhang and with overhangs) and cantilever beams, beams subjected to point loads, UDL, UVL, Couples and their combinations.	8 hours
Module IV **BENDING STRESSES AND SHEAR STRESSES IN BEAMS.** BENDINF STRESSES: Assumptions, Bernoulli's theory of Pure Bending, relationship between bending moment, bending stress and radius of curvature, Moment of Resistance, Section Modulus, flexural rigidity, Modulus of rupture. Bending stress diagram for rectangular, circular, 'I', 'T' and 'L' sections (simple problems) SHEAR STRESS: Expression for transverse shear stressing beams, Shear stress diagram for rectangular, circular, 'I', 'T' and 'L' sections. **TORSION OF CIRCULAR SHAFTS:** Equation for theory of pure Torsion, Assumptions, Torsion equation for circular shaft, Strength and stiffness, torsional rigidity, polar modulus, strengths of solid and hollow shafts, power transmitted by solid and hollow shafts.	8 hours
Module V **ELASTIC STABILITY OF COLUMNS AND STRUTS.** Introduction to short and long columns. Definition of effective length, slenderness ratio, radius of gyration, buckling/critical load. Assumption and derivation of Euler's Buckling load for different end conditions. Problems and limitations of "Euler's theory. Rankine's theory, numerical problems. **DEFLECTION OF BEAMS:**	8 hours

Definition of stiffness, elastic curve, deflection in simple bending, relation between curvature, slope and deflection. Double Integration method for cantilever and simply supported beams for point load, UDL, UVL and couple, Macaulay's method, numerical problems.	

Question paper pattern:

Two questions to be set from each Module by intermixing (in total 10). Students have to answer any five full questions by selecting one question from each module.

Text books:

1. S.S.Bhavikatti "Strength of Materials", New age Publications

2. B.S. Basavarajaiah, P Mahadevappa "Strength of Materials" in SI Units, University Press (India) Pvt. Ltd., 3rd Edition (2010)

3. Shesha Prakash MN and Suresh GS, Mechanics of Materials, Prentice Hall, New Delhi,2011

4. R.Subramanian "Strength of Materials" Oxford University Press. 3rdEdition (2016)

Reference Books:

1. D.H. Young, S.P. Timoshenko "Elements of Strength of Materials "East West Press Pvt. Ltd., 5th Edition (Reprint 2014)

2. S.S. Rattan "Strength of Materials" McGraw Hill Education (India)Pvt. Ltd., 2nd Edition (Sixth reprint 2013).

E books and online course materials:

www.civilenggebooks.com

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
21CV32	CO1	To Understand about simple stress and strains with their relationship. determine the deformation of composite bars due to loads and temperature stress.
	CO2	To explain about the compound (complex) stress for 2D elements both by analytical and graphical methods. To determine principal stresses and their planes, evaluate different stresses acting on thin and thick cylinder.
	CO3	To analyze and draw SFD and BMD for beams with various end conditions and loads.
	CO4	To estimate and draw the bending stress, and shear stress diagram in the beams of various cross sections
	CO5	To determine the torsion and design the shafts to evaluate to slope and deflection of beams subjected to various loads by double integration and Maculay's method. To determine bulking loads for columns with different end conditions.

FLUID MECHANICS		
Course Code	21CV33	CREDIT:03
Lecture Hours/Week	3 hrs (Theory)	SEE: 50 Marks
Total Lecture Hours: 42	CIE: 50 Marks	SEE:03Hours:

Prerequisite: Engineering Mathematics, Engineering Mechanics.

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. Distinction between solid, fluid, liquid and gas. Classify the fluids and measurements of pressure by various types of manometers.
2. Hydrostatic forces on vertical, inclined and curved surfaces. Dynamics of fluid flow
3. Types of flows in pipes and head loss in pipe due to friction and bends. Impact of Jets
4. Measurement of flow through orifice, notches and weirs. Pumps
5. Analyse Open Channel flow, Dimensions & Model studies

Modules	Teaching Hours
Module I **Scope and importance of the subject.** Definition of fluid, distinction between a solid and a fluid, distinction between a liquid and a gas, Fluid continuum. Fluid properties and classification of Fluids: Mass density, specific volume, specific weight, relative density, viscosity, Newton's Law, compressibility, surface tension and capillarity and their units (SI systems) Pressure at a point in a static fluid – Pascal's law – Hydrostatic Pressure law, Atmospheric pressure, Absolute, gauge, and vacuum pressure, Simple U-tube manometer, U-tube Differential manometers, inverted U-tube monometer.	8 hours
Module II **Hydrostatics:** Hydrostatics Forces on vertical & inclined plane surfaces, Hydrostatic forces on curved surfaces and center of pressure, pressure diagrams. Applications of total pressure and center of pressure on Dams, Roller gates, Tainter gates, sector gates, Sluice gates and pressure diagrams. **Dynamics of Fluid Flow**: Euler's equation of motion in one dimension – Integration of Euler's equation, Bernoulli's equation, Limitations and modifications of Bernoulli's equation – Applications of Bernoulli's equation, Pitot tubes, Venturi meter	8 hours

Module III **Flow Through pipes:** Types of flows in pipes, Reynolds's experiments – Reynold's number Laminar & turbulent flows, fluid friction in pipes - Head loss due to friction (Darcy Weisbach equation) Friction factors for commercial pipes, Minor losses in pipes, pipes in series, equivalent pipe and pipes in parallel, Introduction to Impulse – momentum equation and its application on pipe bend. **Impact of jets on vanes**: Force exerted by a jet on a fixed target, Derivations. Force exerted by a jet on a moving target, Derivations. Force exerted by a jet on a series of curved vanes. Force exerted by a jet on hinged plate. Problems on above derivations.	8 hours
Module IV **Flow measurements:** Flow through a small orifice. Hydraulic coefficients and experimental methods of determination. Flow through large rectangular orifices, submerged orifices. Flow through mouth pieces, external cylindrical mouth piece, hydraulic co-efficient, flow through internal or re-entrant Borda's mouth piece. Classification of Notches & weirs, Flow over rectangular Notch, Triangular Notch or weir Trapezoidal Notch, stepped Notch, Velocity of approach, Francis formula Flow, Cipolletti weir or Notch, Broad crested, ogee weir, submerged weir, effect on discharge over a rectangular weir due to error in the measurement of head. Definition of pump, difference between pump & turbine, classification, Description & general principle of working, priming & methods. Work done & efficiencies of a centrifugal pump. .	9 hours
Module V **Open channel flow**: Introduction to open channels, classification, difference between pipe flow & open channel flow, types of flow, geometric properties of open channels, Uniform flow in open channels, Chezy's and Manning's formulae, Problems on uniform flow, Most economical section of open channel flow, Derivation of conditions for most economical rectangular, triangular and trapezoidal sections. Problems on most economical sections. Most economical circular channels derivations and problems, **Dimensional analysis & model similitude**: Introduction to Dimensional Analysis unit & dimensions, Table of Dimensions, Dimensional Homogeneity, Methods of Analysis, Rayleigh's & Buckingham's method. Problems on Rayleigh's & Buckingham's methods, Model Studies, Introduction, Similitude, Dimensionless parameters. Types of models. Froude's models theory & problems. Reynolds models, Problems, Scale effects.	9 hours
Question paper pattern:	

Two questions to be set from each Module by intermixing (in total 10). Students have to answer any five full questions by selecting one question from each module.

Text books:

1. P N Modi and S M Seth, "Hydraulics and Fluid Mechanics, including Hydraulic Machines", 20th edition, 2015, Standard Book House, New Delhi
2. R.K. Bansal, "A Text book of Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi
3. S K SOM and G Biswas, "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw Hill, New Delhi

Reference Books:

1. Victor L Streeter, Benjamin Wylie E and Keith W Bedford, "Fluid Mechanics", Tata McGraw Hill Publishing Co Ltd., New Delhi, 2008(Ed).
2. K Subramanya, "Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Publishing Co. Ltd.
3. K Subramanya, "Fluid Mechanics and Hydraulic Machines-problems and solutions", Tata McGraw Hill Publishing Co. Ltd.
4. J. F. Douglas, J. M. Gasoriek, John Swaffield, Lynne Jack, "Fluid Mechanics", Pearson, Fifth Edition.
5. Mohd. Kaleem Khan, "Fluid Mechanics and Machinery", Oxford University Press.

E books and online course materials:

www.civilenggebooks.com

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)	Blooms Level
21CV33	**CO1**	Identify basic properties of Fluids, measurement of fluid pressure	C2
	CO2	Analyze fluid pressure forces and design sluice gates, roller gates etc. Apply Bernoulli' s equation & its application on fluid flow problems	C4
	CO3	Analyze fluid flow through pipes, impact of jets on fluid machines.	C3
	CO4	Apply fluid flow phenomenon in flow measurement through orifices, mouth piece, notches and weirs	C2
	CO5	Identify basic principles of flow through open channels and organize the design parameters based on model studies.	C3

SURVEYING		
Subject Code	21CV34	Credit 03
Number of Lecture Hours/Week	3Hours (Theory)	SEE: 50
Total Hours: 42	CIE: 50	SEE Hours: 03

Prerequisite: Mathematics.

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. Understand the concept of surveying and leveling.
2. Identify the components of surveying and leveling.
3. Interpret the different measurement techniques for various applications.
4. Apply principles of surveying for solving relevant engineering problems.

Modules	Teaching Hours
Module-1 **INTRODUCTION:** Surveying, Objectives and importance of surveying. Classification of surveys. Principles of surveying. Units of measurements, Surveying measurements and errors, types of errors, precision and accuracy. Topographic maps. **CHAIN SURVEY-** Fundamental terms, chain types & Tape types, booking of chain survey work, Field book, entries, Conventional symbols, Obstacles in chain survey. **MEASUREMENT OF DIRECTIONS:** Compass survey: Basic definitions; Types of meridians, bearings and their types, magnetic and true bearings. Prismatic and surveyor's compasses, temporary adjustments, declination and Dip. Quadrantal bearing system, whole circle bearing system, local attraction and numerical problems, latitudes and departures-consecutive coordinate method.	9 Hours
Module-2 **LEVELING:** Principles of levelling, Fundamental axes and parts of a dumpy level, temporary adjustments and permeant adjustments i.e., two peg test only and objectives, Types of leveling - Simple leveling, Profile leveling and Cross sectioning, fly leveling. Computation of levels using Rise and fall method and Height of instrument method - comparison, Arithmetic checks. Numerical problems.	9 Hours
Module-3 **CONTOUR SURVEY:** Contours and their characteristics, Methods of contouring - direct and indirect methods (squares and cross section methods), contour interpolation, Uses of	8 Hours

contours. **AREAS AND VOLUMES:** Computation of area and volume by trapezoidal, Simpson rules and prismoidal formulae. Planimeter- Principle, working and uses, Digital Planimeter.	
Module-4 **THEODOLITE SURVEY:** Theodolite and types, Fundamental axes and their relationship, parts of Vernier transit theodolite, uses of theodolite, Temporary adjustments, measurement of horizontal angles (Repetition and Reiteration methods) and vertical angles. **TRIGONOMETRIC LEVELLING:** Determination of Heights and Distances of an accessible and Inaccessible object by single plane and double plane methods, Numerical problems.	8 Hours
Module-5 **CURVES:** **SIMPLE CURVES**: Types, Elements, Designation of curves, setting out of simple curves by linear methods (numerical problems on offsets from long chord & chord produced method), Setting out curves by Rankine's deflection angle method (No derivation), Numerical problems. **COMPOUND CURVES:** Elements, Design of compound curves, Setting out of compound curves, numerical problems (Case - 1 only). **REVERSE CURVE:** Between two Parallel straights (numerical problems on Equal radius and unequal radius).	8 Hours

Reference Books:

1. Surveying Vol I and Vol II, Punmia B.C, 16" Edition, 2016, Laxmi Publications, (P) Ltd, New Delhi ISBN- 10: 9788170088530 ISBN-10; 817008883
2. Plane surveying, Chandra A.M, 2'd Edition, 2015, New age International (P) Ltd., ISBN- 10: 8122438806
3. Surveying Vol I& Il, Duggal S.K, g' Edition, 2017, Tata Mc Craw Hill Publishing Co, ISBN- 10: 9781259028991 ISBN-10: 978125902899
4. Surveying, Vol I& I, Arora K.R, 2016, Standard Book House, ISBN-10: 8189401246 ISBN- 10: 8189401238
5. Surveying vol. I and II S.K. Duggal, 4th Edition, Tata McGraw Hill – Publishing Co. Ltd., New Delhi.

E books and online course materials:
www.civilenggebooks.com

Course outcomes: **On completion of the course, the student will have the ability to:**			
Course Code	**CO**	**Course Outcome (CO)**	**Bloom Level**
21CV34	**CO1**	Possess the knowledge of principles of surveying, methodologies and the techniques of measurement.	**C2**
	CO2	Understand use of leveling instruments and techniques of leveling operations and its applications.	**C3**
	CO3	Acquire Knowledge about contouring and calculate the areas and volumes.	**C3**
	C04	Use of Theodolite in execution of different civil engineering problems determination of Height of inaccessible object using Trigonometric Levelling.	**C3**
	CO5	To set out the simple, compound and reverse curves.	**C3**

SAMSKRUTHIKA KANNADA		
Subject Code	21KSK36	Credit 01
Number of LectureHours/Week	1 Hours(Theory)	SEE: 50
Total Hours: 14	CIE: 50	SEE Hours: 1.5 Hrs

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕ

(ಕನ್ನಡ ಮಾತೃಭಾಷೆಯ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ)

(ಕನ್ನಡಿಗರಿಗಾಗಿ – for Kannadigas - Common to all branches)

[As per Outcome Based Education (OBE) and Choice Based Credit System (CBCS) scheme]

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

- ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡದ ಜೊತೆಗೆ ಕ್ರಿಯಾತ್ಮಕ ಕನ್ನಡವನ್ನು, ಕನ್ನಡ ಸಾಹಿತ್ಯ, ಸಂಸ್ಕೃತಿ ಮತ್ತು ನಾಡು ನುಡಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.
- ಕನ್ನಡದಲ್ಲಿ ತಾಂತ್ರಿಕ ವಿಜ್ಞಾನಗಳ ವಿಷಯಕ್ಕೆ ಸಂಬಂಧಿಸಿದ ಹಲವಾರು ವಿಷಯಗಳನ್ನು ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.
- ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ, ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗೂ ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

ಪರಿವಿಡಿ

ಭಾಗ – ಒಂದು ಲೇಖನಗಳು

ಕನ್ನಡ ನಾಡು, ನುಡಿ ಮತ್ತು ಸಂಸ್ಕೃತಿಗೆ ಸಂಬಂಧಿಸಿದ ಲೇಖನಗಳು

೧. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ : ಹಂಪ ನಾಗರಾಜಯ್ಯ
೨. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ : ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ – ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ
೩. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ – ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೊ. ವಿ. ಕೇಶವಮೂರ್ತಿ *

ಭಾಗ – ಎರಡು

ಕಾವ್ಯ ಭಾಗ (ಆಧುನಿಕ ಪೂರ್ವ)

೪. ವಚನಗಳು : ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರ ದಾಸಿಮಯ್ಯ, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ.
೫. ಕೀರ್ತನೆಗಳು : ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ – ಪುರಂದರದಾಸ
ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೆ – ಕನಕದಾಸ
೬. ತತ್ವಪದಗಳು : ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು – ಶಿಶುನಾಳ ಷರೀಫ
ಶಿವಯೋಗಿ – ಬಾಲಲೀಲಾ ಮಹಾಂತ ಶಿವಯೋಗಿ

೭. ಜನಪದ ಗೀತೆ : ಬೀಸುವ ಪದ, ಬಡವರಿಗೆ ಸಾವ ಕೊಡಬೇಡ

ಭಾಗ – ಮೂರು

ಕಾವ್ಯ ಭಾಗ (ಆಧುನಿಕ)

೮. ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗ : ಡಿ.ವಿ.ಜಿ.

೯. ಕುರುಡು ಕಾಂಚಾಣಾ : ದ.ರಾ. ಬೇಂದ್ರೆ

೧೦. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು

೧೧. ಹೆಂಡತಿಯ ಕಾಗದ : ಕೆ.ಎಸ್. ನರಸಿಂಹಸ್ವಾಮಿ

೧೨. ಮಬ್ಬಿನಿಂದ ಮಬ್ಬಿಗೆ : ಜಿ.ಎಸ್. ಶಿವರುದ್ರಪ್ಪ

೧೩. ಆ ಮರ ಈ ಮರ : ಚಂದ್ರಶೇಖರ ಕಂಬಾರ

೧೪. ಚೋಮನ ಮಕ್ಕಳ ಹಾಡು : ಸಿದ್ಧಲಿಂಗಯ್ಯ

ಭಾಗ – ನಾಲ್ಕು

ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿ ಪರಿಚಯ, ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ

೧೫. ಡಾ. ಸರ್ ಎಂ ವಿಶ್ವೇಶ್ವರಯ್ಯ – ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ : ಎ ಎನ್ ಮೂರ್ತಿರಾವ್

೧೬. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ

೧೭. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ

ಭಾಗ – ಐದು

ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ

೧೮. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ

೧೯. 'ಕ' ಮತ್ತು 'ಬ' ಬರಹ ತಂತ್ರಾಂಶಗಳು ಮತ್ತು ಕನ್ನಡದ ಟೈಪಿಂಗ್*

೨೦. ಕನ್ನಡ – ಕಂಪ್ಯೂಟರ್ ಶಬ್ದಕೋಶ*

೨೧. ತಾಂತ್ರಿಕ ಪದಕೋಶ : ತಾಂತ್ರಿಕ ಹಾಗೂ ಪಾರಿಭಾಷಿಕ ಕನ್ನಡ ಪದಗಳು*

* (**ಅಧ್ಯಾಯ 3, 19, 20 ಮತ್ತು 21** ಇವುಗಳು ವಿತಾವಿ ಯದಿಂದ ಪ್ರಕಟಿತ **" ಆಡಳಿತ ಕನ್ನಡ "** ಪುಸ್ತಕದಿಂದ ಆಯ್ದ ಲೇಖನಗಳು **– ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ** ಮತ್ತು **ಪ್ರೊ. ವಿ. ಕೇಶವಮೂರ್ತಿ.**

BALAKE KANNADA		
Subject Code	21KBK36	Credit 01
Number of Lecture Hours/Week	1 Hours (Theory)	SEE: 50
Total Hours: 14	CIE: 50	SEE Hours: 1.5 Hrs

ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ
ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕ
baLake Kannada Text Book for VTU

(Common to B.Arch, B.Plan and B.E/B.Tech of all branches)
[As per Outcome Based Education (OBE) and Choice Based Credit System (CBCS) scheme]

Course Learning Objectives:

The course will enable the non Kannadiga students to understand, speak, read and write Kannada language and communicate (converse) in Kannada language in their daily life with kannada speakers.

Table of Contents

Course Title: Ability enhancement course (AutoCAD Software)		
Course Code	21CVAE36A	Credit:01
Number of Practical Hours/Week	2 Hrs.Practical	SEE: 50
Total Number of Practical Hours: 28	CIE: 50	SEE Hours: 03
Prerequisite: none		

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. Understand the concept of AutoCAD and application.
2. Create various types of building plans, Elevations etc.
3. Create centre line diagrams for various types of building plans.
4. Create Line diagram for various services in a building.

Modules	**Teaching Hours**
Module 1 Introduction to AutoCad, Usage of AutoCAD tool commands like Line, circle, rectangle, polyline, trim, extend, copy, mirror, rotate, erase, offset, move, array, scale, fillet, explode, text, layers, coordinate system, import and exporting of data from various software and its compatibility	**02hours**
Module III Development of plan, elevation and section elevation for 1. One storey residential building 2. Two storeyed residential building	**06 hours**
Module III Centre line diagram for Primary school building, Primary health centre and foundation center line diagram for load bearing and RCC structures in AutoCAD software	**04 hours**
Module IV Line diagram for preparation of water supply, sanitary, electrical layouts and rain water harvesting	**02 hours**

Text Book: AutoCAD User Manual			
Course outcomes: **On completion of the course, the student will have the ability to:**			
Course Code	**CO#**	**Course Outcomes**	**Blooms Level**
21CVA36A	**CO1**	Understand the concept of AutoCAD and application.	
	CO2	Create various types of building plans, Elevations etc.	
	CO3	Create centre line diagrams for various types of building plans.	
	C04	Create Elevations for various types of building plans.	
	CO5	Create Line diagram for various services in a building.	

UNIVERSAL HUMAN VALUES-I			
Course Code	**21UHV36B**	**Credits:1**	**CIE: 50**
Number of Lecture Hours/Week	**2hrs (Tutorial)**		**SEE: 50**
Total Number of Theory Hours	**14 hours**		**SEE Hours: 03**

Course Objectives:

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

Modules	**Teaching Hours**
Module I **Introduction To Value Education:** Understanding Value Education, Need Of Value Education, Basic Guidelines For Value Education, The Content Of Value Education, The Process Of Value Education. **Self- Exploration As The Process For Value Education:** Starting To Observe Inside, What Is Self-Exploration? What Is Its Purpose?, Content Of Self-Exploration, Natural Acceptance, What Is The State Today?, What Is The Way Out? What Do We Need To Do?.	**3hrs**
Module II **The Basic Human Aspirations- Continuous Happiness And Prosperity:**Continuous Happiness And Prosperity- Our Basic Aspiration, Exploring Happiness And Prosperity, A Look At The Prevailing Notions Of Happiness And Prosperity, Some Possible Questions/ Confusions. **The Program To Fulfill Basic Aspiration:** Basic Requirements For Fulfillment Of Human Aspirations, What Is Our State Today?, Why Are We In This State?- Living With Wrong Assumptions, What Is The Solution?- The Need For Right Understanding, Our Program: Understand And Live In Harmony At All Levels Of Living, Our State Today?, Our Natural Acceptance For Harmony At All Levels Of Our Living, Human And Animal Consciousness.	**3hrs**

Module III **Understanding The Harmony At Various Levels:** Understanding The Human Being As Co-Existence Of Self(I) And Body, Human Being Is More Than Just The Body, Understanding Myself As Coexistence Of Self And The Body, Understanding The Needs Of The Self And Needs Of The Body, Understanding The Self(I) As A Conscious Entity, The Body As The Material Entity, Exercise On Distinguishing Needs Of The Self(I) And The Body, Exercise On Distinguishing Activities Of The Self(I) And Body, Understanding The Body As An Instrument Of 'I'(I Being The Seer, Doer And Enjoyer). **Harmony In Self(I)- Understanding Myself:** Why Should I Study Myself?, Getting To Know The Activities In I Related?, The Activities In I Are Continuous, What Is The Problem Today?, Effects Of The Problem, What Then Is The Solution?, Result Of Realization And Understanding-Living With Definiteness. **Harmony With The Body- Understanding *Sanyama* And*Svashtya:*** Our Body- A Self-Orgnaised Unit, Harmony Of I With The Body: *Sanyama*And *Svashtya*, What Is Our State Today?, What Is The Way Out?, Understanding And Living With Sanyama, Correct Appraisal Of Our Physical Needs.	**3hrs**
Module IV **Harmony In The Family- Understanding Values In Human Relationships:** Family As The Basic Unit Of Human Interaction, Harmony In The Family, Justice*(Nyaya)*, What Is The State Today?, Values In Human Relationships, Trust(*Visvasa*),Respect(*Sammana*), The Basis For Respect, Assumed Bases For Respect Today, The Problem Due To Differentiation, Difference Between Attention And Respect, What Is The Way Out?, Affection (*Sneha*), Care(*Mamata*), Guidance(*Vatsalya*),Reverence(*Shraddha*),Glory(*Gaurava*),Gratitude(*Kritagyata*),Love(*Prema*), Harmony From Family To World Family: Undivided Society. **Harmony In The Society-From Family Order To World Family Order:** Extending Relationship From Family To Society, Identification Of The Comprehensive Human Goal, Where Are We Today?, Programs Needed To Achieve The Comprehensive Human Goal: Five Dimensions Of Human Endeavour, Education-Right Living (*Siksha-Sanskara*), Health-Self-Regulation (*Svasthya-Sanyama),* Justice-Preservation (Nyaya-Suraksha), Production-Work (*Utpadana-Karya*), Exchange-Stotage (*Vinimaya-Kosa*), What Is Our State Today?, Harmony From Family Order To World Family Order: Universal Human Order.	**3hrs**
Module V **Harmony In Nature-Understanding The Interconnectedness And Mutual Fulfillment:** The	**2hrs**

Four Orders Of Nature, Incconnectedness And Mutual Fulfillment (Parasparta And Paraspara Purakata), Recyclability And Self-Regulation In Nature, Understanding The Four Orders- Things (Vastu), Activity(Kriya), Innateness(Dharana), Natural Characteristic(Svabhava), Basic Activity, Conformance(Anu-Sangita), Human Beings-Our State Today, What Is The Way Out?. **Harmony In Existence-Understanding Existence As Co-Existence**: An Introduction To Space (Sunya), Co-Existence Of Units In Space, Limited And Unlimited, Active And No-Activity, Energised And Energy In Equilibrium, Each Unit Recognizes…. Space Is Reflecting Or Transparent, Self-Organised And Self-Organisation Is Available, Existence Is Co-Existence, What Are We Doing Today?, Where Do We Want To Be?	

Text Books:

1. The Text Book R.R Gaur, R Sangal, G P Bagaria, A Foundation Course In Human Values And Professional Ethics, Excel Books, New Delhi, 2010, ISBN 978-8-174-46781-2.
2. The teacher's manual R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi, 2010

Reference Books:

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

Course outcomes: On completion of the course, the student will have the ability to:

Course Code	CO	Course Outcome (CO)
	CO1	The students are able to see that verification on the basis of natural acceptance and experiential validation through living is the only way to verify right or wrong, and

21UHV36B		referring to any external source like text or instrument or any other person cannot enable them to verify with authenticity; it will only develop assumptions
	CO2	The students are able to see that their practice in living is not in harmony with their natural acceptance most of the time, and all they need to do is to refer to their natural acceptance to remove this disharmony
	CO3	The students are able to see that lack of right understanding leading to lack of relationship is the major cause of problems in their family and not the lack of physical facilities in most of the cases, while they have given higher priority to earning of physical facilities in their life ignoring relationships and not being aware that right understanding is the most important requirement for any human being
	CO4	The students feel confident that they can understand the whole existence; nothing is a mystery in this existence. They are also able to see the interconnectedness in the nature, and point out how different courses of study relate to the different units and levels. Also, they are able to make out how these courses can be made appropriate and holistic.
	CO5	The students are able to grasp the right utilization of their knowledge in their streams of Technology/Engineering/ Management to ensure mutually enriching and recyclable productions systems.
	CO6	The students are able to sincerely evaluate the course and share with their friends. They are also able to suggest measures to make the course more effective and relevant. They are also able to make use of their understanding in the course for a happy and prosperous society.

FLUID MECHANICS LAB		
Course Code	21CVL31	CREDIT: 01
Number of Lecture Hours/Week	2 hrs (Practical)	CIE: 50Marks
Total hours: 28	CIE: 50 Marks	SEE: 03 Hours

Prerequisite: none

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. Calibration of various notches.
2. Calibration of plug sluice. Broad crested and ogee weir.
3. Determination of constants of Parshall flume, major and minor losses through pipes.
4. Determination of hydraulic coefficients of small circular orifice and external cylindrical mouth piece.
5. Determination of coefficient of discharge of venturi meter and study the performance of centrifugal pump.

Experiments	Teaching Hours
1. Calibration of rectangular notch	2hours
2. Calibration of triangular notch	2hours
3. Calibration of Cipolletti notch	2hours
4. Calibration of broad crested weir	2hours
5. Calibration of ogee weir	2hours
6. Calibration of plug sluice	2hours
7. Determination of constants of Parshall flume	2hours
8. Determination of minor losses through pipes	2hours
9. Determination of hydraulic coefficient of small circular orifice.	2hours
10. Determination of friction loss through pipes	2hours
11. Determination of hydraulic coefficients of external cylindrical mouth piece.	2hours
12. Determination coefficient of discharge of venturi meter.	2hours
13. Study of performance of centrifugal pump	2hours
14. Study of performance of Francis turbine	2hours
or	
Study of performance of Pelton wheel turbine	

15. Demonstrate of flow measurement using current meter	

Question paper pattern:

Conduct any one experiment by picking up student and he has to prepare writeup and conduct experiment.

Computations for result by Analytical and Graphical method.

Text books:

1. P N Modi and S M Seth, "Hydraulics and Fluid Mechanics, including Hydraulic Machines", 20th edition, 2015, Standard Book House, New Delhi
2. R.K. Bansal, "A Text book of Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi

Papers from the international journals (Scopus index and web of science).

Reference Books:

Papers from the international journals (Scopus index and web of science).

E books and online course materials:

www.civilenggebooks.com

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)	Blooms Level
21CVL31	**CO1**	To understand the concepts of Fluid Mechanics course through series of experiments.	C2
	CO2	Share the responsibilities in small teams of 4-5 members for conducting the experiments.	C3
	CO3	Perform the experiments and Calibration of notches, rectangular, triangular, Cipolletti notch, plug sluice, broad crested and ogee weir, determination of Parshall minor flume, losses through pipes cylindrical mouthpiece, centrifugal pump, small circular orifice, friction loss through pipes, external cylindrical mouth piece, venturi meter, study on centrifugal pump, francis turbine, Pelton wheel turbine, demonstrate of open channel flow parameters.	C3
	CO4	Analyse the data and interpret the results.	C4
	CO5	Prepare a well-organized laboratory report.	C3

SURVEYING LAB		
Course Code	21CVL32	CREDIT: 01
Number of Lecture Hours/Week	2 hrs (Practical)	SEE: 50 Marks
Total Number of Lecture Hours: 28	CIE: 50Marks	SEE: 03 Hours

Prerequisite: Mathematics

Course objectives:
To enable the student to acquire the knowledge in the following topics

Experiments	Teaching Hours
1.a) To Measure distance between two points by direct Ranging	02 Hours
1.b) To Set out perpendiculars at various points on a given line by linear methods.	02 Hours
2. Setting out of rectangle, pentagon and hexagon by compass and Chain	02 Hours
3. Closed traverse of a small area using chain and compass & adjustment of closing error by Bowditch's rule	02 Hours
4. Determination of reduced level of points using dumpylevel/auto level (simple leveling)	02 Hours
5. Determination of reduced level of points using dumpylevel/auto level (differential leveling and inverted leveling)	02 Hours
6. Determination of reduced level of points using dumpylevel/auto level (differential leveling and inverted leveling)	02 Hours
7. To determine the difference in elevation between two pointsusing Reciprocal leveling and to determine the collimation error.	02 Hours
8. To conduct profile leveling, cross sectioning and block leveling. Plotting profile and cross sectioning in excel. Block contour on graph paper to scale.	02 Hours
9. To Determine the difference in elevation between two points by conducting Fly Levelling Also Carryout Fly Back Levelling calculate the RL of Points by RISE and FALL method	02 Hours
10. Measurements of horizontal angles by Reiteration method using transit theodolite.	02 hours
11. Measurement of vertical angle using transit Theodolite.	02hours
12. To Determine Distance and elevation of an inaccessible object using single plane	02hours

method.	
13.To Determine the Distance and Elevation of an object using double plane method when the base of an object is inaccessible.	02hours
14. To Setout simple circular curve using Rankine's deflection angle method	02 Hours
15. Demonstration of Digital Planimeter.	02 Hours

Question paper pattern:

Conduct any one experiment by picking up student and he has to prepare writeup and conduct experiment.

Text books:

1. B.C. Punmia, "Surveying Vol.1 & 2", Laxmi Publications pvt. Ltd., New Delhi –2009.
2. Kanetkar T P and S V Kulkarni, Surveying and Leveling Part I & II, Pune VidyarthiGrihaPrakashan,1988

Reference Books:

1. S.K. Duggal, "Surveying Vol.1", Tata McGraw Hill Publishing Co. Ltd. NewDelhi.2009.
2. K.R. Arora, "Surveying Vol. 1 & 2" Standard Book House, New Delhi. –2010
3. R Subramanian, Surveying and Leveling, Second edition, Oxford UniversityPress, New Delhi

A. Bannister, S. Raymond, R. Baker, "Surveying", Pearson, 7th ed., New Delhi

E books and online course materials:

www.civilenggebooks.com

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)	Blooms Level
21CVL32	**CO1**	Demonstrate the concepts of Surveying through series of experiments.	C2
	CO2	Share the responsibilities in small teams of 4-5 members for conducting the experiments.	C3
	CO3	Perform the various experiments on surveying and leveling.	C3
	CO4	Analyse the data and interpret the results.	C4
	CO5	Prepare a well-organized laboratory report.	C3

Course Title: **BUILDING PLANNING AND DRAWING**		
Course Code	21CVL33	CREDIT:02
Number of Lecture Hours/Week	1 Hours (Lectures) 2 Hours (Practical)	SEE: 50
Total Number of Lecture Hours:28	CIE: 50	SEE:04 Hours

Prerequisite: none

Course objectives:

To enable the student to acquire the knowledge in the following topics

	Teaching Hours
PART-I	
To prepare working drawing of component of buildings i) Stepped wall footing and isolated RCC column footing, ii) Fully paneled and flush doors, iii) Half panelled and half-glazed window. iv) symbols used in civil engineering drawing, types of masonry bonds	**3 Hrs**
Functional design of building (Residential, Public and Industrial), positioning of various components of buildings, orientation of buildings, building standards, bye laws, set back distances and calculation of carpet area, plinth area and floor area ratio.	**4 Hrs**
Functional design of building using inter connectivity diagrams (bubble diagram), development of line diagram only for following building: i) Residential building ii) Primary health center, iii) Primary school building	**6 Hrs**
For a given single line diagram, preparation of water supply, Sanitary and electrical layouts. Rain water harvesting elements	**4 Hrs**
PART-II	
Development of plan, elevation, section and schedule of openings from the given line diagram of residential buildings, i) Two bed room Residential building, ii) Two storied building.	**1 Hrs** **10 Hrs**

Question paper pattern:

Part-I: one question of 30 marks

Part-II. Two questions of 10 marks each

Text books:

1 Shah M.H and Kale C.M **"Building Drawing"**, , Tata Mc Graw Hill Publishing co. Ltd., New Delhi.

2 Gurucharan Singh **"Building Construction",** , Standard Publishers & distributors, New Delhi.

Reference Books:

1. **National Building Code,** BIS, New Delhi.
2. "A Course in Civil Engineering Drawing", by V. B. Sikka, S. K. Kataria & Sons

E books and online course materials:

www.civilenggebooks.com

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	**CO #**	**Course Outcome (CO)**
21CVL33	**CO1**	Understand the concepts of Principles of Planning and theory course through series of Drawings.
	CO2	Share the responsibilities in small teams of 4-5 members for planning and drawing.
	CO3	Perform the drawings with logic and application of principles
	CO4	Suitable dimensions as per standard data and interpreted the Drawings.
	CO5	Prepare set of Drawings relevant to the Course.

IV Semester

Course Title **STRUCTURAL ANALYSIS**		
Course Code	21CV41	Credit: 04
Number of Lecture Hours/Week	3 Hours (Theory)	SEE: 50 Marks
Total Number of Lecture :42 Hrs	CIE: 50 Marks	SEE: 03 Hours
Prerequisite: Engineering Mechanics, Strength of material		

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. Determine the degree of freedom and degree of redundancy of structures and analyse the trusses
2. Analysis beams, frames& trusses for displacements using strain energy methods.
3. Analysis arches, cables and analysis of beams by slope deflection method
4. Analysis of beams and frames by moment distribution method
5. Analysis of beams and frames by Kani's method.

Modules	**Teaching Hours**
Module I **Structural systems:** Forms of structures. Determinate and indeterminate structures. Static and Kinematic Indeterminacy of structures. principle of superposition. linear and non-linear structures. **Plane trusses:** Introduction, analysis of trusses by method of joints and by method of sections.	8 hours
Module-II **Strain energy:** 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, Clarke -Maxwell`s theorem of reciprocal deflection & Castigliano's theorems. Numerical examples on beams & frames. **Arches and cables:** Analysis of three hinged parabolic arches and circular arches. (Support at same levels and different levels). Analysis of cables under point loads and UDL, length of cables (support at same levels only) Numerical problems	8 hours

Module -III **Slope & deflection method:** Analysis of continuous beams and Frames by Slope deflection method Analysis of rigid Frames by Slope deflection method	8 hours
Module IV **Moment distribution method:** Analysis of continuous beams with &without sinking of supports Analysis of rigid frames(sway& Non sway) by moment distribution method	9 hours
Module -V **Rotation contribution method (Kani.s method):** Analysis of continuous beams by Kani's method. Analysis of rigid frames by Kani's method (Non sway frames only)	9 hours

Question paper pattern:

Two questions to be set from each module by inter-mixing the syllabus of respective module. Students have to answer any five full questions by selecting minimum one question from each module.

Text books:

1. Reddy C S, Basic Structural Analysis, Tata McGraw Hill, New Delhi.
2. Muthu K U. etal, Basic Structural Analysis, 2nd edition, IK International Pvt. Ltd., NewDelhi,2015.
3. Bhavikatti, Structural Analysis, Vikas Publishing House Pvt. Ltd, New Delhi,2002.
4. S Ramamrutham R Narayan .Dhanpath Rai Publishing company(P) Ltd New Delhi

Reference Books:

1. Hibbeler R C, Structural Analysis, Prentice Hall, 9th edition,2014.
2. Devadas Menon, Structural Analysis, Narosa Publishing House, New Delhi,2008.
3. Prakash Rao D S, Structural Analysis, University Press Pvt. Ltd,2007.

On completion of the course, the student will have the ability to:

Course Code	CO#	CourseOutcome(CO)	
21CV41	**CO1**	Describe different types of structural systems and analyze plane trusses	
	CO2	Analyze the beams, trusses and frames using energy principles and Analyze the arches and cables	
	CO3	Analyze frames and beams by slope deflection method	
	CO4	Analyze beams & frames by moment distribution method	
	CO5	Analyze beams & frames by Kani's method. Analyze beams subjected to rolling loads	

Course Title **CONCRETE TECHNOLOGY**		
Course Code	21CV42	Credit: 02
Number of Lecture/weeks	2 Hrs (Theory)	SEE:50 Marks
Total Number of LectureHours: 28	CIE:50 Marks	SEE: 03 Hours

Prerequisite: none

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. Hydration of cement and physical properties of cement and types of cement.
2. Physical properties of course and fine aggregate.
3. Design of concrete mix.
4. Fresh and hardened state property of concrete.
5. Testing of concrete.

Modules	**Teaching Hours**
Module I **Cement:** Manufacture of cement (OPC) by dry and wet process (Flow charts only). chemical composition and their importance, bogue's compounds, hydration of cement, heat of hydration. Tests on cement- Fineness by sieve test and Blaine's air permeability test, normal consistency, setting time, soundness, compressive strength of cement specific gravity of cement..	5 hours
Module-II **Aggregate:** Coarse aggregate, importance of size, shape, texture, grading of aggregates, sieve analysis Flakiness and Elongation, Specific Gravity, Moisture Content, Crushing ,Impact, Abrasion tests.Fine Aggregate, Bulking of fine aggregate, Bulk Density, Ten percent Fineness Value, Sieve Analysis Specific Gravity. Deleterious Material and Introduction of M sand.	5 hours
Module -III **Fresh Concrete:** Workability-factors affecting, measurement of Workability-Slump, Compaction Factor, Vee-bee Consistometer, Flowtests. Segregation and Bleeding, Mixing, Placing and Compaction. Curing methods, Accelerated curing. **Admixtures**-plasticizer, superplasticizer, accelerators, retarders and airentraining agents. Mineral admixtures-fly ash and silica fume	6 hours

Module IV **Hardened Concrete:** Factors affecting strength- w/c, degree of compaction, age, aggregate/cement ratio, aggregate properties, maturity concept. Elasticity, factors affecting modulus of elasticity, relation between modulus of elasticity and Poisson's ratio, Introduction to RMC. **Testing:** Destructive testing-compressive strength, flexural strength, splittensile strength NDT by Schmidt rebound hammer test. Relation between tensile strength and compressive strength	6 hours
Module V **Shrinkage**- types of shrinkage, factors affecting shrinkage. Creep- factorsaffecting creep, effect of creep. Durability-importance, permeability, sulphate attack, chloride attack, carbonation, freezing and thawing. **Concrete Mix Design**: Factors to be considered in Mix Design, Mix Design by IS method..	6 hours
Question paper pattern: Two questions to be set from each Module by intermixing (in total 10). Studentshave to answer any five full questions by selecting one question from each module.	
Textbooks**:** 1. Neville A.M. "Properties of Concrete"-4th Ed., Longman. 2. M.S. Shetty, Concrete Technology - Theory and Practice Published by S.Chand and Company, New Delhi. 3. Kumar Mehta. P and Paulo J.M. Monteiro "Concrete-Microstructure, Propertyand Materials", 4th Edition, McGraw Hill Education, 2014 4. A.R. Santha Kumar, "Concrete Technology", Oxford University Press, NewDelhi (New Edition).	
Reference Books: 1. M L Gambir, "Concrete Technology", McGraw Hill Education,2014. 2. N. V. Nayak, A. K. Jain Handbook on Advanced Concrete Technology, ISBN:978-81-8487-186-9 3. Job Thomas, "Concrete Technology", CENGAGE Learning,2015. 4. IS 4926 (2003): Code of Practice Ready-Mixed Concrete [CED 2: Cement andConcrete] Criteria for RMC Production Control, Basic Level Certification for Production Control of Ready Mixed Concrete BMTPC.	
E books and online course materials: www.civilenggebooks.com	
Course outcomes: **On completion of the course, the student will have the ability to:**	

Course Code	CO #	Course Outcome (CO)	
21CV42	**CO1**	Explain manufacturing of cement and the significance of physical properties of cement.	
	CO2	Describe and identify the requirements of goodquality fine aggregate and coarse Aggregate.	
	CO3	Design a concrete mix and explain the fresh stateproperty requirements of concrete	
	CO4	Evaluate the influence of different parameters onthe properties of hardened concrete	
	CO5	Analyze the quality of hardened concrete using the results of types of test	

WATER RESOURCES ENGINEERING		
Subject code	21CV43	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Fluid Mechanics, Engineering Mathematics

Course objectives:

to enable the student to acquire the knowledge in the following topics

1. Introduce importance of water resource engineering
2. Making students to understand basics of hydrology & Hydrograph
3. Introduce problems involved in canal irrigation system.
4. Design of Gravity Dams, earthen Dams and spillways

Modules	Teaching Hours
Module I **Introduction:** water resources engineering disciplines, water management sectors Water wealth of India. Hydrological cycle, water shed hydrology, measurement of precipitation by rain gauges Computation of precipitation, missing rainfall data, rain gauge density, rainfall mass curve & hyetograph - Problems on above.	8 Hours
Module-II **Runoff:** Runoff cycle, factors affecting runoff, computation of average annual runoff, maximum runoff, Concept of Hydrograph & Unit Hydrograph & Flood frequency Studies - problems. **Reservoirs:** Types, site selection, Investigations for reservoirs. Determination of storage capacity of reservoirs using mass curve, analytical method, storage zones of reservoir, economical height of dam.	8 Hours
Module-III	

Canal irrigation: Types of canals, alignment of canals, definition of gross command area, culturable command area, intensity of irrigation, time factor, capacity factor, kharif season, rabi season, types of crops & their duty, delta, base periods determination of canal capacity, frequency of irrigation, field capacity. Crop factor. Consumptive use of water, Blinney-criddle equation problems irrigation efficiency, L-section of canal, balancing depth of canal	10 Hours
Module –IV **Types of Dams & Spillways:** Rigid dams & non-rigid dams Gravity dams, Forces acting on gravity dams, design of elementary profile of gravity dam, Types of Spillways, Necessity, location, ogee spillway. Design of ogee spillway, Energy dissipation below spillway. Use of hydraulic jump & design of stilling basin	8 Hours
Module-V **Earthen dams:** Types, Necessity, mode of failures of earth dams, Preliminary section, design of earth dam, determination of Phreatic line in earth dams, seepage discharge and problems, Control of seepage in earth dams. Design criteria of earth dams, Seepage Analysis & stability Analysis of earthen dams- Fellenious method & Swedish Slip circle method,	8 Hours

Course Outcomes: On completion of this course, students are able to:

CO	Course Outcomes	Blooms Level
CO1:	Explain water management sectors and importance of water resource projects	C2
CO2:	Describe hydrological cycles and various components	C2
CO3:	Assess requirements of canal irrigation and gain knowledge about spillways and energy dissipating systems	C2
CO4	Design Spillways and Dams	C5
CO5	Design earthen dam	C5

Question paper pattern:

Scheme of SEE: i) Two questions are to be set from each module. i) Total five questions are to be answered by selecting minimum one question from each module.

Text book:

1. S. K. Garg, “Irrigation Engineering and Hydraulic Structures”, Khanna Publishers, New Delhi.

2. Punmia and Pandey Lal, “Irrigation and Water Power Engineering” Lakshmi Publications, New Delhi.

3. K. R. Arora. “Irrigation, Water Power and Water Resources Engineering” Standard Publications, New Delhi.

Reference books:

1. Garg, S.K. "Hydrology & Water Resource Engineering" Khanna publications
2. Modi, P.N. "Irrigation, Water Resources and Water Power Engineering Standard Book
3. R.K. Sharma, "Hydrology & Water resources Engineering House, New Delhi.

4. Punmia and Pandey Lal, Irrigation and Water Power Engineering Lakshmi Publications, New Delhi.

Nptel Link: https://youtu.be/fx1uUek3Iqg

E-Books: www.civilenggebooks.com

BUILDING MATERIALS AND CONSTRUCTION TECHNOLOGY		
Course Code	21CV44	CREDIT: 03
Number of Lecture Hours/Week	3 Hrs (Theory)	SEE: 50
Total Hours: 42	CIE: 50	SEE: 03 Hours

Prerequisite: None

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. Properties and preservation for stone and timber.
2. Properties of bricks and bonds in brick work
3. Types of stone masonry, materials and methods of damp proofing courses.
4. Types of stairs and design of dog legged stair.
5. Roof, insulating materials and types of plastering.
6. Types of doors, windows, flooring and paints,
7. Plumbing and electrical materials and works.

Modules	Teaching Hours
Module I **Building Stones:** Common building stones and their uses, quarrying of stones, qualities of good building stones, deterioration of stones, Preservation of stones, dressing of stones, tests on building stones. **Timber:** Important varieties and uses, defects in timber, tests for good timber, seasoning of timber, ply wood and its uses.	8 hours
Module-II **Bricks & Brick Masonry:** Classification and composition of bricks, qualities of good bricks, tests on bricks. Definition of terms used in masonry, bonds in brick work, English bond, Flemish bond, Reinforced brick work, Sand lime brick. **Stone Masonry:** Rubble Masonry, Coursed and Un-coursed rubble masonry, Ashlar masonry, Shoring, Under Pinning and Scaffolding.	7 hours

Module III **Damp Proof Course:** Materials used for damp proof course, D.P.C Treatment in building methods of treatment to foundations, treatment to floors, walls and slabs, Concrete paver blocks. **Stairs:** Types (classifications) and technical terms in stairs, requirements of a good stair, geometric design of R.C.C dog legged and open well stairs (Plan and Sectional elevation of stairs).	5hours 3hours
Module IV **Doors:** Types, Paneled doors, glazed doors, flush doors. **Windows:** Types, Paneled Window, glazed Window, UPVC Windows, . **Floors:** Types of flooring (materials and methods of laying), Granolithic, mosaic, ceramic, marble and polished granite, Linoleum. **Plastering & Painting:** Purpose of plastering, materials of plastering, lime mortar, cement mortar, masonry mortar, methods of plastering, Stucco plastering, Lath plastering. Purpose of painting, types of paints, application of paints to new and old surfaces, distemper, plastic emulsion, enamel, polishing of wood surface.	5hours 4hours
Module V **Roofs & Miscellaneous Materials:** Sloped roof (R.C.C and tile roof), Requirements of good roofs, Adhesives, Asbestos, Thermopolis, Fibers, Heat insulating materials, Sound insulating materials, Geosynthetics. Partition walls (Gypsum sheets etc), other advanced building materials. **Plumbing:** Pipework, Pipe fittings – couplings and connections, Range of fittings, Valves and cocks Services generally, Hot and cold-water services, Soil and ventilation stacks, Overflows, Water supply from the main, Equipment, Cold water storage cisterns, Hot water storage cylinders, Feed and expansion tanks, Central heating, Piping for central heating systems, Emitters, Appliances, Waste disposal piping and systems, Insulation, Corrosion, Air locking and water hammer, First fixings. **Electrical:** Power generation, wiring installation types, Sub-mains and consumer, control units, Sub-circuits, Work stages, Electrician's roughing, Earth bonding, Final fix, Testing and certification, more on protective devices, Wiring diagrams, Accessories	3 hours 4 hours 3 hours
Question paper pattern: Two questions to be set from each Module by intermixing (in total 10). Students have to answer any five full questions by selecting one question from each module.	

Text books:

1. B.C. Punmia, "Surveying Vol.1", Laxmi Publications pvt. Ltd., New Delhi – 2009.
2. Kanetkar T P and S V Kulkarni, Surveying and Leveling Part I, Pune VidyarthiGrihaPrakashan,1988

Reference Books:

1. S.K. Duggal, "Surveying Vol.1", Tata McGraw Hill Publishing Co. Ltd. New Delhi.2009.
2. K.R. Arora, "Surveying Vol. 1" Standard Book House, New Delhi. –2010
3. R Subramanian, Surveying and Leveling, Second edition, Oxford University Press, New Delhi
4. A. Bannister, S. Raymond, R. Baker, "Surveying", Pearson, 7th ed., New Delhi
5. Eric Fleming. "Construction technology".

E books and online course materials:
www.civilenggebooks.com, https://youtu.be/EIDXE28_8eQ

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)	Blooms Level
21CV44	**CO1**	Explain and compare the properties of stone and timber materials suitable for building construction	C3
	CO2	Select suitable type of stone masonry and brick masonry compatible for a particular work.	C3
	CO3	Explain the importance of DPC, types of stair case and do the geometric design of dog legged staircase.	C3
	CO4	Compare and select suitable types of doors, windows, floors, plastering and painting.	C3
	CO5	Explain different types of roofs and deicide the requirement of plastering and electricals.	C3

CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS		
Course Code	21HU45	CREDIT: 01
Number of Lecture Hours/Week	2Hrs (Theory)	SEE: 50
Total Hours: 28	CIE: 50	SEE: 03 Hours

Course Objectives :

To enable the students to obtain the basic knowledge about The Constitution of India and Professional Ethics in the following topics:-

- Introduction and Fundamental Rights
- Directive Principles of the State Policy and the State Executive
- The Union Executive
- Constitutional Provisions for women, Children & SC/ST 'S , Emergency Provisions and Election Process
- Engineering Ethics

MODULE – I

Introduction and Fundamental Rights : The Constitution of India. Evolution of the Constitution. The Constituent Assembly of India. Sources and Features of the Indian Constitution. Preamble to the Constitution of India. Salient Features of Fundamental Rights and their classification. General exercise of Fundamental Rights and their limitations. RTI (Right to Information Act of 2005 Under Article 19(1)) and The Right of Children to Free and Compulsory Education Act or Right to Education Act (RTE) Under Article 21-A of the Constitution. Article 371(J) of the Constitution applicable to Hyderabad Karnataka Area.

6 hrs.

MODULE – II

Directive Principles of the State Policy and The State Executive: Under Article 36 to 51 of The Constitution and their Relevance. Fundamental Duties Under Article 51A of The Constitution and their Relevance. State Government - The Governor- Appointment, Powers and Functions of the Governor. The Appointment of Chief Minster, his Powers and Functions. The State Council of Ministers and their Functions. The State legislature and The State Council. The High Court of the State, its Powers and Jurisdiction. Appointment and Qualifications of High Court Judges. **6 hrs.**

MODULE – III

The Union Executive: Central Government. The President of India, his Election, Powers and Functions. The Vice-President of India, his Election, Powers and Functions. The Supreme Court of India and its Structure. Appointment and Qualification of Supreme Court Judges. Their Powers and Functions. The Structure of Judiciary in India. The Parliament of India. The Prime Minister, his Appointment, Powers and Functions. The Union Council of Ministers their Powers and Responsibilities. Concept of Public Interest Litigation (PIL) **6 hrs.**

MODULE – IV

Constitutional Provisions and Emergency Provisions and Election Process : Constitutional for Women, Children, Backward Classes and Scheduled Caste and Scheduled Tribes under different Article of The Constitution. Different types of Emergencies under Article 352, 356 and 360 of the Constitution of India. The Election Commission of India- its Powers and Functions. The State Election Commission

5 hrs.

MODULE – V

Engineering Ethics: Its Aims and Scope, Responsibilities of Engineers, Impediments to their Responsibilities, Honesty, Integrity, Reliability, Risk and Safety Measures, Liabilities of Engineers.**5 hrs.**

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

CO 1	Explain the evolution and features of constitution, fundamental rights and their classification L 2
CO 2	Describe the directive principles of state policy, fundamental duties and The State Executive L 2
CO 3	Describe about The Union Executive and concept of Public Interest Litigation L 2
CO 4	Explain the Constitutional Provisions for women, children, SC/ST'S, Emergency Provisions and Election Process L 2
CO 5	Identifies the qualities required for an professional engineers to be ethical L 4

TOTAL STATION SURVEYINGLAB		
Course Code	21CVAE46B	CREDIT:2
Number of Lecture Hours/Week	2hrs(Practical)	SEE:50Marks
Total Number of LectureHours:28	CIE:50Marks	SEE:03Hours

Prerequisite: Basic Surveying, AutoCAD

Course objectives:
To enable the student to acquire the knowledge in the following topics

Experiments	Teaching Hours
1. Setting up, levelling up, centering and creation of file in Total Station.	02Hours
2. Taking out basic measurements RDM, REM & SHV using Total Station	02Hours
3. Determination of Area measurement using Total Station	02Hours
4. Establishment of new station using free stationing technique	02Hours
5. Traversing using total station to prepare topographic map of Area.	04Hours
6.Contour surveying using Total station.	04Hours
7. Plotting of topographic details within contours.	04Hours
8. Downloading total station data and map completion.	04Hours
9. Strake-out using Total Station	04Hours

Question paper pattern:
Conduct any one experiment by picking up student and he has to prepare writeup and conduct experiment.

Reference Books:

1. S.K. Duggal, "Surveying Vol.1", Tata McGraw Hill Publishing Co. Ltd. New Delhi.2009.
2. A. Bannister, S. Raymond, R. Baker, "Surveying", Pearson, 7th ed., New Delhi

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)	Blooms Level
21CVAE46B	**CO1**	Understand the concepts of Surveying theory course through series of experiments.	C2
	CO2	Sharetheresponsibilitiesinsmallteamsof4-5members for	C3

		conducting the experiments.	
	CO3	Perform the various experiments on total station survey	C3
	CO4	Analyze the data and interpret the results.	C3
	CO5	Prepare a well-organized laboratory report.	C3

UNIVERSAL HUMAN VALUES-II			
Course Code	**21UHV46C**	**Credits:1**	**CIE: 50**
Number of Lecture Hours/Week	**2hrs (Tutorial)**		**SEE: 50**
Total Number of Theory Hours	**14 hours**		**SEE Hours: 03**

Course Objectives:

1. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
2. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life.

Modules	Teaching Hours
Module I **Implications Of The Right Understanding: Providing The Basis For Universal Human Values And Ethical Human Conduct**- Value In Different Dimensions Of Humanliving, Universal Values Naturally Emerging From The Right Understanding, Defintiveness Of Ethical Human Conduct, Identification Of *Svatva* Leading To *Svatantrata And Svarajya*, Development Of Human Consciousness, Implications Of Value-Based Living.	**3hrs**
Module II **Basis For The Holistic Alternative Towards Universal Human Order**: Identification Of Comprehensive Human Goal, Vision For The Holistic Alternative, Basis For Humanistic Education And Humanistic Constitution, Universal Human Order And Its Implications.	**3hrs**
Module III **Professional Ethics In The Light Of Right Understanding:** Profession-In The Light Of Comprehensive Human God, Ensuring Competence In Professional Ethics, Issues In Professional Ethics-The Current Scenario, Inherent Contradictions And Dilemmas And Their Resolutions.	**3hrs**
Module IV **Vision For Holistic Technologies, Production Systems And Management Models**: The Holistic Criteria For Evaluation, A Critical Appraisal Of The Prevailing Systems, Learning From The Systems In Nature And Traditional Practices, Holistic Technologies And Systems- Typical Case Studies.	**3hrs**
Module V **Journey Towards the Holistic Alternative- The Road Ahead:** Appreciating The Need For Self-Exploration, Facilitating The Understanding Of Harmony At Various Levels, Steps For Evaluation At The Individual Level, Steps For Transition At The Level Of Family, Society And	**2hrs**

Profession, Promoting Mass Awareness And Moving Towards Humanistic Education, Evolving Holistic Models Of Living, Amending Policies, Programs And Social Systems In Tune With Comprehensive Human Goal, Is The Transition Too Difficult?, Concluding Remarks.	

Text Books:

1. The Text Book R.R Gaur, R Sangal, G P Bagaria, A Foundation Course In Human Values And Professional Ethics, Excel Books, New Delhi, 2010, ISBN 978-8-174-46781-2.
2. The teacher's manual R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi, 2010

Reference Books:

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

Course outcomes: On completion of the course, the student will have the ability to:

Course Code	CO	Course Outcome (CO)
21UHV46	CO1	The students are able to visualize the co-relation between lack of human values and the prevailing problems.
	CO2	They are also able to visualize tangible steps and a roadmap for moving in the cherished direction.
	CO3	The students are able to visualize an appropriate utilization of the knowledge in their respective streams to ensure mutually enriching and sustainable systems.

	CO4	The students are able to sincerely evaluate the course and the transformation achieved in this process.
	CO5	They are also able to make use of this understanding for moving towards happy and prosperous life including an ethical conduct of their profession.

Course Title: **ENGINEERING GEOLOGY LABORATORY**		
Course Code	21CVL41	CREDIT: 01 CIE: 50
Number of Lecture Hours/Week	2 hrs. (Practical)	SEE: 50
Total Number of Lecture Hours	14/28 Hours	SEE: 03 Hours

Prerequisite: none

Course objectives:

This laboratory course will enable students to

1: Understand the various physical properties of minerals, and they can identify different types of Minerals

2: Understand the various physical properties of the rocks, and they can classify different types of rocks.

3: Understand the various structural features of the earth.

	Teaching Hours
1. Physical properties of minerals: Identification of	2 Hrs
I. ROCK FORMING MINERALS - Quartz group, Feldspar group, Garnet group, Mica group & Talc, Chlorite, Olivine, Asbestos, Calcite, Gypsum, etc	2 Hrs
II. ORE FORMING MINERALS- Magnetite, Hematite, Pyrite, Pyralusite, Graphite, Chromite, etc	2 Hrs
2. Engineering Properties of Rocks: Identification of	2 Hrs
I. IGNEOUS ROCKS- Types of Granites, Dolerite, Granite Porphyry, Basalt, Pumice etc	2 Hrs
II. SEDIMENTARY ROCKS- Sandstone, Lime stone, Shale, Laterite, Breccia etc	1 Hrs
III. METAMORPHIC ROCKS- Gneiss, Slate, Schist, Marble, Quartzite etc	
3.. Dip and Strike problems. Determination of Apparent dip and True dip.	
5. Calculation of Vertical, True thickness and width of the outcrops.	2 Hrs
6. Three-point borehole problems.	
7. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.	1 Hrs
8. Interpretation and drawing the GEOLOGICAL SECTION MAPS.	
9. Field work– To identify Minerals, Rocks, Geomorphology and Structural features with related to the Civil Engineering projects.	

Text books:
Papers from the international journals(scopus index and web of science).

E books and online course materials:
www.civilenggebooks.com

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
21CVL41	**CO1**	The students able to identify the minerals, rocks and utilize them effectively in civil engineering practices.
	CO2	The students will interpret and understand the geological conditions of the area for implementation of civil engineering projects.
	CO3	The students will interpret subsurface information such as thickness of soil, weathered
	CO4	The students will learn the techniques in the interpretation of GEOLOGICAL MAPS to find out the lineaments and other structural features for the given area.
	CO5	The students will be able to identify the different structures in the field.

Course Title: **STRENGTH OF MATERIALS LAB**		
Course Code	21CVL42	CREDIT:01 CIE: 50
Number of Lecture Hours/Week	2 hrs(Practical)	SEE: 50
Total Number of Lecture Hours	28 Hours	SEE: 03 Hours

Prerequisite: Strength of Materials

Course objectives:

To enable the student to acquire the knowledge in the following topics

- Determine tensile, compressive, torsional, shear and Impact strength of steel samples and interpret the results.
- Determine compressive strength and bending strength of wood samples and interpret the results
- Determine strength properties of brick and tile and interpret the results.

	Teaching Hours
1. Tension test on Mild Steel.	2 Hrs
2. Tension test on HYSD bar	2 Hrs
3. Torsion test on Mild Steel circular sections.	2 Hrs
4. Bending test on Wood under two-point loading.	2 Hrs
5. Compression test of Mild Steel, Cast iron and Wood.	2 Hrs
6. Impact test on Mild steel (Charpy & Izod)	2 Hrs
7. Hardness test on metals-Brinell's Test	2 Hrs
8. Test on Bricks: Compressive strength, Water absorption and Efflorescence.	2 Hrs
9. Demonstration of Strain gauges and Strain indicators.	2 Hrs
10. Demonstration of loading frame	2 Hrs

Question paper pattern:

Student have to conduct two tests one on major experiments (1 to 4 in syllabus)

and one test on remaining experiments (5 to 11 experiments). Picked by the student and he has to prepare write up and conduct experiment.

Text books:

Papers from the international journals (Scopus index and web of science).

Reference Books:

1. Davis, Troxell and Hawk, Testing of Engineering Materials, International Student edition-Mcgraw Hill Book Co. New Delhi.
2. Fenner, George Newness,Mechanical Testing of Materials Ltd., London.

3. Holes K.A, Experimental Strength of Materials, English Universities Press Ltd. London.

E books and online course materials:
www.civilenggebooks.com

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
21CVL42	**CO1**	Demonstrate the concepts of SOM theory course through series of experiments.
	CO2	Share the responsibilities in small teams of 4-5 members for conducting the experiments.
	CO3	Perform the experiments and determination of Tension test, Compression test, Torsion test, Bending test, Shear Test, Impact test on Mild steel (Charpy & Izod), Hardness test, Test on Bricks: Compressive strength, Water absorption and Efflorescence, Demonstration of Strain gauges and Strain indicators parameters.
	CO4	Analyze the data and interpret the results.
	CO5	Prepare a well-organized laboratory report.

CONCRETE LAB		
Subject code	21CVL43	Credit: 01
Hours/Week	2 hours. (Practical)	SEE: 50 Marks
Total hours: 28	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Concrete Technology

Course objectives:

To enable students to acquire the knowledge in the following topics:

Modules	Teaching Hours
I Testing of cement	
Cement:	
Normal Consistency,	1 Hours
Setting time (Initial and Final)	2 Hours
Soundness by autoclave method,	1 Hours
Compression strength test	2 Hours
Fineness of cement.	1 Hours
Specific gravity of cement	1 Hours
II Testing of aggregate	
Water absorption and moisture content of aggregate.	2 Hours
Specific gravity and bulk density of coarse and fine aggregates	2 Hours
Fineness modulus of fine and coarse aggregate (sieve analysis).	1 Hours
Flakiness index and elongation index of coarse aggregate.	2 Hours
Impact value and crushing value of aggregate.	1 Hours
Tests on Concrete	
Workability tests- Slump cone test.	2 Hours
Compression factor test.	2 Hours
Vee Bee consistometer test.	2 Hours
strength tests Concrete:	

Compression Strength	2 Hours
Split tensile tests	2 Hours
Permeability of concrete	2 Hours

Course Outcomes: On completion of this course, students are able to:

CO	Course Outcomes	BL
CO1:	Demonstrate the concepts of CT theory course through series of experiments.	C2
CO2:	Sharetheresponsibilitiesinsmallteamsof4-5membersforconductingtheexperiments	C3
CO3:	Perform the experiments and determination of specific gravity, Setting time of cement, soundness and Tests on Hardened concrete.	C4
CO4	Analyze the data and interpret the results.	C3
CO5	Prepare a well-organized laboratory report.	C3

Question paper pattern:

Any one of the above experiments is to be conducted in the examination by the student.

Reference books:

1. M. L. Gambir, “Concrete Manual”, Danpat Rai and sons, New Delhi
2. Shetty M.S, “Concrete Technology”, S. Chand &Co. Ltd, New Delhi.
3. Mehta P.K, “Properties of Concrete”, Tata McGraw Hill Publications, New Delhi
4. Relevant codes.

Nptel Link: https://youtu.be/cx5gPKp9QEc

Hyderabad Karnataka Education Society's

Poojya Doddappa Appa College of Engineering

(An Autonomous Institution &Affiliated to

Visvesvaraya Technological University, Belagavi)

Aiwan E-Shahi Area KALABURAGI 585 102 Karnataka India

CURRICULUM

FOR B.E.V SEMESTER AND VI SEMESTER

FOR THE ACADEMIC YEAR 2023-24

DEPARTMENT OF CIVIL ENGINEERING

About College:

Poojya Doddappa Appa College of Engineering (PDACE) is the first institution of Hyderabad Karnataka Education (HKE) Society, Kalaburagi, which was established in the year 1958. The foundation stone of this college was laid by the then Vice President of India Dr.Sarvapalli Radhakrishnan in 1958.

At present, PDA College of Engineering is offering 11 UG programs, 10 PG Programs and 12 Research centers, spreading and imparting technical education in North Karnataka Region. The college has state of the art laboratories, digitalized smart class rooms having highly qualified and experienced faculty with highest no. of Ph.D. and M. Tech degrees.

PDACE is the only Autonomous Institution in the region, which was sponsored under TEQIP I , TEQIP-II and TEQIP-III from World Bank and received grants of Rs.10.43 crores, Rs. 17.5 crores and 7 crores respectively. This is one among 12 institutions having TEQIP-I and TEQIP -II sponsorship. At present, college is selected in TEQIP-III as Mentor Institution for Bundelkhand Institute of Engineering & Technology, Jhansi.

The Vision and Mission of PDA College of Engineering are as mentioned below.

VISION

- To be an institute of excellence in technical education and research to serve the needs of the industry and society at local and global levels.

MISSION

- To provide a high-quality educational experience for students with values and ethics that enables them to become leaders in their chosen professions.
- To explore, create and develop innovations in engineering and science through research and development activities.
- To provide beneficial service to the national and multinational industries and communities through educational, technical and professional activities.

About Department of Civil Engineering

The Civil Engineering Department was established in the year 1958 with an intake of 60 students. In 1994 the intake was increased to 90 and further increased to 180 in the year 2014.Presentlythe department runs both UG and PG (Environmental Engineering and Structural Engineering) programs with intake of 180 in UG program and 18 in each PG program. Department is recognized as Research Centre by Visvesvaraya Technological University Belagavi in the year 2002 and at present 35 research scholars are pursuing their Ph.D. and seven research scholars have been awarded with Ph D degree.

The Department has signed MoU with various industries like Medini, Sharan Technical consultancy, Canter Technologies Pvt. Ltd, Sharan Chandra Consultant, JGD Consultants, Jalavahini Management Services Pvt. Ltd. Dharwad, Shah Technical Consultants Pvt. Ltd., PP Raju & Co., Design Consortium, KRIDL, Bharath Dal and Oil Industries, Ultratech, ACC, Alstom, Karnataka State Pollution Control Board & HCC. These MoUs have helped the students in getting exposure to industrial environment and also for conducting Industry Institute Interaction events.

The Vision, Mission and Program educational objectives of Civil Engineering Department are as follows:

VISION

- To be the preeminent department for imparting technical knowledge and skills in the Civil Engineering field to meet the social, industrial, environmental and research needs at local and global levels.

MISSION

- To provide technical education to meet the challenges in the profession through a well-structured curriculum.
- To inculcate innovation and research ideas for sustainable development with ethical background.
- To impart entrepreneurial skills for serving the needs of the society through technical and professional activities.
- To create Civil Engineering professionals to serve the needs of the industry at local and global levels.

PROGRAM EDUCATIONAL OBJECTIVES(PEO'S)

Program educational objectives are broad statements that describe the Career and Professional accomplishments that the program is preparing graduates to achieve. The program educational objectives of the B.E. in Civil Engineering Program at PDA College of Engineering, Kalaburagi are:

PEO1: To provide the knowledge of mathematics, science and engineering fundamentals for solving civil engineering problems.

PEO2: To enable the graduates to exhibit their technical knowledge and skills of recent practices to identify and solve civil engineering problems.

PEO3: To enable the graduates to conduct and interpret the results of laboratory/ field experiments in basic sciences, engineering sciences and civil engineering.

PEO4: To enable the graduate for pursuing higher education and lifelong learning.

PEO5: To enable the graduates to acquire communication, team work and entrepreneurial skills along with the values of professional ethics.

PROGRAM OUTCOMES

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

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

3. 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.

4. 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.

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

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

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

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

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

10. 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.

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

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

PROGRAM SPECIFIC OUTCOMES

The Civil Engineering graduates are able to:

PSO1: Plan, Analyze and Design buildings, Water supply and Sewerage systems, Hydraulic structures and Transportation infrastructure using sustainable materials and conceptual knowledge of Geotechnical engineering.

PSO2: Conduct survey and Laboratory experiments/ field investigations and interpret the data for application to real life problems.

PSO3: Prepare detailed estimate of civil Engineering works and Execute the civil Engineering Projects with optimum resources using effective communication skills and Professional ethics

POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING, KALABURAGI											
DEPARTMENT OF CIVIL ENGINEERING											
Choice Based Credit System (CBCS)											
Scheme of Teaching and Examination 2021 – 22											
(Effective from the academic year 2021 – 22)											
V semester											
Sl. No	**Category**	**Subject Code**	**Subject Title**	**Credits**	**L**	**T**	**P**	**SS**	**CIE**	**SEE**	**Total**
1	HSMC/PC	21HU51	ENTREPRENEURSHIP MANAGEMENT AND FINANCE	3	2	2	0		50	50	100
2	IPCC	21CV52	ENVIRONMENTAL ENGG	4	3	0	2		50	50	100
3	PC	21CV53	DESIGN OF RCC STRUCTURES	3	2	2	0		50	50	100
4	PC	21CV54	GEOTECHNICAL ENGG	3	2	2	0		50	50	100
5	PCL	21CVL55	GEOTECHNICAL ENGG LAB	1	0	0	2		50	50	100
6	AEC	21RMI56	RESEARCH METHODOLOGY AND IPR	2	1	2	0		50	50	100
7	HSMS	21CIV57	MECHANIZATION IN CONSTRUCTION	1	0	2	0		50	50	100
8	AEC	21CVAE58X	ABILITY ENHANCEMENT COURSE	1	0	2	0		50	50	100
TOTAL				**18**					**400**	**400**	**800**

Ability Enhancement Course					
Sl. No	Course Code	Course Title	Sl. No	Course Code	Course Title
1.	**21CVAE581**	**Remote Sensing and GIS**	3.	21CVAE583	Quality Control and Quality Assurance
2.	21CVAE582	Software Applications	4.	21CVAE584	Offshore Structures

POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING, KALABURAGI										
DEPARTMENT OF CIVIL ENGINEERING										
Choice Based Credit System (CBCS)										
Scheme of Teaching and Examination 2021 – 22										
(Effective from the academic year 2021 – 22)										
VI semester										
Sl. No	**Category**	**Subject Code**	**Subject Title**	**Credits**	**HOURS/ WEEK**			**EXAMINATION MARKS**		
					L	**T**	**P**	**CIE**	**SEE**	**Total**
1	PC	21CV61	ESTIMATING, COSTING & VALUATION	3	2	2		50	50	100
2	IPCC	21CV62	TRANSPORTATION ENGINEERING	4	3	0	2	50	50	100
3	PC	21CV63	DESIGN OF STEEL STRUCTURES	3	2	2		50	50	100
4	PEC	21CV64X	Professional Elective-I	3	3			50	50	100
5	POC	21CV65OEX	Professional Open Elective - I	3	3			50	50	100
6	PCCL	21CVL66	SOFTWARE BASED LAB	1	--	--	2	50	50	100
7	MP	21CVP67	EXTENSIVE SURVEY PROJECT	2	-	-	2	50	50	100
8	INT	21INT68	SUMMER INTERNSHIP- II	3				50	-	100
TOTAL				**22**				**400**	**350**	**750**

Professional Elective-I		Professional Open Elective - I	
Course Code	Course Title	Course Code	Course Title
21CV641	STRUTURAL DYNAMICS	21CV65OE1	**ECOLOGY AND ENVIRONMENT**
21CV642	**DESIGN OF MASONRY STRUCTURES**	21CV65OE2	REMOTE SENSING & GIS
21CV643	DESIGN OF PRESTRESSED CONCRETE STRUCTURES	21CV65OE3	NUMERICAL METHODS IN ENGINEERING
21CV643	THEORY OF ELASTICITY & PLASTICITY		

COURSE TITLE: ENTREPRENEURSHIP, MANAGEMENT AND FINANCE		
Course code	21HU51	Credit: 03
Hours/Week	03 hours. (Theory)	SEE: 50 Marks
Total hours: 42 hours	CIE: 50 Marks	SEE: 03 hours

Prerequisite:

Course objectives:

To enable the students to obtain the basic knowledge about Entrepreneurship and Management and finance in the following topics:-

- The Meaning, Functions, Characteristics, Types, Role and Barriers of Entrepreneurship, Government Support for Entrepreneurship
- Management – Meaning, nature, characteristics, scope, functions, role etc and Engineers' social responsibility and ethics
- Preparation of Project and Source of Finance
- Fundamentals of Financial Accounting
- Personnel and Material Management, Inventory Control

Modules	Teaching Hours
Module I ENTREPRENEUR : Meaning of Entrepreneur; Functions of an Entrepreneur; Characteristics of an entrepreneur , Types of Entrepreneur; Intrapreneurs – an emerging class ; Role of Entrepreneurs in economic development; Barriers to entrepreneurship, Government Support for Innovation and Entrepreneurship in India - Startup-India, Make-in-India, PMMY, AIM , STEP, BIRAC, Stand-up India, TREAD	08 hours
Module II MANAGEMENT: Introduction – Meaning – nature and characteristics of Management, Scope and functional areas of management, Levels of Management, Henry Fayol - 14 Principles to Management , McKinsey's 7-S Model, Management by objective(MBO) – Meaning, process of MBO, benefits and drawbacks of MBO	08 hours
Module-III PREPARATION OF PROJECT AND SOURCE OF FINANCE: PREPARATION OF PROJECT: Meaning of project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents; SOURCE OF FINANCE: Long Term Sources(Equity, Preference, Debt Capital, Debentures, loan from Financial Institutions etc) and Short Term Source(Loan from commercial banks, Trade Credit, Customer Advances etc)	08 hours
Module -IV FUNDAMENTALS OF FINANCIAL ACCOUNTING: Definition, Scope and Functions of Accounting , Accounting Concepts and Conventions: Golden rules of Accounting, Final Accounts - Trading and Profit and Loss Account, Balance sheet	09 hours

Module – V	
PERSONNEL MANAGEMENT, MATERIAL MANAGEMENT AND INVENTORY CONTROL: PERSONNEL MANAGEMENT: Functions of Personnel Management, Recruitment, Selection and Training, Wages, Salary and Incentives MATERIAL MANAGEMENT AND INVENTORY CONTROL: Meaning, Scope and Objects of Material Management. Inventory Control- Meaning and Functions of Inventory control ; Economic Order Quantity(EOQ) and various stock level (Re-order level, Minimum level, Maximum level, Average level and Danger level)	09 hours

Course Outcomes: On completion of this course, students are able to:

CO	
CO1:	Develop Entrepreneurship skills
CO2:	Apply the concepts of management and Management By Objective(MBO)
CO3:	Prepare project report & choose different Source of Finance.
CO4	Apply Fundamentals of Financial Accounting and interpret the final accounts
CO5	Apply personnel management skills, Material and inventory control techniques

Question paper pattern:
i) Two questions are to be set from each module.
ii) Total five questions are to be answered by selecting minimum one question from each module

Text Books :

1. Financial Accounting -B S RAMAN- United Publishers Manglore, Maheswar S N & Maheswari S K-Vikas Publishing House. January 2018
2. Management & Entrepreneurship- K R Phaneesh- Sudha Publications January 2018 ,Prof Manjunatha & Amit kumar G – laxmi Publication , January 2011. Veerbhadrappa Havina - Published by New Age International (P) Ltd., 2009.
3. Principles of Management First Edition (English, G. Murugesan), Laxmi Publications – New Delhi
4. Management by Objectives (Mbo) in Enterprises: 21 December 2018 by Dr Wazir Ali Khan

Reference books:

Management Studies IIT Madras https://nptel.ac.in/courses/110/106/110106141/
https://www.businessmanagementideas.com/notes/management-notes/notes-on-management-in-an-organisation/4669
https://vskub.ac.in/wp-content/uploads/2020/04/Unit-5-ppmb.pdf

ENVIRONMENTAL ENGINEERING		
Subject code	21CV52	Credit: 04
Hours/Week	3 hours. (Theory)	SEE: 3 hours
Total hours: 42	CIE: 50 Marks	SEE: 50 Marks

Prerequisite: Water Resources engineering

Course objectives:

To enable the student to acquire the knowledge in the following topics.

1. Fundamentals of water and wastewater engineering.
2. Various components of water supply and wastewater collection systems.
3. Quantitative and qualitative assessment of water and wastewater.
4. Design water and wastewater system using hydraulic principles.
5. Operation of water wastewater treatment systems.

Modules	Teaching Hours
MODULE-I **INTRODUCTION**: Waste water disposal - Necessity for sanitation. methods of sewage disposal. **Introduction**: 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, differentmethods with merits and demerits- variations in demand of water. Fire demand – estimation by Kuching's formula, Freeman formula and national board offire underwriters' formula, peak factors, design periods and factors governing the design periods. **Quality of water:** Objectives of water quality management. Concept of safe water wholesomeness, palatability and potable. water borne diseases. **Sources:** Surface and subsurface sources – suitability with regard to quality and quantity.	08 Hours
MODULE-II **Materials of Sewers**: Sewer materials, Shapes or sewers, laying of sewers, jointing and testing of sewers, ventilation and cleaning of sewers. . **Examination of water and wastewater:** objectives – Physical chemical and Microbiological Examinations, (IS: 3025 and IS: 1622) using analytical and instrumental techniques. Drinking water standards BIS and WHO standards. Health significance of Fluoride, Nitrates and heavy metals like Mercury and Cadmium. Sampling of water for examination. **Analysis of wastewater**: Physical. chemical and biological characteristics concepts of aerobic and anaerobic activity, CNS cycles, more emphasis on BOD and COD. Sampling, significance, techniques and frequency. **Quantity of Sewage**: Dry weather flow, factors affecting dry weather flow, flow variations and their effects on design of sewerage system; computation of design	08 Hours

flow, estimation of storm flow, rational method and empirical formulae of design of storm water drain; Time of concentration. **Sewer Appurtenances**: Catch basins, manholes, flushing tanks, oil and grease traps, drainage traps, basic principles of house drainage, typical layout plan showing house drainage connections, maintenance of house drainage	
MODULE-III **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; Nomograms – use; Pipe appurtenances. types of sewerage systems and their suitability. **Design of Sewers**: Hydraulic formulae for velocity, effects of flow variations on velocity, self-cleansing and non-scouring velocities. Design of hydraulic elements for circular sewers flowing full and for partially full. **Disposal of effluents:** By dilution, self-purification phenomenon, oxygen sag curve, zones of purification, sewage farming, sewage sickness, disposal standards on land and water, chlorination of sewage. **Treatment of sewage:** Flow diagram of municipal sewage treatment Plant.	08 Hours
MODULE-IV **Water treatment**: Objectives – Treatment of flow-chart. Aeration- Principles, types of aerators. **Sedimentation:** Theory of settling tanks, types, design. Aided sedimentation –with coagulants, dosages, chemical feeding, flash mixing, and flocculator-design of all units. **Primary Treatment: screening**, grit chambers, skimming tanks, primary sedimentation tanks – Designs.	08 Hours
MODULE-V **Filtration**: Mechanism – theory of filtration, types of filters, slow sand, rapid sand and pressure filters including construction, operation, cleaning and their design – excluding under drainage system – back washing filters. **Softening: D**efinition, methods of removal of hardness lime soda process and zeolite process. **Disinfections**: Theory of disinfections, methods of disinfections, Chlorination, chlorine demand, residual chlorine, use of bleaching powder. **Secondary Treatment:** Trickling filter – types, theory and operation – Designs. Activated sludge process – principle and flow diagram, methods of aeration, modifications, F/M ratio – Design	08 Hours
Course Outcomes: On completion of this course, students are able to:	
Question paper pattern: i) Two questions are to be set from each module. ii) Total five questions are to be answered by selecting minimum one question from each module	
Text books: 1. Environmental Engineering (Vol I & II) – By S.K. Garg, Khanna Publishers 2. Environmental Engineering – (Vol I & II) By B.C. Punmia and Ashok Jain 3. Water and Wastewater Engineering Vol – II By Fair, Geyer, Okun, Willey Eastern	

Publishers, New York

4. Waste Water Treatment, Disposal and Reuse - By Metcalf & Eddy Inc... Tata McGraw Hill Publications (2003 Edition)
5. Water Technology By Hammer & Hammer
   Environmental Engineering By Howard.S. Peavy, Donald. Rowe, George Tchobanoglouse, McGraw Hill International Edition

Reference Books:

1. Manual on Waste Water Treatment – CPHEEO, Ministry of Urban Development, New Delhi

E-Books: www.civilenggebooks.com

ENVIRONMENTAL ENGG LAB

Prerequisite: None

Course objectives:

1. **To enable the student to acquire the knowledge in the following topics**
2. **Determination of Solids in Water / Sewage, turbidity, electrical conductivity, optimum alum dosage, Sieve Analysis of Filter Sand.**
3. **Determination of Chlorides. Alkalinity, Acidity, Total Hardness, COD, BOD, percentage of chlorine,**
4. **Determination of pH. Sulphate, Fluoride. Iron. Nitrate.**
5. **Determination of Total Count Test, Most Probable Number (MPN).**

Modules	Teaching Hours
I Analysis of Physical Parameters:	
1. Determination of Solids in Water / Sewage – Total Solids, Suspended Solids, Dissolved Solids, Volatile Solids, Fixed Solids, Settleable Solids.	2 Hours
2. Determination of Turbidity present in water.	2 Hours
3. Determination of Electrical Conductivity of water.	2 Hours
4. Determination of Optimum Alum Dosage.	2 Hours
5. Sieve Analysis of Filter Sand.	2 Hours
II Analysis of Chemical Parameters:	
1. Determination of Chlorides.	2 Hours
2. Determination of Alkalinity, Acidity.	2 Hours
3. Determination of Total Hardness, Calcium Hardness, Magnesium Hardness	2 Hours
4. Determination of Dissolved Oxygen, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD).	2 Hours
5. Determination of Percentage of Chlorine in Bleaching Powder, Residual Chlorine, Chlorine Demand	2 Hours
III Analysis of Chemical Parameters by Instrumental Methods:	
1. Determination of pH.	2 Hours
2. Determination of Sulphate.	2 Hours
3. Determination of Flouride	2 Hours
4. Determination of Iron.	

IV. Analysis of Biological Parameters:	
1.Determination of Total Count Test, Most Probable Number (MPN).	2 Hours
Question paper pattern: Any one of the above experiments is to be conducted in the examination by the student.	
Reference books: 1.Standard Methods for Examination of Water & Wastewater American Publication-Association of Water Pollution Control Federation, American Water Works Association, Washington DC (New Edition). 2.Manual of Water Wastewater Analysis – NEERI Publication. 3. IS Standards: 2490-1974, 3360-1974, 3307-1974. 4.Chemistry for Environmental Engineering By Sawyer & Macarty.	
Nptel Link: https://youtu.be/LeKqhMqEoKQ	
E-Books: www.civilenggebooks.com	

DESIGN OF R.C.C STRUCTURES		
Subject code	21CV53	Credit: 03
Hours/Week	2 hours. (Theory) + 2 hours Tutorial	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours
Prerequisite: Concrete Technology, Strength of Materials.		

Course objectives:

To enable the students to acquire the knowledge in the following topics:

1. Basic concepts of RCC, Working Stress method, Limit state method.
2. Design of beams, slabs, staircases, columns and isolated column footing using LSM
3. Serviceability requirements.

Modules	Teaching Hours
Module I **Introduction:** Basic concepts of reinforced concrete, Methods and design philosophies in RCC design, Load and Load combinations, Stress- Strain behavior of concrete and steel, working stress method (Elastic theory): Assumptions, concept of Transformed Area concept, Philosophy of limit state design, Characteristic loads and design loads, Characteristic. Strength and design strength, Limit State of Collapse- Flexure, Ultimate flexural strength of rectangular sections and flanged sections, Numerical examples for analysis of rectangular, flangedsection in Flexure.	9 Hours
Module-II **Limit State of Collapse Shear:** Ultimate Shear strength of R.C. Sections, Limit State of Collapse - Torsion, Concepts of development length and anchorage in R.C. Sections, Numerical examples. Limit state of serviceability for deflection, Computation of short term and long-term deflection for Singly Reinforced Rectangular section as perI.S.456-2000. Limit state of serviceability for cracking, Control of cracking and computation of crack width as per IS 456-2000 for Singly Reinforced sections. Numerical examples on computation of deflection and crack width.	8 Hours
Module-III **Design of beams:** Codal requirements in the design of beams, cover to reinforcement, spacing of Reinforcement, curtailment and splicing of reinforcement, Design of reinforced rectangular beams (singly & doubly) with detailing. (Cantilever & simply supported). Design of flanged beams with detailing.	8 Hours
Module -IV **Design of slabs:** Introduction, General aspects in the design of slabs, Design & detailing of rectangular slabs spanning in one direction (Simply supported and Continuous) as per IS: 456-2000, Design & detailing of rectangular slabs spanning in two directions (Simply supported and Continuous) as per IS: 456-2000, Design & detailing of Cantilever slabs. **Design of staircase:** Introduction, Structural behavior of staircases, Loads and distribution of load on staircases as per IS: 456-2000, Design & detailing of staircases (Dog legged, Open well type), Design concepts of Free-Standing Stair	8 Hours

cases.	
Module-V **Design of columns:** Introduction, Limit state of compression, Minimum eccentricity, slenderness limits, Code provisions for reinforcement & detailing, Design & detailing of short axially loaded columns (Square &. Rectangular and circular), Design & detailing of short columns under axial load with uniaxial bending and axial load with biaxial bending using SP-16 (Square & Rectangular sections). **Design of footing**: Introduction, types of footing, Structural behavior of footing, selection of types of footing, footing shapes & size, Reinforcement requirement as per IS: 456: 2000, Design & detailing of Isolated footing of uniform depth & variable depth (Square & Rectangular footing).	9 Hours

Course Outcomes: On completion of this course, students are able to:

CO		**BL**
CO1:	Analyze rectangular and flanged beams using working stress method	C3
CO2:	Analyze the beams using limit state approach for flexure, shear, torsion and also analyze the flexural members for limit state of serviceability	C3
CO3:	Design rectangular and flanged beams by limit state approach	C4
CO4	Design one way and two-way slabs and stair case using limit state approach	C4
CO5	Design columns and isolated column footing using limit state approach	C4

Question paper pattern:

i) Two questions are to be set from each module.

) Total five questions are to be answered by selecting minimum one question from each module

Text book:

1. Unnikrishnan Pillai and Devdas Menon, "Reinforced Concrete Design", McGraw Hill, New Delhi
2. Subramanian, "Design of Concrete Structures", Oxford university Press
3. H J Shah, "Reinforced Concrete Vol. 1 (Elementary Reinforced Concrete)", Charotar Publishing House Pvt. Ltd.

Reference books:

1. P C Varghese, "Limit State design of reinforced concrete", PHI, New Delhi.
2. W H Mosley, R Husle, J H Bungey, "Reinforced Concrete Design", MacMillan Education, Palgrave publishers.
3. Kong and Evans, "Reinforced and Pre-Stressed Concrete", Springer Publications.
4. A W Beeby and Narayan R S, "Introduction to Design for Civil Engineers", CRC Press.
5. Robert Park and Thomas Paulay, "Reinforced Concrete Structures", John Wiley & Sons, Inc.

Nptel Link: https://youtu.be/pIdaC_I6H_M

E-Books: www.civilenggebooks.com

GEOTECHNICAL ENGINEERING		
Subject code	21CV54	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Engineering geology

Course objectives:

To enable the student to acquire the knowledge in the following topics.

1. Understand basic properties of soil and classify the soil
2. Determine compaction, permeability of soil and consolidation of soil.
3. Understand the Shear strength of soil and Stability of slopes.
4. Develop an understanding of stresses and lateral earth pressure of soil.
5. Understanding of the essential steps involved in a geotechnical site investigation and familiarize the students with the procedures used for estimation of Bearing capacity andsettlements under the foundation.

Modules	Teaching Hours
Module I **Introduction:** Definition, origin and formation of soil, Phase Diagram, Voids ratio, Porosity, Percentage Air Voids, Air content, Degree of saturation, Moisture content, Specific gravity, Bulk density, Dry density, Saturated density, Submerged density and their inter relationships and Density index. **Index properties of soils and their determination**: Index properties of soils-Water content, Specific Gravity, Particle size distribution, Consistency limits and indices, insitu density. particle size distribution (Sieveanalysis and Hydrometer analysis only). **Classification of soils**: Particle size Classification by IS Method.	08 hours
Module-II **Flow of water through soils**: Darcy's law- assumptions and validity, coefficient of permeability and its determination (laboratory), factors affecting permeability, permeability of stratified soils, Seepage velocity, Superficial velocity andcoefficient of percolation, effective stress concept-total pressure and effective stress, quick sand phenomena, Capillary Phenomena. **Compaction of soils definition**: Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control-proctor needle.	08 hours
Module-III **Subsurface exploration:** Importance, Exploration program, Methods of exploration: Boring, sounding tests, geophysical methods-Electrical resistivity and Seismic refraction methods. Types of samples- undisturbed, disturbed and representative samples. Samplers, sample disturbance, area ratio, Recovery ratio, clearance, Stabilization of boreholes. Typical boring log. Number and depth of borings for building and dams. Determination of ground water level by Hvorselev method **Consolidation of soils**: Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory, assumption and limitations. Normally consolidated, under consolidated and over consolidated soils. Reconsolidation pressure and its determination by Casagrande's method. Laboratory one	09 Hours

dimensional consolidation test. Determination of consolidation characteristics of soils-compression index. and coefficient of consolidation, Determination of coefficient of consolidation by square root of time fitting method and logarithmic time fitting method.	
Module -IV **Shear strength of soil**: Concept of shear strength, Mohr's strength theory, Mohr-coulomb theory, measurement of shear parameters. Direct shear test, unconfined compression test, Triaxial compression test and vane shear test. Test under different drainage conditions. Conventional and modified failure envelops. Total and effective shear strength parameters, factors affecting shear strength of soils. **Lateral earth pressure:** Types of Earth pressure, Active and Passive earth pressures, Earth pressure coefficient and their range. Earth pressure theories-Rankine's and Coulomb's – assumptions and limitations, Graphical solutions for active earth pressure (cohesionless soil only) –Cullman's and Rebhann's methods,Lateral earth pressure in cohesive and cohesionless soils, Earth pressure distribution.	09 Hours
Module-V **Bearing capacity:** Definitions of ultimate, net and safe bearing capacities, Allowable bearing pressure. Terzaghi's and Brinch Hansen's bearing capacity equations-assumptions and limitations. Bearing capacity of footing subjected to eccentric loading. Effect of ground water table on bearing capacity. Plate load test, Standard penetration test, cone penetration test. **Foundation settlement:** Concept, immediate, consolidation and secondary settlements (no derivations), Tolerance BIS specifications for total and differential settlements of footings and rafts.	08 hours

Course Outcomes: On completion of this course, students are able to:

CO		**BL**
CO1:	Determine the index properties of soil and classify the soils.	C3
CO2:	Apply the principal of flow of water through the soil and also determine the compaction properties.	C4
CO3:	Explain the methods of subsurface exploration and determine the consolidation properties.	C4
CO4	Analyze the shear strength of soil and determine lateral earth pressure in soils.	C4
CO5	Determine the bearing capacity and settlement of soils	C4

Question paper pattern:

iii) Two questions are to be set from each module.

iv) Total five questions are to be answered by selecting minimum one question from each module

Text book:

1. Gopal Ranjan and Rao A.S.R., Basic and Applied Soil Mechanics, New Age International (P) Ltd., New Delhi.
2. Punmia B C, Soil Mechanics and Foundation Engineering, Laxmi Publications co., New Delhi.
3. Murthy V.N.S., Principles of Soil Mechanics and Foundation Engineering, UBS Publishers and Distributors, New Delhi.
4. Braja, M. Das, Geotechnical Engineering; Thomson Business Information India (P) Ltd., India.
5. Bowles,J.E., "Foundation Analysis and design" 5th edition, McGraw Hill Pub. Co ., New York (1996)

Reference books:

1. T.W. Lambe and R.V. Whitman, Soil Mechanics-, John Wiley & Sons.
2. Donald P Coduto, Geotechnical Engineering- Phi Learning Private Limited, New Delhi.
3. Shashi K. Gulathi & Manoj Datta, Geotechnical Engineering-Tata McGraw Hill Publications.
4. Debashis Moitra, "Geotechnical Engineering", Universities Press.,
5. Malcolm D Bolton, "A Guide to soil mechanics", Universities Press.,
6. Dr. C Venkataramaiah, 'Geotechnical engineering" New age Publications.
7. Dr. Alam Singh , Modern Geotechnical engineering.

Nptel Link: https://youtu.be/afirGWlleSM

E-Books: www.civilenggebooks.com

GEOTECHNICAL ENGINEERING LAB		
Subject code	21CVL55	Credit: 01
Hours/Week	2 hours. (Practical)	SEE: 50 Marks
Total hours: 28	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Engineering geology

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. Determination of Specific gravity, moisture content, Grain size analysis, density by core cutter
2. Determination of Consistency limits- Liquid limit, plastic limit and shrinkage limit.
3. Determination of Standard Proctor compaction test and Modified Proctor Compaction test,
4. Determination of Coefficient of permeability, Strength tests, Unconfined compression test, Direct shear test (for small and big particle size), Triaxial compression test

	Modules	Teaching Hours
1.	Test for determination of specific gravity and moisture content	2 hours
2.	Grain size analysis of soil sample (sieve analysis)	2 hours
3.	Insitu density by core cutter and sand replacement methods.	
4.	Consistency limits- Liquidlimit (Casagrande and cone penetration methods), plastic limit and shrinkage limit.	2 hours
5.	Standard Proctor compaction test and Modified Proctor Compaction test.	2 hours
6.	Coefficient of permeability by constant head and variable head methods	2 hours
7.	Strength tests	
	a) Unconfined compression test	2 hours
	b) Direct shear test (for small and big particle size)	2 hours
	c) Triaxial compression test	2 hours
8.	Consolidation test–determination of compression index and co -efficient of consolidation.	2 hours
9.	Laboratory vane shear test	2 hours
	a) Demonstration of miscellaneous equipment's such as Augers, Samplers, Rapid moisture meter, Proctor's needle.	2 hours
	b) Demonstration of Hydrometer test.	2 hours
	c) Demonstration of free Swell Index test	2 hours
	d) Demonstration of determination of relative density	2 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL

CO1	Demonstrate the concepts of GT theory course throughseries of experiments.	C2
CO2	Sharetheresponsibilitiesinsmallteamsof4-5membersforconductingtheexperiments	C3
CO3	Perform the experiments and determination of specific gravity, moisture content, Grain size analysis of soil sample, core cutter and sand replacement methods, Liquid limit, plastic limit and shrinkage limit, Standard Proctor compaction test, Modified Proctor Compaction test, compression index, co-efficient of consolidation, Laboratory vane shear test, Hydrometer test, Swell index test, relative density.	C4
CO4	Analyze the data and interpret the results.	C3
CO5	Prepare a well-organized laboratory report.	C3

Question paper pattern:
Any one of the above experiments is to be conducted in the examination by the student.

Reference books:

1. Soil testing –lab manual & question bank by KVS Appa Rao, VCS Rao, university science press
2. Punmia B C, Soil Mechanics and Foundation Engineering-(2017),16th Edition, Laxmi Publications co., New Delhi.
3. Lambe T.W., "Soil Testing for Engineers", Wiley Eastern Ltd., New Delhi.
4. Head K.H., "Manual of Soil Laboratory Testing" Vol. I, II, III, Princeton Press
5. Bowles J. E "Engineering Properties of Soil and Their Measurements", -Mc Graw Hill Book Co. New York.
6. Relevant BIS Codes of Practice: IS-2720 series

Nptel Link: **https://youtu.be/55RwyS0-ySo**

E-Books: www.civilenggebooks.com

RESEARCH METHODOLOGY & INTELLECTUAL PROPERTY RIGHTS			
Course Code	21RMI56	Credits	2
Course Type	Theory	CIE Marks	50
Lecture Hours(L:T:P)	1:2:0	SEE Marks	50
Total Hours	28	SEE Hours	3

Course Objectives:

The objectives of the course is to enable students:

- To Understand the knowledge on basics of research and its types.
- To Learn the concept of defining research problem and Literature Review, Technical Reading.
- To learn the concept of attributions and citation and research design.
- Concepts, classification, need for protection, International regime of IPRs - WIPO, TRIPS, Patent - Meaning, Types, surrender, revocation, restoration, Infringement, Procedure for obtaining Patent and Patent Agents.
- Meaning, essential requirements, procedure for registration and Infringement of Industrial Designs, Copyright.

Modules	Teaching Hours
Module-1	
Introduction: Meaning of Research, Objectives of Engineering Research, and Motivation in Engineering Research, Types of Engineering Research, Finding and Solving a Worthwhile Problem. Ethics in Engineering Research, Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship	**6**
Module-2	
Defining the research problem - Selecting the problem. Necessity of defining the problem Techniques involved in defining the problem- Importance of literature review in defining a problem Literature Review and Technical Reading, New and Existing Knowledge, Analysis and Synthesis of Prior Art Bibliographic Databases, Web of Science, Google and Google Scholar, Effective Search: The Way Forward Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading, Taking Notes While Reading, Reading Mathematics and Algorithms, Reading a Datasheet.	**6**
Module-3	
Research design and methods - Research design - Basic principles. Need of research design Features of good design- Important concepts relating to research design - Observation and Facts Attributions and Citations: Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations, Acknowledgments and Attributions, What Should Be Acknowledged, Acknowledgments in, Books Dissertations, Dedication or Acknowledgments.	**6**

Module-4	
Basic Concepts of Intellectual Property (IP), Classification of IP, Need for Protection of IP, International regime of IPRs - WIPO , TRIPS. Patents: Meaning of a Patent – Characteristics/ Features. Patentable and Non-Patentable Invention. Procedure for obtaining Patent. Surrender of Patent, revocation &restoration of Patents, Infringement of Patents and related remedies (penalties) . Different prescribed forms used in Patent Act. Patent agentsqualifications and disqualifications Case studies on patents - Case study of Neem petent, Curcuma(Turmeric)patent and Basmati rice patent, Apple inc.v Samsung electronics co.Ltd	**5**

Module-5	
Industrial Design: Introduction to Industrial Designs. Essential requirements of Registration. Designs which are not registrable, who is entitled to seek Registration, Procedure for Registration of Designs Copy Right Meaning of Copy Right. Characteristics of Copyright. Who is Author, various rights of owner of Copyright. Procedure for registration. Term of copyright, Infringement of Copyright and Its remedies. Software Copyright.	**5**

Question paper pattern:

- The question paper shall have five Module for 100 marks;
- Each full question carries 20 marks.
- Two questions to be set in each module (total ten questions).
- The candidate will have to answer one full question from each module.

Note: There can be a maximum of 4 subsections in each Question.

Text Books:

1. Research Methodology: Methods and Techniques C.R.Kothari, Gaurav Garg New Age International 4th Edition,2018
2. Dipankar Deb•RajeebDey,ValentinaE.Balas "EngineeringResearchMethodology",ISSN1868- 4394 ISSN 1868-4408 (electronic), Intelligent Systems Reference Library, ISBN 978-981-13- 2946-3 ISBN 978-981-13-2947-0 (eBook), https://doi.org/10.1007/978-981-13-2947-0.3
3. Dr. M.K. Bhandari"Law relating to Intellectual property" January 2017 (Publisher By Central Law Publications). Dr. R Radha Krishna and Dr. S Balasubramanain "Text book of Intellectual Property Right". First edition, New Delhi 2008. Excel books.
4. P Narayan "Text book of Intellectual Property Right". 2017 ,Publisher: Eastern Law House

Reference Books:

1. David V.Thiel"ResearchMethodsforEngineers"CambridgeUniversityPress,978-1-107-03488- 4-
2. Nishith Desai Associates - Intellectual property law in India – Legal, Regulatory & Tax

E books and online course materials:

- NPTEL: INTELLECTUAL PROPERTY by PROF.FEROZ ALI , Department of Humanities and Social Sciences IIT Madras https://nptel.ac.in/content/syllabus_pdf/109106137.pdf
- www.wipo.int
- www.ipindia.nic.in

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
21RMI56	**CO1**	To know them leaning of engineering research.
	CO2	To know the defining of research problem and procedure of Literature Review.
	CO3	To know the Attributions and Citations and research design.
	CO4	Highlights the basic Concepts and types of IPRs and Patents
	CO5	Analyse and verify the procedure for Registration of Industrial Designs & Copyrights

MECHANISATION IN CONSTRUCTION		
Subject code	21CIV57	Credit: 01
Hours/Week	2 hours. (Theory)	SEE: 50 Marks
Total hours: 28	CIE: 50 Marks	SEE: 2 hours

Prerequisite: None

Course objectives:

This course enables students to understand

1. Various type of equipment's used in constructions advantage & limitations of these equipment's
2. Manufacturing of natural aggregate & recycled aggregate through mechanization.
3. Mechanization in rebar fabrication, concrete production, placement, types of form work & scaffolding and materials used.
4. Construction of bridge/flyover by segmented construction and box pushing technology for tunneling &pile driving equipment.
5. Construction methods of drilling blasting, tunneling &various equipment's used in this construction.

Modules	Teaching Hours
Module I **Introduction to mechanization:** Definition, advantages and limitations of mechanization **Mechanization through construction equipment:**, cycle-Dozers, scrapers, Excavators, finishing equipment, Trucks and Hauling equipment, Hoisting equipment, Draglines and Clamshells	8 hours
Module-II **Mechanization in aggregate manufacturing:** Natural aggregates and recycled aggregates	6 hours
Module-III **Mechanization in rebar fabrication** Mechanization in concrete production and placement **Mechanization through construction:** Formwork and scaffolding types, materials and design principles	4 hours
Module -IV **Mechanization through construction methods/technologies:** Segmental construction of bridges/flyovers, box pushing technology for tunneling, trench-less technology Pile driving equipment: Pile hammers, selecting a pile hammer..	6hours
Module-V **Mechanization through construction methods of drilling, Blasting and Tunneling Equipment:** Definition of terms, bits, Jackhammers, Drifters, wagon drills, chisel drills, piston drills, blast hole drills, shot drills.	4 hours

Course Outcomes: On completion of this course, students are able to:		
CO		**BL**
CO1:	Definition and explaining of various construction equipment's.	C2
CO2:	Explain the manufacturing process of natural & recycled Aggregate	C3
CO3:	Explain the production and placement of concrete through Mechanization materials of formwork& design of formwork.	C3
CO4	Explanation on construction of bridge/flyover by segmental Construction&boxpushingtechnologyfortunnelingandpiledrivingequipment.	C3
CO5	Choose the sites for tunneling& drilling method equipment.	C3
Question paper pattern: i) Objective type questions		
Text book: 1) Construction equipment by, S. C. Shrama		
Nptel Link: https://youtu.be/2B7DhQvL8kw		
E-Books: www.civilenggebooks.com		

SUBJECT : REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM		
SUBJECT CODE: 21CVAE581	**CREDITS :01**	**Teaching Hours / Week : (L:T:P) (0:2:0)**
CIE : 50 MARKS	**SEE: 50 MARKS**	**SEE: 2 HRS**

COURSE OBJECTIVES:

• To develop the fundamental concepts of GIS and remote sensing including the electromagnetic

Spectrum, and nature of geospatial data.

• To make the student to understand the various Civil engineering applications of remote sensing.

• To familiarize s the students in the GIS based analytical and problem solving techniques for

• Sustainable planning and management of civil Engineering projects.

MODULE – I

INTRODUCTION:

Introduction to Remote Sensing , Historical Development of Remote Sensing , Remote Sensing Components.

BASIC PRINCIPLES: Energy Source & its characteristics, Electromagnetic Energy and Spectrum, Wave Bands,

Interaction of Electromagnetic Energy with Atmosphere and Earth's Surface

MODULE-2

REMOTE SENSING PLATFORMS AND SENSORS

Introduction, Satellite System Parameters, Sensor Parameters, Imaging Sensor System, Earth Resources Satellites,

Metrological Satellites.

MODULE -3

MICROWAVE REMOTE SENSING

Introduction, The Radar Principle. Factors Affecting Microwave Measurements

Radar Wave Bands. Side Looking Airborne Radar(SLAR) System. Synthetic Aperture Radar (SAR).

MODULE-4

FUNDAMENTALS OF GIS AND INTRODUCTION OF GPS

Roots of GIS . Overview of Information System. The four Ms. GIS definition and terminology. In brief about GPS

MODULE-5

INTEGRATION OF REMOTE SENSING AND GIS

Introduction. Remote Sensing and GIS Synergy. Raster Data for GIS. Vector Data for GIS. Need of Integration. General view on application, Applications of RS & GIS in civil engineering field.

COURSE OUTCOMES:

- Understand the importance of remote sensing and GIS application in civil engineering
- Students are familiarize with study and identification of satellite imageries
- Students are able to learn the soft skills by using GIS technologies.

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

CO1: Understand the principles of RS and its components.

CO2: Understand the Remote Sensing Platforms and Sensors.

CO3: Understand and familiarize with study and identification of satellite imageries.

CO4: Understand the soft skills by using GIS technologies.

Apply their RS AND GIS knowledge to illustrate and graph a problem and describe the realities that civil engineers face when dealing with issues.

REFERENCE BOOKS.

1. M .ANJI REDDY "REMOTE SENSING AND GEOGRAPHICAL INFORMATON SYSTEM" B S PUBLICATIONS, 3RD EDITION

Question paper pattern:

· The Question paper will have 50 objective questions.
· Each question will be for 01 marks
· Students will have to answer all the questions in an OMR Sheet.
· The Duration of Exam will be 2 hours.

VI Semester

ESTIMATING, COSTING & SPECIFICATIONS		
Subject code	21CV61	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 3 hours
Total hours: 42	CIE Marks: 50 Marks	SEE: 50 Marks

Prerequisite: Building material and construction, building planning and drawing

Course objectives:

To enable the students to obtain the basic knowledge about in the following topics: -

1.Understand the methods of taking out the quantities of each item of building components earth work, Bed concrete, Size stone masonry, Brickwork, RCC work etc. and for sanitary works, culverts, and steel truss.

2. Understand the method of writing the detailed specifications for all items of building of other works

3. Capable of calculate the rate per unit quantity of all items of building and other works.

4. Able to evaluate the value of property for different purposes.

Modules	Teaching Hours
Module I	
Estimate: Different types of estimates, Study of various drawings, important terms, units of measurements, abstracts, approximate methods of estimating	
1. **Estimation:** Methods of taking out quantities & their cost – center line method, long wall & short wall method. Preparation of detailed abstract & estimates for the following civil engineering works – Buildings- masonry structures & framed structures with flat & sloped R.C.C roof. Building components such as beams, columns, footings & roof slab with T beams. Excel spread sheet for estimation of small buildings.	10 Hours
2. **Estimates:** Steel trusses – fink & Howe trusses, R.C.C. slab culverts, manholes & septic tank with soak pits. Excel spread sheet for estimation of slab culvert bridges.	06 Hours
Module-II	
1. **Specifications:** Definition, objectives & essentials of specifications. General & detailed specifications for items of works in buildings, specifications of aluminum & wood partitions, false ceiling, aluminum & fiber doors & windows, various types of claddings.	03 Hours
2. **Contracts:** Types of contracts – essentials of contract agreement – legal aspects, penal provisions on breach of contract. Definition of the terms – tender, earnest money deposits, security deposit, tender forms, documents & types. Comparative statements, acceptance of contract documents & issue of work order. Duties & liabilities, termination of contract, completion certificate, quality control, right of contractor, refund of deposit. Administrative approval, technical sanction, nominal muster roll, measurement books, procedure for reading & checking measurements – preparation of bills.	03 Hours

Module-III **Rate Analysis:** Definitions & purpose, working of quantities of and rates for the following standard items of works – earth work, cement concrete, brick work, stone masonry, flooring, plastering, R.C.C. works, centering & form work for different R.C.C. items, wood & steel works for doors, windows & ventilators.		07 Hours
Module -IV **Measurement of earthwork for roads:** methods for computation of earthwork by different methods.		07 Hours
Module-V **Valuation:** Definition of terms used, different methods of valuation for different purposes with numerical examples.		06 Hours
Course Outcomes: On completion of this course, students are able to:		**BL**
CO1:	Prepare the estimate for building items such as foundation, wall, column, beam, roofs lab steel roof trusses and Sanitary works.	C2
CO2:	Prepare the tender document and tender notice with detailed specifications including the legal aspects of contract of civil engineering projects	C2
CO3:	Determine the rates of different items of civil engineering works such as Earth work excavation, stone and brick masonry, woodwork, concrete and Reinforced concrete works.	C3
CO4	Determine the quantity of earthwork by different methods for railways and highway	C3
CO5	Determine the fair price of the property by different methods of valuation for different	C3
Text book: 1. Datta B.N., "Estimating and costing", UBSPD Publishing House, New Delhi. 2. B.S. Patil, "Civil Engineering Contracts and Estimates", Universities Press. 3. M. Chakraborthi; "Estimation, Costing and Specifications", Laxmi Publications. 4. MORTH Specification for Roads and Bridge Works – IRC New Delhi.		
Reference books: 1. Kohli D. D and Kohli R.C, "Estimating and Costing", 12 th Edition, S.Chand Publishers, 2014. 2. Vazirani V.N and Chandola S.P, "Estimating and costing", Khanna Publishers, 2015. 3. Rangwala, C. "Estimating, Costing and Valuation", Charotar Publishing House Pvt. Ltd., 2015. 4. Duncan Cartlidge, "Quantity Surveyor's Pocket Book", Routledge Publishers, 2012. 5. Martin Brook, "Estimating and Tendering for Construction Work", A Butterworth-Heinemann publishers, 2008. 6. Robert L Peurifoy, Garold D. Oberlender,"Estimating Construction Costs" – 5ed, Tata McGraw-Hill, New Delhi.		
Nptel Link: https://youtu.be/ofkpm4lhJcg		
E-Books: www.civilenggebooks.com		

TRANSPORTATION ENGG		
Subject code	21CV62	Credit: 04
Hours/Week	3 hours. (Theory) + 2Hr Lab	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: **None**

Course objectives: To enable students to acquire the knowledge in the fallowing topics

1. Understand different modes of transportation systems, highway planning and highway alignment and survey.
2. Design the horizontal and vertical alignments of roads.
3. Understand the different pavement materials and design the thickness of different types of pavements.
4. Understand about pavement construction and highway drainage system.
5. Gain the skills of evaluating the highway economics by different methods and also introduce the students to highway financing and pavement maintenance.

Modules	Teaching Hours
MODULE-I **Introduction**: Importance of Transportation. Different modes of transportation, characteristics and comparison of different modes. Road development in India, Jayakar committee recommendations and implementation. Salient features of 1st, 2nd and 3rd 20-year road development plan and problems on 3rd20 year road development plan only. Salient features of road development plan vision 2021. Present scenario of road development in India. NHDP, PMGSY, KSHIP and KRDCL projects **Highway Planning**: Road Types and classification, road patterns. Planning surveys or fact-finding surveys, Master plan - saturation system of road planning, phasing road development programmed – problems on best alignment among alternate proposals and phasing. **Highway Alignment and Surveys**: Ideal alignment, factors affecting alignment, engineering surveys for new and realignment projects.	03 Hours. 03 Hours. 03 Hours
MODULE-II **Highway Geometric Design:** Importance, factors controlling the design of geometric elements. Highway cross section elements – pavement surface characteristics, camber, width of carriageway, shoulder width, formation width, right of way, typical cross section of roads. Design speed – sight distances - Design of horizontal alignment: radius of curve, superelevation, extra widening on curves, transition curves and vertical alignment –Summit and valley curves. Numerical problems on above (No derivation of formulae only brief description)	08 Hours.
MODULE-III **Pavement Materials**: Properties and requirements of subgrade soils, HRB andIS soil classification. Determination of CBR and Modulus of subgrade reaction ofsoil. Properties and requirements of road aggregates, Bitumen – Tar – Emulsion –Cutback (Tests on aggregates and bitumen not included). Numerical problems on above. **Pavement Design**: Types of pavements – Design factors, Determination of ESWL by equal stress criteria using graphical method only, EWL factors and numerical	03 Hours. 06 Hours

problems. IRC method of flexible pavement design based on CSA method using IRC: 37 – 2001. Stresses in rigid pavement and design of rigid pavement as per IRC: 58 – 2002 excluding design of joints.	
MODULE-IV **Pavement Construction:** Specifications, construction steps and quality control tests for Granular sub base course, WBM base course. Brief description on bituminous constructions such as prime coat, tack coat, bituminous binder course (BM and DBM), common types of bituminous surfacing courses such as surface dressing, premixed carpet (PMC) and bituminous concrete. Construction steps for cement concrete pavements. **Surface and Subsurface drainage system** for road pavements, types, functions and basic design principles	04 Hours. 04 Hours.
MODULE-V **Highway Economics and Financing:** Highway user benefits –VOC using charts only – Highway costs – Economic analysis by annual cost method and benefit cost ratio methods. Numerical problems on above. Highway financing – BOT and BOOT concepts. **Pavement Maintenance:** Pavement failures, cases. Maintenance of highways. Principles of pavement evaluation – functional and structural evaluation.	04 Hours. 04 Hours.

Course outcomes:
On completion of the course, the student will have the ability to:

CO #	Course Outcome (CO)	Blooms Level
CO1	Understand about the road development in India, Highway planning & Highway alignment	C2
CO2	Design highway geometries	C5
CO3	Explain the different pavement materials and design the thicknesses of different types of pavements	C2
CO4	Understand about pavement construction and highway drainage system	C2
CO5	Determine the highway economic cost by different methods and understand about highway financing and pavement maintenance	C4

Question paper pattern:
i) Two questions are to be set from each module.
i) Total five questions are to be answered by selecting minimum one question from each module

Text books:

1. Khanna, S.K. and Justo, C.E.G., "Highway Engineering" Nem Chand and Bros, Roorkee 8th Edition (2003).
2. Kadiyali, L.R., "Highway Engineering" Khanna Publishers, New Delhi.
3. Subramanyam, K.P., "Transportations Engineering –I" Scitech Publications, Chennai.
4. Rao, G.V., "Principles of Transportation and Highway Engineering," McGraw – Hill Publishing Company Limited, New Delhi.

Reference Books:

1. IRC: 37-2001, IRC: 58-2002 and other relevant IRC codes
2. MoRT&H-2001, "Specifications for Roads and Bridges" New Delhi (2001)
3. Partha ChakraoBorthy and Animesh Das, "Principles of Transportation Engineering", Prentice-Hall of India Private Limited, New Delhi (2003)

E books and online course materials: www.civilenggbooks.com

Nptel Link: https://youtu.be/5zKC_aq4ypM

HIGHWAY MATERIAL TESTING LAB	
List of Exercises:	**Teaching Hours**
1. Tests on Aggregates	
a. Aggregate Crushing value	2 Hours
b. Los Angeles abrasion test	2 Hours
c. Aggregate impact test	2 Hours
d. Aggregate shape tests (combined index and angularity number)	2 Hours
2. Tests on Bituminous Materials	
a. Penetration test	2 Hours
b. Ductility test	2 Hours
c. Softening point test	2 Hours
d. Specific gravity test	2 Hours
e. Viscosity test by tar viscometer	2 Hours
f. Bituminous Mix Design by Marshal Method (Demonstration only)	2 Hours
3. Tests on Soil	
a. Wet sieve analysis	2 Hours
b. CBR test	2+2 Hours

Course Outcomes: On completion of this course, students are able to:

CO		**BL**
CO1:	Demonstrate the concepts of Highway Engg theory course through series of experiments.	C2
CO2:	Sharetheresponsibilitiesinsmallteamsof4-5membersfor Conducting the experiments.	C3
CO3:	Perform the experiments and determination of strength of aggregates, Bitumen and Tar Properties like Softening point, ductility, and Flash and fire	C4
CO4	Analyze the data and interpret the results.	C3
CO5	Prepare a well-organized laboratory report.	C3

Question paper pattern:

All are individual experiments

1. Instructions as printed on the cover page of answer script for split up of marks to be strictly followed.
2. All exercises are to be included for practical examination.

Reference books:

1. M. L. Gambir, "Concrete Manual", Danpat Rai and sons, New Delhi

DESIGN OF STEEL STRUCTURES		
Subject code	21CV63	Credit: 03
Hours/Week	2 hours. (Theory+ 2 Hrs Tutorial)	SEE: 50 Marks
Total hours: 56	CIE: 50 Marks	SEE: 3 Hours

Prerequisite: Civil Engineering Materials, Strength of Materials, Structural Analysis

Course objectives:

The objectives of this course are to learn:

1. Design philosophies, loads and load combinations
2. Behavior and design of fasteners typically bolted and welded and simple beam-column connections
3. Behavior and design of axially loaded members and column bases

Behavior and design of simple beams

Modules	Teaching Hours
Module I	
Introduction: Advantages and Disadvantages of Steel structures, Loads and Load combinations, Design considerations, Limit State Method (LSM) of design, Failure criteria for steel, Codes, Specifications and section classification.	3hours
Plastic Behavior of Structural Steel: Introduction, Plastic theory, Plastic hinge concept, Plastic collapse load, conditions of plastic analysis, Theorem of Plastic collapse, Methods of Plastic analysis, Plastic analysis of continuous beams	5 hours
Module-II	
Bolted connections: Introduction, Behavior of Bolted joints, Design strength of ordinary Black Bolts, Design strength of High Strength Friction Grip bolts (HSFG), Design of axially loaded and eccentrically loaded connections.	4 hours
Welded connections: Introduction, Welding process, advantages of Welding, Types and Properties of Welds, Types of joints, Weld symbols, Weld specifications, Effective areas of welds, Design of axially loaded and eccentrically loaded joints using fillet and butt welds.	4 hours
Module III	
Design of Tension Members: Introduction, Types of tension members, Design of strands, Slenderness ratio, Behavior of tension members, Modes of failure, Factors affecting the strength of tension members, Angles under tension, other sections, Design of tension member, Lug angles.	4hours
Design of Compression Members: Introduction, Failure modes, Elastic buckling of slender compression members, Sections used for compression members, Effective length of compression members, Design of compression members: angle struts, laced and battened built up compression members.	5hours
Module -IV	
Design of Beams: Introduction, Beam types, , Lateral stability of beams, factors affecting lateral stability, Behavior of simple and built-up beams in	8 hours

bending(I-sections with flange plates only without vertical stiffeners), Design strength of laterally supported beams in Bending, Design strength of laterally unsupported beams, Shear strength of steel beams, Maximum deflection, Design of beams.	
Module-V **Design of column bases:** Design of simple slab base and gusseted base subjected to axial loading. Design of concrete pedestal along with anchor bolt design for given uplift load. **Design of beam to beam and beam to column connections:** Design of simple framed and seated (un stiffened and stiffened) connections using bolting and welding.	4 hours 5 hours

Course Outcomes: On completion of this course, students are able to:

CO		**BL**
CO1:	Explain different design philosophies and analyze continuous beams using plastic analysis technique	C4
CO2:	Design axially loaded and eccentrically loaded bolted and welded connections	C4
CO3:	Design axially loaded tension and compression members	C4
CO4	Design simply supported beams using single I section and simple built-up sections	C4
CO5	Design simple beam to column connections using bolting and welding	C4

Text book:

1. N Subramanian., "Design of Steel Structures" (2016), Oxford University Press, New Delhi.
2. Duggal S K., "Limit State Method of Design of Steel Structures", Tata McGraw Hill, New Delhi.

Reference books:

1. Dayarathnam P, "Design of Steel Structures", Scientific International Pvt. Ltd.
2. Kazim S M A and Jindal R S, "Design of Steel Structures", Prentice Hall of India, New Delhi.
3. IS 800-2007: General Construction in Steel Code Practice (Third revision), Bureau of Indian Standards, New Delhi.

Nptel Link: **https://youtu.be/CNE4hk_SGTo**

E-Books: www.civilenggebooks.com

STRUCTURAL DYNAMICS		
Subject code	21CV641	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Knowledge of basic structural engineering subjects, such as SOM, SA-I,SA-II& Matrix methods of structural analysis.

Course objectives:

To enable students to acquire the knowledge in the fallowing topics:

1. To attain the knowledge of effect of vibrations & earthquake force on the structures.
2. To attain the knowledge of rotating unbalance, Duhamel's integral, DLF, SDOF.
3. To attain the knowledge of free vibration of MDOF, natural frequencies, shear buildings modeled as MDOF.
4. To attain the knowledge of forced vibration of MDOF, response of shear building to base motion, base isolation.
5. To attain the knowledge of continuous systems, dynamic analysis of beams, lumped mass and consistent mass formulation

Modules	Teaching Hours
Module I Introduction to structural dynamics, Brief history of vibration and Earthquakes, Major earthquakes, Earthquakes zones, some basic definitions, Vibration of single degree of freedom system, undamped, damped, free vibrations, logarithmic decrement. Forced vibrations of single degree freedom systems, response of undamped and damped systems subjected to harmonic loading.	8 hours
Module-II Rotation unbalance, reciprocating unbalance. Duhamel's integral, response due to general system of loading, dynamic load factor, response spectrum, response of SDOF subjected to harmonic base excitation, vibration isolation.	7 hours
Module-III Free vibration of multi degree of freedom systems, natural frequencies, normal modes, orthogonality property of normal modes, eigen values. Shear buildings modeled as multi degree of freedom systems, free vibrations, natural frequencies.	11 hours
Module -IV Forced vibration motion of shear buildings, modal superposition method, and response of shear buildings to base motion, harmonic forced excitation. Damped motion of shear buildings, equations for damped shear buildings, uncoupled damped equations, conditions for damping uncoupling	11 hours
Module-V Dynamic analysis of beams stiffness matrices lumped mass and consistent mass formulation equations of motion.	5 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Explain the terminology associated with earthquake And the basic concepts of SDOF System and its response to harmonic loads.	C2
CO2:	Explain Duhamel's integral vibration isolation and analyze SDOF subjected to general system of load, harmonic base excitation	C2

CO3:	Analyze MDOF system subjected to free vibration,	C3
CO4	Determine the response of shear building to forced vibration, base motion and Harmonic forced excitation.	C4
CO5	Analyze beams by dynamic approach using technique of lumped mass and consistent mass formulation.	C4

Question paper pattern:

i) Two questions are to be set from each module.

ii) Total five questions are to be answered by selecting minimum one question from each module

Text book:

1. Reddy C S, Basic Structural Analysis, Tata McGraw Hill, New Delhi.
2. Muthu K U. etal, Basic Structural Analysis, 2nd edition, IK International Pvt. Ltd., NewDelhi,2015.
3. Bhavikatti, Structural Analysis, Vikas Publishing House Pvt. Ltd, New Delhi,2002.

Reference Books:

1. Hibbeler R C, Structural Analysis, Prentice Hall, 9th edition,2014.
2. Devadoss Menon, Structural Analysis, Narosa Publishing House, New Delhi,2008.
3. Prakash Rao D S, Structural Analysis, University Press Pvt. Ltd,2007.

Nptel Link: https://youtu.be/0KiYC8QQOiM

E-Books: www.civilenggebooks.com

DESIGN OF MASONRY STRUCTURES		
Subject code	21CV642	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: **Elements of civil engineering and Strength of material**

Course objectives:

This course will enable the students to

1. Understand properties of masonry units, strength and factors affecting strength.
2. Understand design criteria of various types of walls subjected to different load system.
3. Impart the culture of following the codes for strength, serviceability and durability as an ethics.
4. Provide knowledge in analysis and design of masonry elements

Modules	Teaching Hours
MODULE-I **Masonry units, materials, types & masonry construction:** Brick, stone and block masonry units –strength, modulus of elasticity and water absorption ofmasonry materials – classification and properties of mortars, selection of mortars. Defects and errors in masonry construction, cracks in masonry, types, reasons for cracking, methods of avoiding cracks. **Strength and stability:** Strength and Stability of concentrically loaded masonry walls, effect of unit strength, mortar strength, joint thickness, rate of absorption, effect of curing, effect of ageing, workmanship, Compressive strength formulae based on elastic theory and empirical formulae. .	10 Hours
MODULE-II **Permissible stresses**: Types of walls, permissible compressive stress, stress reduction and shape modification factors, increase in permissible stresses for eccentric vertical and lateral loads, permissible tensile stress and shear stresses. **Design Considerations:** Effective height of walls and columns, openings in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action in lintels. Problems on design considerations for solid walls, cavity walls, wall with pillars.	7 Hours
MODULE-III **Load considerations and design of Masonry subjected to axial loads:** Design criteria, design examples of walls under UDL, solid walls, cavity walls, solid wall supported at the ends by cross wall, walls with piers.	9 Hours
MODULE-IV **Design of walls subjected to concentrated axial loads:** Solid walls, cavity walls, solid wall supported at the ends by cross wall, walls with piers, design of wall with openings. **Design of walls subjected to eccentric loads:** Design criteria – stress distribution under eccentric loads – problems on eccentrically loaded solid walls, cavity walls, walls with piers.	8 Hours
MODULE-V	

Design of Laterally and transversely loaded walls: Design criteria, design of solid wall under wind loading, design of shear wall – design of compound walls. Introduction to reinforced brick masonry, lintels and slabs. In-filled frames: Types – modes of failures – design criteria of masonry retaining walls.	8 Hours

CO	**Course Outcome (CO)**	**BL**
CO1	Explain different types of masonry construction such as brick, stone, reinforced walls in composite action and identify the loads on masonry walls. Summarize various formulae's for finding compressive strength of masonry units.	C2
CO2	Explain permissible stresses and design criteria as per IS: 1905 and SP-20.	C3
CO3	Consider the loads. and design of walls under udl, solid walls, cavity walls	C4
CO4	Design of Masonry walls subjected to axial loads and eccentric loads	C5
CO5	Design of Laterally and transversely loaded walls	C5

Question paper pattern:

i) Two questions are to be set from each module.

ii) Total five questions are to be answered by selecting minimum one question from each module.

Text books:

1. Dayaratnam P, "Brick and Reinforced Brick Structures", Scientific International Pvt. Ltd.
2. M. L. Gambhir, "Building and Construction Materials", McGraw Hill education Pvt. Ltd.
3. Structural Masonry- Henry, A.W. Macmillan Education Ltd., 1990.

Reference Books:

1. Henry, A.W., "Structural Masonry", Macmillan Education Ltd.,1990.
2. IS 1905–1987 "Code of practice for structural use o f un-reinforced masonry- (3rd revision) BIS, New Delhi.
3. SP20(S&T)–1991, "Hand book on masonry design and construction(1strevision) BIS, New Delhi.

Nptel Link: https://youtu.be/E-rfU6n2rCw

E books and online course materials: www.civilenggbooks.com

DESIGN OF PRESTRESSED CONCRETE STRUCTURES		
Subject code	21CV643	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 Hours

Prerequisite:

Course objectives:

1.Explain the fundamental concepts of stress analysis
2 Apply systems of pre-stressing for various sections of structural elements
3 Evaluate and analyze the stresses under various conditions
4 Design and detail the prestressed concrete members for various loading conditions

Modules	Teaching Hours
Module I **Introduction to Pre stressed concrete and codal provisions:** **Introduction:** Historic development- general principles of Prestressing, Types of prestressing, pre-tensioning and post tensioning, advantages and limitation of prestressed concrete, Materials for pre stressed concrete- high strength steel and concrete, properties, Stress-strain characteristics of high strength steel and concrete **Codal Provisions:** Basic principles of pre stressing, fundamentals of prestressing, load balancing concept, Stress concept, center of thrust, Pre-Tensioning and post tensioning methods-Analysis of pre and post tensioning, Systems of pre stressing, End anchorages	9 Hours
Module-II **Analysis of sections for Flexure:** Elastic analysis of pre stressed concrete beams with straight, parabolic, triangular, trapezoidal cable profiles, Eccentric and concentric pre stressing, Numerical problems	8 Hours
Module-III **Losses of Pre stress**: Loss of prestress in pretensioned and post tensioned members due to elastic shortening of concrete, shrinkage of concrete, creep of concrete, relaxation of steel, slip in anchorage and frictional losses, Numerical problems	8 Hours
Module -IV **Deflection of pre stressed concrete beams:** short term and long-term deflections, Elastic deflections under transferred loads and due to different cable profiles, Deflection limits as per IS 1343, Effect of creep on deflection, Load versus deflection curve, methods of reducing deflection, Numerical problems. **Limit state of Collapse:** Flexure- IS code recommendations, Ultimate flexural strength of sections, IS code recommendations on shear strength, Shear resistance of sections, shear reinforcement, Limit state of serviceability-Control of deflection and cracking, Numerical Problems	9 Hours
Module-V Design of Beams: Design of pre stressing force and eccentricity for post tensioned prismatic beams, permissible stresses, Limiting zone and cable profile	8 Hours

Course Outcomes: On completion of this course, students are able to:	BL

CO1:	Understand the fundamental concepts of stress analysis	C2
CO2:	Apply systems of pre-stressing for various sections of structural elements	C2
CO3:	Analyse and evaluate the stresses under various conditions	C3
CO4	Design the prestressed concrete members for various loading conditions	C4
CO5	Design of Prestressed Beams	C4

Text book:
Krishna Raju, N. "Pre stressed Concrete", Tata McGraw Hill Publishing Company, New Delhi 2006
2. Krishna Raju. N., "Pre-stressed Concrete - Problems and Solutions", CBS Publishers and Distributors, Pvt. Ltd., New Delhi.
3. Rajagopalan N, "Pre - stressed Concrete", Narosa Publishing House, New Delhi

Reference books:
1.Prestressed concrete, N Krishna Raju, Tata McGraw Hill Publishers, 2009,
2 Prestressed Concrete, P Dayarathnam, Oxford and IBH Publishing Co., 2000,
3. Design of pre stressed concrete structures, T Y Lin and Ned H Burns, John Wiley & Sons, New York, 2008
4.Fundamental of pre stressed concrete, N C Sinha and S K Roy, 3rd Edition, S Chand and Company Ltd, 2011
5. Code Books: IS 1343:2012; Pre stressed Concrete: Code of practice

Nptel Link: https://youtu.be/4KYPltsNAWs

E-Books: www.civilenggebooks.com

THEORY OF ELASTICITY		
Subject code	21CV644	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Strength of materials, Structural analysis –I, and Structural analysis–II

Course objectives:

1. Generalized Hooke's law and strain-displacement relations, Equations of equilibrium and compatibility for two dimensional problems in rectangular & polar co ordinates
2. Plane stress and plane strain problems, measurement of surface strains and strain rosettes, stalk polynomial.
3. Analysis of two-dimensional problems in rectangular and polar coordinates

Modules	Teaching Hours
Module I Introduction to Mathematical theory of elasticity, definition of continuum, stress and strain at a. point, constitutive laws, Generalized Hook's Law, Strain displacement relations.	7 hours
Module-II Differential equations of equilibrium, boundary conditions, compatibility equations, Airy's stress function, problems, Stress polynomials, St. Venant's principle.	8 hours
Module-III Plane stress and plane strain, Principal stresses and strains, measurement of surface strains, strain rosettes, analytical method. Two-dimensional problems in rectangular coordinates, bending of a cantilever beam subjected to end load, effect of shear deformation in beams, simply supported beam subjected to UDL.	10 hours
Module -IV Two-dimensional problems in polar coordinates, strain- displacement relations, equations of equilibrium, compatibility equation, stress function.	9 hours
Module-V Stress distribution symmetrical about an axis, Rotating discs, Lame's problem. Effect of circular hole in an infinite plate, stress concentration factors.	8 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Describe stress and strain at a point, Generalized Hooke's law and strain displacement relations	C2
CO2:	Explain equilibrium and compatibility equation for the two-dimensional rectangular coordinate system &solve problems on stress polynomials	C2
CO3:	Explain surface strain measurement technique using strainrosettes and solve problems on cantilever and section beams.	C3
CO4	Solve two dimensional problems in polar coordinate system using the	C3

	Concepts of equilibrium and compatibility equation	
CO5	Develop the for- s t r e s s distribution for the call of rotator discs and Effect of circular hole in an infinite rate	C4

Question paper pattern:
i) Two questions are to be set from each module.
ii) Total five questions are to be answered by selecting minimum one question from each module

Text book:
1. S P Timoshenko and J N Goodier, "Theory of Elasticity", McGraw-Hill International Edition, 1970.
2. Sadhu Singh, "Theory of Elasticity", Khanna Publishers, 2012.
3. S Valliappan, "Continuum Mechanics - Fundamentals", Oxford &IBH Pub. Co. Ltd., 1981.
4. L S Srinath, "Advanced Mechanics of Solids", Tata - McGraw-Hill Pub., New Delhi, 2003.

Reference books:
Reference Books:
1. C. T. Wang, "Applied Elasticity", Mc-Graw Hill Book Company, New York,1953.
2. G. W. Housner and T. Vreeland, Jr., "The Analysis of Stress and Deformation", California Institute of Tech.,
CA, 2012. [Downloadasperuserpolicyfromhttp://resolver.caltech.edu/CaltechBOOK:1965.001].
3. A. C. Ugural and Saul K. Fenster, "Advanced Strength and Applied Elasticity", PrenticeHall,2003.
4. Abdel-Rahman Ragab and Salah Eldinin Bayoumi, "Engineering Solid Mechanics: Fundamentals and Applications", CRC Press,1998

Nptel Link: https://youtu.be/eICv1p8WjgI

E-Books: www.civilenggebooks.com

ECOLOGY AND ENVIRONMENT		
Subject code	21CVO651	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Environmental studies

Course objectives:

To enable the student to acquire knowledge in the following topics:

1. Componentsofenvironmentandtheirinteractionsandsubdivisionsofecology.
2. Structural and functional characteristics of an ecosystem, principles related to energy and concepts of productivity.
3. Bio-geochemical cycles and pathways of matter in the biosphere.
4. Fresh water and marine water eco system.
5. Effects of pollution on human health, aquatic and terrestrial ecosystems and global environmental problems.

Modules	Teaching Hours
Module I	
Introduction: Environment, definition, components of environment and its interaction. Ecology – Definition, Sub divisions of Ecology.	4 hours
Concepts of ecosystem: Structural and functional characteristics of an ecosystem. Balanced ecosystem, biological control, production and decomposition in nature.	6 hours
Module-II	
Principles and concepts pertaining energy in ecological system: Fundamental principles related to energy, energy environment, laws of thermodynamics, energy system. Pathways of energy in the biosphere; Concept of productivity – its measurement; Food chains/ Food webs – trophic levels, trophic structure	7 hours
Bio geo chemical cycles: Concept of bio-geochemical cycles –significance, pathways of matter in the biosphere, C, N, S & P cycles	7 hours
Module-III	
Fresh water ecology: Fresh water environment types and limiting factors, classification of fresh water organisms, fresh water biota (flora & fauna), zonation in streams, Eutrophication of lakes.	7 hours
Marine ecology: Marine environment, marine biota, zonation in the area (case study), estuarine ecology.	5 hours
Module -IV	
Pollution and environmental health: Types of pollution (Air, Water and Land) effects on human health, effects on aquatic and terrestrial system.	3 hours
Module-V	
Global environment problems: Acid rain, ozone layer depletion, greenhouse effect, Global warming.	3 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Identify the components of environment and the sub-divisions of ecology	C1

CO2:	Describe the characteristics of an ecosystem, energy system and the concepts of bio-geochemical cycles	C1
CO3:	Understand the fresh and marine water ecology,	C2
CO4	Understand effects of pollution on human health, and on ecosystems.	C2
CO5	Understand the global environment problems. And its causes and effect so faci drain, ozone layer depletion, greenhouse effect, global warming.	C1, C2

Question paper pattern:
i) Two questions are to be set from each module.
ii) Total five questions are to be answered by selecting minimum one question from each module

Text book:

1. Modi, P.N., "Irrigation Water Resources and Water Power Engineering". Standard Book House, New Delhi. 10th Edition, 2019.
2. Raghunath, H.M., "Groundwater",3rd Edition, New Age International Publishers, New Delhi, 2007.
3. Krishnan, M.S., "Geology of India & Burma". CBS publishers, New Delhi, 2017.
4. P. Jaya Rami Reddy, "A Textbook of Hydrology", University Science Press, New Delhi, 2011.
5. M N Rao and H V N Rao, "Air pollution", McGraw Hill Publications, 2017.
6. Krishnamurthy K.V., "An advanced textbook of Biodiversity- Principle &Practices." Oxford and IBH publications, New Delhi. 2004.

Reference books:

1. Odum, E.P., "Fundamentals of Ecology", W.B sounders, Philadelphia, USA, 1971
2. Singh J.S, Singh S.P & Gupta, S.R. "Ecology, environment and resource conservation", Anamaya publications, 2006.
3. Edmond A. Mathez & Jason E. Smerdon, "Climate Change: The science of Global warming and our energy feature", Columbia University Press, 2009.
4. National Council of Applied Economic Research, "Economic Impact of Interlinking of Rivers Program", Revised Final Report, April 2008.
5. http://nwda.gov.in/content.
6. Madhav Gadagil, "Biodiversity and India's degraded lands", Indian Academy of Sciences, Volume 22- No 2/3, http://www.jstor.org/pss/4314063

Nptel Link: https://youtu.be/ZngDF4jfRdw

E-Books: www.civilenggebooks.com

REMOTE SENSING AND GIS		
Subject code	21CVO652	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Survey-II

Course objectives:

To enable the students to acquire the knowledge in following topics

1. Basic Remote Sensing.
2. Concept of geographical Information.
3. GIS data models.
4. Digitizing, Editing & Structuring map data.
5. GPS (Basic knowledge of Global Positioning system).

Modules	Teaching Hours
Module I	
Remote sensing: Introduction–Historical sketch of Remote sensing, Idealized remote sensing-Basic principles of remote sensing-Electromagnetic energy Electromagnetic spectrum- Wave length regions and theirapplicationinremotesensing-characteristicsofsolarradiation-Basicradiation and atmosphere-interaction of Eradiation-with earth surface-remotesensingobservationplatform-sensors-ApplicationofRemotesensing.	8 hours
Module-II	
Geographic Information: system concepts and spatial models. Introduction, Spatial information, temporal information, conceptual models of spatial information, representation of geographic information.	2 hours
GIS Functionality –Introduction, data acquisition, preliminary data processing, data storage and retrieval, spatial search and analysis, graphics and interaction.	3 hours
Computer fundamentals of GIS and Data storage: Fundamentals of computers vector/raster storage character files and binary files, file organization, linked lists, chains, trees.	3 hours
Module-III	
Coordinate systems and map projection: Rectangular polar and spherical coordinates, types of map projections, choosing a map projection.	3 hours
GIS Data models and structures –Cartographic map model, GEO-relation model, vector/raster methods, non-spatial data base structure viz., hierarchal network, relational structures.	3 hours
Digitizing Editing and structuring map data –Entering the spatial data (digitizing), the non-spatial, associated attributes, linking spatial and non-spatial data, use of digitizers and scanners of different types.	3 hours
Module -IV	
Data quality and sources of error –Sources of errors in GIS data, obvious sources, natural variations and the processing errors and accuracy.	5 hours
Principles of Spatial data: access and search, regular and object orient edde	4 hours

composition, introduction to spatial data analysis, and overlay analysis, raster analysis, network analysis in GIS.		
Module-V **GIS and remote sensing data integration techniques:** in spatial decision support system land suitability and multi criteria evaluation, rule-based systems, network analysis, special interaction modeling, Virtual GIS. **Global positioning system:** Hyper spectral remote sensing, Dip techniques, hardware and software requirements for GIS, overview of GIS software.		4 hours 4 hours
Course Outcomes: On completion of this course, students are able to:		
CO		**BL**
CO1:	Define the basics principles of Remote sensing, sensors etc.	C2
CO2:	Classify RS and GIS software, and also about GPS device.	C2
CO3:	Contrast different areas with the help of RS and GIS	C2
CO4	Apply RS and GIS for urban application and water resources etc	C2, C3
CO5	Survey the area with respect to altitude, with the help of GPS	C3
Question paper pattern: i) Two questions are to be set from each module. ii) Total five questions are to be answered by selecting minimum one question from each module		
Text book: 1. Narayan Panigrahi, "Geographical Information Science", and ISBN 10: 8173716285 / ISBN 13: 9788173716287, University Press2008. 2. Basudeb Bhatta, "Remote sensing and GIS" , ISBN:9780198072393, Oxford University Press2011 3. Kang – T surg Chang, "Introduction to Geographic Information System". Tata McGraw Hill Education Private Limited2015. 4. Lilles and, Kiefer, Chipman, "Remote Sensing and Image Interpretation", Wiley2011.		
Reference books: 1. Chor Pang Lo and Albert K.W Yeung, "Concepts &Techniques of GIS", PHI,2006 2. John R. Jensen, "Remote sensing of the environment", an earth resources perspective– 2nd edition–by Pearson Education2007. 3. Anji Reddy M., "Remote sensing and Geographical information system", B. S. Publications2008. 4. Peter A. Burrough, Rachael A. McDonnell, and Christopher D. Lloyd, "Principals of Geo physical Information system", Oxford Publications2004. 5. S Kumar, "Basics of remote sensing & GIS", Laxmi publications 2005.		
Nptel Link: https://youtu.be/-4D1-eSEWXw		
E-Books: www.civilenggebooks.com		

NUMERICAL METHODS IN ENGINEERING		
Subject code	21CVO653	Credit: 03
Hours/week	3 hours. (theory)	See: 50 marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: mathematics-III, mathematics- IV

Course objectives:

To enable students to acquire the knowledge in the fallowing topics:

1. To understand and apply a suitable technique for solution simultaneous equations.
2. To understand and apply a suitable non-linear differentiation equation method among the given, for the solution of beam problems.
3. Application of different methods for non-linear algebraic and transcendental equations.
4. To understand numerical integration method to be applied for beam problems.
5. To understand and apply finite difference techniques for beams and columns to and slopes, deflections, torsion.

Modules	Teaching Hours
Module I **Introduction:** Historical development of Numerical techniques, role n researchand design in the field of civil engineering. Numerical solutions of simultaneous equations for Engg Problems. Development of Algorithms for (i) Cramer'srule (ii) Gaussian elimination method (iii) Gauss-Siedel iteration method (iv) Choleskyde composition method (v) Matrix inversion method Eigen value problems in civil engineering	1 Hours 9 Hours
Module-II **Solution of non-linear first order differential equation- applicable to beam problems.** (i) Euler's method (ii) Taylor's series (iii) Runge-Kutta 2nd and 4th order methods Gaussian quadrature method	9 Hours
Module-III **Solution for non-linear and algebraic and transcendental equation** (i) Newton-Raphson method (ii) Bisection method (iii) Gershoff's theory **Numerical integration** Numerical method for solving simple beam problems	6 Hours 3 Hours
Module -IV **Finite difference techniques:** (i) Slope and deflection of cantilever beam, simply supported beam, fixed beam, propped beam (ii) Beams of elastic foundation	8 Hours

Module-V **Finite Element Techniques:** 1. Buckling load from column 2. Torsion problem of non-regular section 3. Membrane problem		6 Hours
Course Outcomes: On completion of this course, students are able to:		
Co		**Bl**
CO1	Determine the solutions simultaneous for equations and develop algorithm for numerical technique such as Cramer's rule, gaussian elimination method, gauss seidel, Iteration method, cholesky decomposition method and eigen value problems in civil engineering	C2
CO2	Solve nonlinear first order differential equations especially applicable to beam problem using technique such as Euler's method, Taylor's series, runge-kutta and gaussian quadrature method.	C3
CO3	Solve nonlinear first order equation. About the most widely used (newton-ripsaw method) to find the roots also the simplest method (bisectional method) for the solution of nonlinear equation.	C3
CO4	Students will understand about the application of finite difference techniques to solve for soles & deflections for beams with different boundary conditions.	C4
CO5	Application off fdt's for column buckling, torsion and membrane Problems.	C4
Question paper pattern: I) Two questions are to be set from each module. Ii) Total five questions are to be answered by selecting minimum one question fromEach module		
Text book: 1. Grewal. B.S. and Grewal. J.S., "Numerical methods in Engineering and Science", Khanna Publishers, 9th Edition, New Delhi 2. Gerald. C. F., and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education, Asia,6th Edition, New Delhi.		
Reference books: 1. Chapra. S.C. and Canale. R. P., "Numerical Methods for Engineers, Tata McGraw Hill, NewDelhi. 2. Brian Bradie. "A friendly introduction to Numerical analysis", Pearson Education, Asia, NewDelhi. 3. Sankara Rao. K., "Numerical methods for Scientists and Engineers", Prentice Hall of IndiaPrivate, New Delhi		
Nptel Link: https://youtu.be/qqhsmdkqgjq		
E-Books: www.civilenggebooks.com		
2. Shetty M.S, "Concrete Technology", S. Chand &Co. Ltd, New Delhi. 3. Mehta P.K, "Properties of Concrete", Tata McGraw Hill Publications, New Delhi. 4. Neville AM, "Properties of Concrete", ELBS Publications, London. 5. Relevant BIS codes. 6. S K Khanna, C E G Justo and A Veeraragavan, "Highway Materials Testing Laboratory Manual", Nem Chand Bros, Roorkee. 7. L R Kadiyali, "Highway Engineering", Khanna Publishers, New Delhi.		
Nptel Link: https://youtu.be/3oNa9Z94Hiw		
E-Books: www.civilenggebooks.com		

SOFTWARE BASED LAB		
Subject code	21CVL66	Credit: 01
Hours/week	2 practical	See: 50 marks
Total hours:28 hours	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Basic Knowledge of computers

Course objectives:

This course will enable students to

1. Use industry standard software in a professional set up.
2. Understand the elements of finite element modeling, specification of loads and boundary condition, performing analysis and interpretation of results for final design.
3. Develop customized excel spread sheets.

Modules	Teaching Hours
Module I Use of civil engineering software for: 1. Analysis and design of plane trusses, continuous beams. 2. 3D analysis of multistoried frame structures(G+2).	10 hours
Module-II Use of EXCEL spread sheets: Design of singly reinforced and doubly reinforced rectangular beams, design of one way and two-way slabs and Axially loaded Column.	12 hours
Module-III GIS applications using open-source software: 1. To create shape files for point, line and polygon features with a map as reference.	6 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Analyze and Design beams and trusses using software	C2
CO2:	3Danalysisofmultistoriedframestructuresusing Software.	C3
CO3:	ApplyGISsoftwaretocreateshapefileswithamapasreferenceandtocreate Decision maps for specific purpose	C4
CO4	Design beams and slabs using excel spread sheets	C5
CO5	Design Columns using excel spread sheets	C5

Question paper pattern:

Writeup & Viva 15 marks
Excel sheet 20marks
Staad Pro 10 marks
QGIS 5 marks

Reference books:

Training manual sand User manual sand Relevant course reference books

E-Books: www.civilenggebooks.com

EXTENSIVE SURVEY PROJECT *(MINI PROJECT)		
Subject code	21CVP67	Credit: 02
Hours/week	1 hours. (Theory)+ 2 hours Practical	See: 50 marks
Total hours:	CIE: 50 Marks	SEE: 3 hours

Prerequisite:

Course objectives:

To be conducted between 5th& 6th Semester for a period of 2 weeks, Viva voce conducted along with 6th semester exams)

An extensive survey training involving investigation and design of the following projects is to be conducted for 2 weeks (14 days). The student shall submit a project report consisting of designs and drawings. Preferably the Total Station must be used for the survey work of the projects

General instructions, Reconnaissance of the sites and fly levelling to establish bench marks.

1.new tank projects: The work shall consist of

Alignment of center line of the proposed bund, Longitudinal and cross sections of the center line. Capacity surveys.

2. Details at Waste weir and sluice points. Canal alignment:

3. Restoration of an existing tank: The work shall consist of: Alignment of center line of the existing bund, Longitudinal and cross- sections. along the center line.

Capacity surveys, details at sluice and waste weir.

4. Water supply and sanitary project:

Examination of sources of water supply, Calculation of quantity required based on existing and projected population. Preparation of village map by any suitable method of surveying (like plane tabling), location of sites for ground level and overhead tanks, underground drainage system surveys for laying the sewers

5. Highway project: Preliminary and detailed investigations to align a new road between two terminal stations. The investigations shall consist of topographic surveying of strip of land for considering alternate routes and for final alignment. Report should justify the selected alignment with details of all geometric designs for traffic and design speed assumed. Drawing shall include key plan initial alignment, final alignment, longitudinal section along final alignment, typical cross sections of road

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1	Demonstrate the concepts of survey, water resource engineering, environmentalengineeringandtransportationengineeringtheorycoursethroughseriesof experiments	C2
CO2	Share the responsibilities in small teams of 4-5 members for conducting the experiments.	C2
CO3	Perform the experiments and determination of General instructions,	C4

	Reconnaissance new tank projects Alignment of center line of the proposed bund, Longitudinal and cross sections of the centerline. restoration of an existing tank, water supply and sanitary project, Examination of sources of water supply, highway project Preliminary and detailed investigations to align a new road between two terminal stations.	
CO4	Analyze the data and design the projects such highway, w a t e r supply and sanitation, overhead tank and restoration of existing tank project	C3
CO5	Prepare a well-organized drawings and report containing detail design.	C3
Question paper pattern:		
Reference books: Training manuals and User manuals Relevant course reference books		
Nptel Link: https://youtu.be/HgKYf6TVrNE		
E-Books: www.civilenggebooks.com		

Hyderabad Karnataka Education Society's

Poojya Doddappa Appa College of Engineering

(An Autonomous Institution &Affiliated to

Visvesvaraya Technological University, Belagavi)

Aiwan E-Shahi Area KALABURAGI 585 102 Karnataka India

CURRICULUM

FOR B.E.VII SEMESTER AND VIII SEMESTER

FOR THE ACADEMIC YEAR 2024-25

DEPARTMENT OF CIVIL ENGINEERING

About College:

Poojya Doddappa Appa College of Engineering (PDACE) is the first institution of Hyderabad Karnataka Education (HKE) Society, Kalaburagi, which was established in the year 1958. The foundation stone of this college was laid by the then Vice President of India Dr.Sarvapalli Radhakrishnan in 1958.

At present, PDA College of Engineering is offering 11 UG programs, 10 PG Programs and 12 Research centres, spreading and imparting technical education in North Karnataka Region. The college has state of the art laboratories, digitalized smart classrooms having highly qualified and experienced faculty with highest no. of Ph.D. and M. Tech degrees.

PDACE is the only Autonomous Institution in the region, which was sponsored under TEQIP I , TEQIP-II and TEQIP-III from World Bank and received grants of Rs.10.43 crores, Rs. 17.5 crores and 7 crores respectively. This is one among 12 institutions having TEQIP-I and TEQIP -II sponsorship. At present, college is selected in TEQIP-III as Mentor Institution for Bundelkhand Institute of Engineering & Technology, Jhansi.

The Vision and Mission of PDA College of Engineering are as mentioned below.

VISION

- To be an institute of excellence in technical education and research to serve the needs of the industry and society at local and global levels.

MISSION

- To provide a high-quality educational experience for students with values and ethics that enables them to become leaders in their chosen professions.
- To explore, create and develop innovations in engineering and science through research and development activities.
- To provide beneficial service to the national and multinational industries and communities through educational, technical and professional activities.

About Department of Civil Engineering

The Civil Engineering Department was established in the year 1958 with an intake of 60 students. In 1994 the intake was increased to 90 and further increased to 180 in the year 2014.Presentlythe department runs both UG and PG (Environmental Engineering and Structural Engineering) programs with intake of 180 in UG program and 18 in each PG program. Department is recognized as Research Centre by Visvesvaraya Technological University Belagavi in the year 2002 and at present 35 research scholars are pursuing their Ph.D. and seven research scholars have been awarded with Ph D degree.

The Department has signed MoU with various industries like Medini, Sharan Technical consultancy, Canter Technologies Pvt. Ltd, Sharan Chandra Consultant, JGD Consultants, Jala Vahini Management Services Pvt. Ltd. Dharwad, Shah Technical Consultants Pvt. Ltd., PP Raju & Co., Design Consortium, KRIDL, Bharath Dal and Oil Industries, Ultratech, ACC, Alstom, Karnataka State Pollution Control Board & HCC. These MoUs have helped the students in getting exposure to industrial environment and also for conducting Industry Institute Interaction events.

The Vision, Mission and Program educational objectives of Civil Engineering Department are as follows:

VISION

- To be the preeminent department for imparting technical knowledge and skills in the Civil Engineering field to meet the social, industrial, environmental and research needs at local and global levels.

MISSION

- To provide technical education to meet the challenges in the profession through a well-structured curriculum.
- To inculcate innovation and research ideas for sustainable development with ethical background.
- To impart entrepreneurial skills for serving the needs of the society through technical and professional activities.
- To create Civil Engineering professionals to serve the needs of the industry at local and global levels.

PROGRAM EDUCATIONAL OBJECTIVES(PEO'S)

Program educational objectives are broad statements that describe the Career and Professional accomplishments that the program is preparing graduates to achieve. The program educational objectives of the B.E. in Civil Engineering Program at PDA College of Engineering, Kalaburagi are:

PEO1: To provide the knowledge of mathematics, science, and engineering fundamentals for solving civil engineering problems.

PEO2: To enable the graduates to exhibit their technical knowledge and skills of recent practices to identify and solve civil engineering problems.

PEO3: To enable the graduates to conduct and interpret the results of laboratory/ field experiments in basic sciences, engineering sciences and civil engineering.

PEO4: To enable the graduate for pursuing higher education and lifelong learning.

PEO5: To enable the graduates to acquire communication, teamwork and entrepreneurial skills along with the values of professional ethics.

PROGRAM OUTCOMES

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

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

3. 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.

4. 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.

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

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

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

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

9. Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. 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.

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

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

PROGRAM SPECIFIC OUTCOMES

The Civil Engineering graduates are able to:

PSO1: Plan, Analyze and Design buildings, Water supply and Sewerage systems, Hydraulic structures and Transportation infrastructure using sustainable materials and conceptual knowledge of Geotechnical engineering.

PSO2: Conduct survey and Laboratory experiments/ field investigations and interpret the data for application to real life problems.

PSO3: Prepare detailed estimate of civil Engineering works and Execute the civil Engineering Projects with optimum resources using effective communication skills and Professional ethics

POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING, KALABURAGI											
DEPARTMENT OF CIVIL ENGINEERING											
Choice Based Credit System (CBCS)											
Scheme of Teaching and Examination 2021 – 22											
(Effective from the academic year 2021 – 22)											
VII semester											
Sl. No	**Category**	**Subject Code**	**Subject Title**	**Credits**	**HOURS/ WEEK**				**EXAMINATION MARKS**		
					L	**T**	**P**	**SS**	**CIE**	**SEE**	**Total**
1	PEC	21CV71X	Professional Elective – II	3	3	-	--	1	50	50	100
2	PEC	21CV72X	Professional Elective – III	3	3		--		50	50	100
3	OEC	21CV73OEX	Open Elective – II	3	3	-	--		50	50	100
4	OEC	21CV74OEX	Open Elective – III	3	3	--	--		50	50	100
5	Project	21CVP75	Project Work	10		-	--		50	50	100
6	AEC	21NPAE76	Ability Enhancement Course (Online NPTEL Course of Minimum 8 weeks duration)	2	-	-			50	50	100
TOTAL				**24**					**300**	**300**	**600**

VII SEM ELECTIVE

VII SEM PROFESSIONAL ELECTIVE - II	
21CV71X	21CV711- SOLID WASTE MANAGEMENT
	21CV712- ENGINEERING HYDROLOGY
	21CV713- DESIGN OF BRIDGES
	21CV714- REINFORCED EARTH
	21CV715-RAILWAY, AIRPORT & HARBOUR ENGG
	21CV716-DESIGN OF PRE-STRESSED CONCRETE STRUCTURE

VII SEM PROFESSIONAL ELECTIVE - III	
21CP72X	21CV721-ADVANCED FOUNDATION DESIGN
	21CV722- INDUSTRIAL WASTEWATER TREATMENT
	21CV723- ADVANCED DESIGN OF STEEL STRUCTURES
	21CV724- PAVEMENT DESIGN
	21CV725- DESIGN OF HYDRAULIC STRUCTURES

VII SEM PROFESSIONAL OPEN ELECTIVE - II	
21CV73OEX	21CV73OE1- RURAL DEVELOPMENT TECHNOLOGY
	21CV73OE2 – OPTIMIZATION AND RELIABILTIY ANALYSIS
	21CV73OE3-FINITE ELEMENT METHOD
	21CV73OE4-GLOBAL ENVIRONMENTAL ISSUES

VII SEM PROFESSIONAL OPEN ELECTIVE - III	
21CV74OEX	21CV74OE1 - MECHANISATION IN CONSTRUCTION
	21CV74OE2 - INDUSTRIAL SAFETY AND HEALTH
	21CV74OE3 - ALTERNATE BUILDING MATERIALS

POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING, KALABURAGI											
DEPARTMENT OF CIVIL ENGINEERING											
Choice Based Credit System (CBCS)											
Scheme of Teaching and Examination 2021 – 22											
(Effective from the academic year 2021 – 22)											
VIII semester											
Sl. No	**Category**	**Subject Code**	**Subject Title**	**Credits**	**HOURS/ WEEK**			**EXAMINATION MARKS**			
					L	**T**	**P**	**CIE**	**SEE**	**Duration in hours**	**Total**
1	Seminar	21CVS81	Technical Seminar	1	-	-	--	50	-	-	50
2	Internship	21CVI82	Research/Industry Internship	15	-	-	-	50	50	03	100
TOTAL				**16**				**100**	**50**		**150**

SOLID WASTE MANAGEMENT		
Subject code	21CV711	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours
Prerequisite: Environmental studies, Environmental Engineering.		

Course objectives:

To enable the students to acquire the knowledge in the following topics:

1. Need for solid waste management studies scope and importance of solid waste management.
2. To identify the sources of wastes collection and transportation of wastes.
3. To know the methods of disposal of wastes
4. To know the importance of Reduce, Recycle and Reuse. (3R's)
5. To know the effect of plastic and E-waste.

Modules-I	Teaching Hours
Introduction: Solid waste – Definition,– scope and importance of solid waste management, functional elements of solid waste management. **Sources:** Classification and characteristics – municipal, hospital / biomedical waste, Quality – generation rate, methods.	8 hours
Module-II **Collection and transportation:** Systems of collection, collection equipment, garbage, chutes, transfer stations – bailing and compacting, route optimization. Treatment / processing techniques: Component's separation, volume reduction, size reduction, chemical reduction and biological processing.	8 hours
Module-III **Incineration:** Processes – 3 T's, factors affecting incineration process, incinerators – types, prevention of air pollution, pyrolysis. **Composting:** Aerobic and anaerobic composting, factors affecting composting, Indore and Bangalore processes, mechanical and semi mechanical composting processes, Vermicomposting	8 hours
Module -IV **Sanitary land filling**: Definition, methods, trench area, ramp and pit method, site selection, basic steps involved, cell design, prevention of site pollution, leachate collection and control methods, gas collection systems. Land pollution Open dumping – selection of site, ocean disposal, feeding to hogs	8 hours
Module-V **Disposal method:** Incineration, pyrolysis, composting, sanitary landfilling, merits and demerits. **Recycle and reuse:** Material and energy recovery operations, reuse in other industries, plastic wastes, environmental significance, and reuse.	8 hours

E-Waste management		
Course Outcomes: On completion of this course, students are able to:		
CO		BL
CO1:	Identify the sources, types, composition and characteristics of solid wastes.	C2
CO2:	Identify the systems of collection, equipment's used for the collection of solid waste.	C3
CO3:	Knowledge of the hazardous of solid waste and the necessity to treat solid waste.	C2
CO4	Identify the methods of disposal for different solid waste.	C2
CO5	know the importance of reduce, recycle and reuse of solid wastes.	C2

Textbook:

1. George Tchobanoglous, Hilary Theisen, Samuel A Vigil, "Integrated Solid Waste Management Engineering principles and management issues", M/c Graw hill Education. Indian edition
2. Howard S Peavy, Donald R Rowe and George Tchobanoglous, "Environmental Engineering", Tata Mc graw Hill Publishing Co ltd.,

Reference books:

1. Municipal Solid Wastes (Management and Handling) Rules, 2000.Ministry of Environment and Forests
2. Notification, New Delhi, the 25th September, 2000. Amendment – 1357(E) – 08-04-2016
3. Municipal Solid waste management manual, Part II published under Swachh Bharat Mission, Central
4. Public Health and Environmental Engineering Organization (CPHEEO), 2016, Ministry of Urban Development, Government of India.
5. Handbook of Solid waste management, second edition, George Tchobanoglous, Frank Kreith, published by M/c Graw hill Education, 2002, ISBN-13 978-0071356237 ISBN -10 0071356231

Nptel Link: https://youtu.be/cjIacnNRLHE

E-Books: www.civilenggebooks.com

ENGINEERING HYDROLOGY		
Subject code	21CV712	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: The students should have knowledge of Engineering Mechanics & Water Resources Engineering

Course objectives:

1. Hydrological cycle & Measurement rainfall over a catchment.
2. Engineering Analysis of Rainfall data.
3. Rainfall-Runoff relationship & Analysis of stream flow data.
4. Hydrograph theory & Application to predict floods.
5. Ground water hydrology & Estimation of yield of well.

Modules	**Teaching Hours**
Module I INTRODUCTION: Introduction and practical application of Hydrology and water Resources. Hydrologic cycle (Engineering, Horton's Qualitative Representation), Concept of Catchment and Its Characteristics and Water budget equation. PRECIPITATION: Definition and forms &Types of precipitation – Climate & Weather seasons in India, Measurement of precipitation – Non recording and recording type rain gauges. Computation of average depth of precipitation over an area. Statistical methods. Estimation of missing precipitation data	**4 hours** **4 hours**
Module-II ANALYSIS OF RAINFALL DATA: Mass curve and consistency of rainfall data Rain gauge networks – optimum number of rain gauges, Hyetograph, Infiltration and Infiltration Indices. Average & Maximum intensity curves, Depth area duration curves. Problems on dependable rain, frequency analysis**.**	**8 hours**
Module-III RUNOFF & STREAM FLOW MEASUREMENT: Components. Factors affecting Runoff. Basin yield. Rainfall – Runoff relationship using simple regression analysis. Computation of maximum flood discharge by rational formula, Empirical equations, frequency analysis. Stream flow measurement, Stage – Discharge Curve, area-velocity method. Slope area method, Dilution method, Current meter, Units of stream flow, flow duration curve, flow mass curve and problems.	**9 hours**

Module -IV HYDROGRAPH: Components of hydrograph. Separation of base flow. Unit hydrograph theory. Derivation and application of unit hydrograph. Computation of unit hydrographs ordinates of different durations. S-Curve and its use. Computation of Runoff Hydrograph using unit hydrograph. Unit hydrograph for complex storms.	**9 hours**
Module-V GROUND WATER HYDROLOGY AND WELL HYDRAULICS: Scope and importance of ground water hydrology. Occurrence of ground water. Definitions: Aquifers, aquitard, aquifuge, aquiclude, perched aquifer. Aquifer parameters. Darcy's law and its validity. Steady radial flow into a well in confined and unconfined aquifers. Safe yield, yield of an open well, Pumping test and recuperation test. problems	**8 hours**

Course Outcomes: On completion of this course, students are able to:

CO		**BL**
CO1:	The students will be in a position to analyze the rainfall data and apply the principles to the real problems.	C2
CO2:	The students will be in a position to assess runoff computations and apply the principles.	C3
CO3:	The students will be able to explain hydrographs and its components also students can apply the principles of various hydrographs to solve field problems.	C4
CO4	The students will gain information about ground water source and apply the principles to different problems.	C3
CO5	The students will acquire the skills to interpret the hydrological data pertaining to surface and ground water.	C4

Textbook:

1. K. Subramanya, "Engineering Hydrology", Tata McGraw Hill Publishers, New Delhi.
2. Jayarami Reddy, "A Text Book of Hydrology", Lakshmi Publications, New Delhi.
3. Punmia and Lal Pandey, "Irrigation and Water Power Engineering" Lakshmi Publications, New Delhi**.**

Reference books:

1. **H.M. Raghunath**, "Hydrology", Wiley Eastern Publication, New Delhi.
2. **Sharma R.K.,** "Irrigation Engineering and Hydraulics", Oxford & IBH Publishing Co., New Delhi.
3. **Ven Te Chow**, "Applied Hydrology", Tata McGraw Hill Publishers, New Delhi.
4. **Modi P.N** "Water Resources and Water Power Engineering"-. Standard book house,
5. Delhi.
6. **Garg S.K,** "Irrigation Engineering and Hydraulic Structures" Khanna publications, New Delhi.

Nptel Link: https://youtu.be/XTDkU7kPfUQ

DESIGN OF BRIDGES		
Subject code	21CV713	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours
Prerequisite: Elements of Engineering and Engineering mechanics, Strength of material, Structural analysis		
Course objectives: 1. Types and importance of bridges and basic investigations for proposing bridge at a site. 2. Details of different types of foundations for a proposed bridge its stability analysis for different components of substructures. 3. Loads as per IRC and stresses on different components of bridge and design of RCC slab culvert. 4. Design of pipe culvert and box culvert for a proposed highway road. 5. Design of RCC T-beam girder bridge by different methods and detailing.		

Modules	Teaching Hours
Module I **Introduction**: Definition, components of bridges, Classification, types of bridges, importance of bridges. Bridge Site Investigation and Hydraulic Design: Selection of bridge site, determination of design discharge, natural, artificial, and linear waterways, afflux, economical span, scour depth for alluvial and quasi alluvial waterways. Numerical problems	**2 hours** **6 hours**
Module-II **Foundation:** Types of foundations. Shallow and deep foundations, spread and raft type foundation. Pile foundation: bearing, friction and combined bearing and friction piles. Caisson foundations and open and pneumatic caissons. **Substructure and Foundations**: Types of abutments, piers, wing walls, forces to be considered for the design, Principles of stability analysis of abutment and pier & wing walls. Codal provisions for fixing of tentative sections of abutment, pier, wing walls. problems on stability analysis of abutments	**4 hours** **4 hours**
Module-III **Loads and stresses:** various loads to be considered while designing bridges. IRC Loading standards. Design of RC slab culvert for IRC class AA tracked and class A two lane loading using effective width method. Neat, dimensioned sketches of slab culvert showing half section plan at foundation, half front elevation, half plan at foundation level and half top view.	**2 hours** **6 hours**

Module -IV **Design of pipe culvert:** Hydraulic and structural design. pipe culvert for shallow and high embankments. Design of pipe culvert for high embankments. given site particulars. Neat, dimensioned sketches of pipe culvert for given site particulars. **Design of Box Culvert**: Design of single box culvert by actual analysis using moment distribution method for different combinations of loads such as dead load, live load, earth pressure from outside and water pressure from inside		**5 hours** **5 hours**
Module-V **Design of T-Beam Bridge:** Design of all the components of T-Beam bridge for class AA tracked vehicle only. Design of interior deck slab panel by Pigeaud's theory. Design of interior longitudinal girder by Courbon's load distribution method. Approximate method of design of interior cross girder. Neat sketches showing reinforcement details in slab and beams**.**		**8 hours**
CO		**BL**
CO1:	Determine hydraulic inputs required for design of bridges	C2
CO2:	Apply the principles of stability analysis of abutment, pier and wing walls and Analyse abutment from stability. criteria	C4
CO3:	Estimate the loads for design of bridges and design a RCC. slab culvert	C5
CO4	Design a Pipe using the IRC class AA loading and Box culvert	C5
CO5	Design a T-Beam Bridge	C5
Textbook: 1. Johnson Victor. D, "Essentials of Bridge Engineering", Oxford Publishing Company. 2. N Krishna Raju, "Design of Bridges, Oxford and IBH publishing company 3. T R Jagadeesh and M A Jayaram, "Design of bridge structures", Prentice Hall of India		
Reference books: 1. Jain and Jai krishna, "Plain and Reinforced Concrete", Vol.2 Nem Chand Brothers. **2.** Standard specifications and code of practice for road bridges, IRC section I,II, III and IV. "Concrete Bridges", The Concrete Association of India		
Nptel Link: https://youtu.be/5k8vdDSK6jU		
E-Books: www.civilenggebooks.com		

REINFORCED EARTH		
Subject code	21CV714	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours
Prerequisite: Geotechnical Engg		

Course objectives:

1. identify, formulate reinforced earth techniques that are suitable for different soils and in different structures.
2. understand the laboratory testing concepts of Geo-synthetics.
3. design RE retaining structures and Soil Nailing concepts.
4. Determine the load carrying capacity of Foundations resting on RE soil bed.
5. asses the use of Geo-synthetics in drainage requirements and landfill designs

Modules	Teaching Hours
Module I **Basics of Reinforced Earth Construction**: Definition, Historical Background, Components, Mechanism and Concept, Advantages and Disadvantage of reinforced earth Construction, Sandwich technique for clayey soil. Study of Codal provisions **Geo-synthetics and their Functions**: Historical developments, Recent developments, manufacturing process, Raw materials – Classification based on materials type – Metallic and Non-metallic, Natural and Man-made, Geo-synthetics Properties and Tests on Materials Properties –Physical, Chemical, Mechanical, Hydraulic, Endurance and Degradation requirements, Testing & Evaluation of properties	**9 Hours**
Module-II **Design of Reinforced Earth Retaining Walls**: Concept of Reinforced earth retaining wall, Internal and external stability, Selection of materials, Typical design problems **Soil Nailing Techniques**: Concept, Advantages & limitations of soil nailing techniques, comparison of soil nailing with reinforced soil, methods of soil nailing, Construction sequence, Components of system, Design aspects and precautions to be taken	**8 Hours**
Module-III **Design of Reinforced Earth Foundations**: Modes of failure of foundation, Determination of force induced in reinforcement ties – Location of failure surface, tension failure and pull-out resistance, length of tie and its curtailment, Bearing capacity improvement in soft soils, General guidelines as per IS Codes	**9 Hours**

Module –IV **Geosynthetics for Roads and Slopes**: Roads – Applications to Temporary and Permanent roads, Role of Geosynthetic in enhancing properties of road, control of mud pumping, enhancing properties of subgrade, Design requirements Slopes – Causes for slope failure, Improvement of slope stability with Geosynthetic, Drainage requirements, Construction technique. Simple Numerical Stability Checking Problems on Reinforced Slopes	**8 Hours**
Module-V **Geosynthetics - filter, drain and landfills**: Filter & Drain – Conventional granular filter design criteria, Geosynthetic filter design requirements, Drain and filter properties, Design criteria – soil retention, Geosynthetic permeability, anticlogging, survivability and durability (No Numerical Problems) Landfills – Typical design of Landfills – Landfill liner & cover, EPA Guidelines, Barrier walls for existing landfills and abandoned dumps (No Numerical Problems**)**	**8 Hours**

Course Outcomes: On completion of this course, students are able to:

CO		**Blooms Level**
CO1:	Identify, formulate reinforced earth techniques that are suitable for different soils and in different structures**;**	C1
CO2:	Understand the laboratory testing concepts of Geosynthetics	C2
CO3:	Design RE retaining structures and Soil Nailing concepts	C3
CO4	Determine the load carrying capacity of Foundations resting on RE soil bed.	C3
CO5	Asses the use of Geosynthetics in drainage requirements and landfill designs	C3

Textbook:

1. Koerner. R.M, “Design with Geosynthetics”, Prince Hall Publications
2. Koerner. R.M. &Wesh J.P, “Construction and Geotechnical Engineering using synthetic fabrics”, Wiley Inter Science, New York
3. SivakumarBabu G. L., “An introduction to Soil Reinforcement and Geosynthetics”, Universities Press, Hyderabad
4. Swami Saran, “Reinforced Soil and its Engineering Applications”, I. K. International Pvt. Ltd, New Delhi
5. Venkattappa Rao, G., & Suryanarayana Raju., G. V.S, “Engineering with Geosynthetics”, Tata McGraw Hill publishing Company Limited., New Delhi.

Reference books:

1. Jones, “Earth reinforcement and Soil structure”, CJEP Butterworths, London
2. Ingold, T.S. & Millar, K.S, “Geotextile Hand Book”, Thomas, Telford, London.
3. Hidetoshi Octial, Shigenori Hayshi& Jen Otani, “Earth Reinforcement Practices”Vol. I, A.A. Balkema, Rotterdam
4. Bell F.G, “Ground Engineer’s reference Book”, Butterworths, London
5. Ingold, T.S, “Reinforced Earth”, Thomas, Telford, London.
6. Sarsby R W- Editor, “Geosynthetics in Civil Engineering”, Woodhead Publishing Ltd & CRC Press, 2007

Nptel Link: https://youtu.be/10TwMa2JiXY

E-Books: www.civilenggebooks.com

RAILWAY, AIRPORT & HARBOUR ENGG

Subject code	21CV715	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Transportation Engineering

Course objectives:

To enable the students to acquire the knowledge in the following topics.

1. Understand role of railway and different route selection for the construction railway track
2. Learn different types of structural components, Engineering properties of material to construct the material to calculate the material quantities required for construction.
3. Understand the various aspects of geometric element, points and crossings, significance of maintenance of track.
4. Study of Airport layout, design facilities required for runway, taxiway and impart knowledge about visual aids.
5. Understand different types of harbour structure, dock and necessary navigational aids: also expose them to various methods of tunneling and tunnel necessaries.

Modules	Teaching Hours
Module I **Railways**: Role of railways in transportation- selection of routes. **Permanent way** – Gauges in railways – railway track, cross-sections, coning of wheels,rails, rail sections, Ballast and sleepers. Rail fixtures, calculation of quantity of materials needed for laying of tracks. Wear on rails, rail joints, welding of rails, creep of rails, traction and tractive resistances, tractive power, Hauling capacity. Problems on above	8 Hours
Module-II **Geometric design of track –** Necessity, grade, ruling gradient, pusher grade, minimum Gradient, grade compensation on curves. Speed of train, super elevation, cant- deficiency, negative cant- speed calculation based on IR Formulae for High speed tracks only-problems on above. **Points and crossing:** Necessity, components, turnout, design of turnout (no derivations, only relevant problems).	9 Hours
Module-III **Points and crossing Continued:** stations and yards, Signaling and interlocking, track defects, track maintenance, level crossing, Indian Railway standards. **Airport Planning:** Layout of an airport with component parts and functions of each, Aircraft Characteristics – Airport Classifications, - Site selection- regional Planning.	8 Hours
Module -IV **Runway Design-** Analysis of Wind data-determination of the best orientation of the runway configurations by using two types of wind rose diagrams- basic length of the runway –corrections to runway length by International Civil Aviation Organization (ICAO) and Federal aviation Administration FAA specification- runway	9 Hours

Cross Sections- problems on above. **Taxiway Design:** Factors affecting the layout of the taxiway-geometrics of taxiway-design of exit taxiways, - ICAO Specifications. Problems on above. **Visual Aids:** Airport marking – lightings- ILS.	
Module-V **Harbors:** Types, components, typical layout, objects and functions of docks. different harbour structures.	8 Hours

Course Outcomes: On completion of this course, students are able to:

CO		**BL**
CO1:	Identify various components of permanent way and determine hauling capacity of railway	C3
CO2:	Determine the permanent parameters required for geometric design of track.	C4
CO3:	Explain the components of points, crossings, signaling and interlocking systems and design the turnouts.	C2
CO4	Explain the component parts and functions of an airport and design the runway length and exit taxiway.	C2
CO5	Explain different dock and harbour structures.	C2

Textbook:

1. Saxena Subhash C and Satyapal Arora, "A Course in Railway Engineering", Dhanpat Rai and Sons, Delhi.
2. Satish Chandra and Agarwal M. M, "Railway Engineering", 2nd Edition, Oxford University Press, New Delhi.
3. Khanna S K, Arora M G and Jain S S, "Airport Planning and Design", Nemch and and Brothers, Roorkee.
4. C Venkatramaiah, "Transportation Engineering", Volume II: Railways, Airports, Docks and Harbours, Bridges and Tunnels, Universities Press.
5. Bindra S P, "A Course in Docks and Harbour Engineering", Dhanpat Rai and Sons, New Delhi.

Reference books:

1. Oza.H.P. and Oza. G.H.,"Acoursein Docks & Harbour Engineering".Charotar Publishing Co.,
2. Mundrey J. S. "A course in Railway Track Engineering". Tata Mc Graw Hill.
3. Srinivasan R. Harbour," Dock and TunnelEngineering",26thEdition2013.

Nptel Link: https://youtu.be/37WMS483T7Y

E-Books: www.civilenggebooks.com

DESIGN OF PRESTRESSED CONCRETE STRUCTURES		
Subject code	21CV716	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 Hours

Prerequisite: Design of RCC Structures

Course objectives:

1. Explain the fundamental concepts of stress analysis.
2. Apply systems of prestressing for various sections of structural elements.
3. Evaluate and analyse the stresses under various conditions.
4. Design and detail the prestressed concrete members for various loading conditions.

Modules	Hours
Module I Introduction to Prestressed concrete and codal provisions: Introduction: Historic development- general principles of Prestressing, Types of prestressing, pre-tensioning and post tensioning, advantages, and limitation of prestressed concrete, Materials for prestressed concrete- high strength steel and concrete, properties, Stress-strain characteristics of high strength steel and concrete. Codal Provisions: Basic principles of prestressing, fundamentals of prestressing, load balancing concept, Stress concept, center of thrust, Pre-Tensioning and post tensioning methods-Analysis of pre and post tensioning, Systems of prestressing, End anchorages	9 Hours
Module-II Analysis of sections for Flexure: Elastic analysis of prestressed concrete beams with straight, parabolic, triangular, trapezoidal cable profiles, Eccentric and concentric pre-stressing, Numerical problems	8 Hours

Module-III Losses of Prestress: Loss of prestress in pre tensioned and post tensioned members due to elastic shortening of concrete, shrinkage of concrete, creep of concrete, relaxation of steel, slip in anchorage and frictional losses, Numerical problems	8 Hours
Module -IV Deflection of pre-stressed concrete beams: short term and long-term deflections, Elastic deflections under transferred loads and due to different cable profiles, Deflection limits as per IS 1343, Effect of creep on deflection, Load versus deflection curve, methods of reducing deflection, Numerical problems. Limit state of Collapse: Flexure- IS code recommendations, Ultimate flexural strength of sections, IS code recommendations on shear strength, Shear resistance of sections, shear reinforcement, Limit state of serviceability- Control of deflection.and cracking, Numerical Problems	9 Hours
Module-V **Design of Beams**: Design of pre-stressing force and eccentricity for post tensioned prismatic beams, permissible stresses, Limiting zone and cable profile	8 Hours

Course Outcomes: On completion of this course, students are able to:		BL
CO1:	Understand the fundamental concepts of stress analysis	C2
CO2:	Apply systems of pre-stressing for various sections of structural elements	C2
CO3:	Analyse and evaluate the stresses under various conditions	C3
CO4	Design the prestressed concrete members for various loading conditions	C4
CO5	Design of Prestressed Beams	C4

Textbook:

Krishna Raju, N. “Pre-stressed Concrete”, Tata McGraw Hill Publishing Company, New Delhi2006

2. Krishna Raju. N., “Pre-stressed Concrete - Problems and Solutions”, CBS Publishers andDistributors, Pvt. Ltd., New Delhi.

3. Rajagopalan N, “Pre - stressed Concrete”, Narosa Publishing House, New Delhi

Reference books:

1.Prestressed concrete, N Krishna Raju, Tata McGraw Hill Publishers, 2009,

2 Prestressed Concrete, P Dayarathnam, Oxford and IBH Publishing Co., 2000,

3. Design of pre stressed concrete structures, T Y Lin and Ned H Burns, John Wiley & Sons,New York, 2008

4. Fundamental of pre stressed concrete, N C Sinha and S K Roy, 3rd Edition, S Chand andCompany Ltd , 2011

5. Code Books: IS 1343:2012; Pre stressed Concrete: Code of practice

Nptel Link: https://youtu.be/4KYPltsNAWs

E-Books: www.civilenggebooks.com

ADVANCED FOUNDATION DESIGN		
Subject code	21CV721	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Geotechnical Engineering-

Course objectives:

To enable the students to acquire the knowledge in the following topics:

1. Types of shallow foundations, Bearing capacity according to BIS.
2. Classification of pile foundation, Group efficiency of piles.
3. Construction of different types of drilled piers and caissons.
4. Components of well foundation and forces acting on it.
5. Classification of expansive soils, Design of foundations in swelling soils, Drilled piers, Under reamed piles.

Modules	Teaching
Module I **Shallow foundations:** Presumptive Bearing Capacity according to BIS, Factors affecting bearing capacity and settlement. Factors influencing selection of depth of foundation, type of shallow foundations – isolated footing. Combined footing, strap footing, Strip footing and Raft (Proportioning only)	9 hours
Module-II Pile foundations: Necessity, Classification, Load bearing capacity by static formula, Dynamic formula, pile load test and Penetration tests, pipe groups, group capacity of piles in sand and clay, group efficiency of piles, settlement of piles, negative skin friction, under reamed piles.	8 hours
Module III Drilled piers and casissons: Introduction, construction, advantages and disadvantages of drilled piers. Design of open, pneumatic and floating caissons. Advantages and disadvantages of floating caissons.	8 hours
Module -IV Well foundation: Different shapes and characteristics of wells. Components of well foundation. Terzaghi's Analysis, IRC method, Forces acting on well foundation. Sinking of wells.	7 hours

<table>
<tr><td colspan="2"></td><td>Hours</td></tr>
<tr><td colspan="2">Module-V

Foundation in expansive soils: Expansive soils, Parameters of Expansive soils, Classification of Expansive soils, Causes of moisture changes in soils, Effects of swelling on buildings, Preventive measures for expansive soils, Modification of expansive soils, Design of foundations in swelling soils, Drilled piers, Belled drilled pier, Under-reamed piles, construction of Under-reamed piles, Identification of collapsible soils, Design of foundation on collapsible soils not subjected to wetting, design of foundations subjected to wetting, Illustrative examples, problems.</td><td>10 hours</td></tr>
<tr><td colspan="3">Course Outcomes: On completion of this course, students are able to:</td></tr>
<tr><td>CO</td><td></td><td>BL</td></tr>
<tr><td>CO1:</td><td>Apply principles design of shallow foundations.</td><td>C3</td></tr>
<tr><td>CO2:</td><td>Design pile and pile groups with reference to dimensions.</td><td>C5</td></tr>
<tr><td>CO3:</td><td>Explain the construction of drilled piers and principles of design for open, pneumatic and floating caissons.</td><td>C2</td></tr>
<tr><td>CO4</td><td>Explain the construction of drilled piers and principles of design for open, pneumatic and floating caissons.</td><td>C2</td></tr>
<tr><td>CO5</td><td>Determine the effects of expansive soil on foundations and apply soil design principle for foundation in swelling soil.</td><td>C4</td></tr>
<tr><td colspan="3">Textbook:
1. Punmia B.C., “Soil Mechanics and Foundation Engineering,Laxmi Publications Co., India.
2. Donald P. Coduto, “Geotechnical Engineering Principles & Practices”, Prentice-hall of India Ltd, India.
3. Murthy V.N.S., “Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering”, CRC Press, New York.</td></tr>
</table>

Reference books:

1. Bowles J.E., “Foundation Analysis and Design”, McGraw Hill Pub. Co. New York.
2. Swami Saran, “Analysis and Design of Substructures”, Oxford & IBH Pub. Co. Pvt. Ltd., India.
3. R.B. Peck, W.E. Hanson & T.H. Thornburn, “Foundation Engineering”, Wiley Eastern Ltd., India.
4. Braja, M. Das, “Principles of Geotechnical Engineering”, Cengage Learning, India.
5. Bureau of Indian Standards: IS-1904, IS-6403, IS-8009, IS-2950, IS-2911 and all other relevant codes.

Nptel Link:https://youtu.be/lsYFtwwlHIw

E-Books: www.civilenggebooks.com

INDUSTRIAL WASTE WATER TREATMENT		
Subject code	21CV722	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Engineering Chemistry, Environmental Engineering

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. To enable the students to understand fundamentals of industrial wastewater treatment.
2. To make students to understand treatment of industrial wastewater in order to reduce the cost of treatment.
3. To make students to understand minimize the cost of treatment by joint treatment with municipal wastewater.
4. To enable students to understand the characterization, suitable treatment and disposal of industrial wastewater.

To enable students to understand reuse and recovery of by products from industrial wastewater.

Modules	Teaching Hours
Module I	
Introduction: Industrial wastewater, difference between Industrial and domestic wastewater, effects of industrial wastewater on municipal sewage treatment systems and on receiving streams.	4 hours
Dissolved oxygen sag curve in streams Streeter-Phelps formulation, stream sampling, effluent and stream standards.	4 hours
Module-II	
Treatment methods: Volume reduction, strength reduction, neutralization, equalization, proportioning.	4 hours
Removal of suspended and dissolved solids. Treatment and disposal of sludgesolids.	3 hours
Module-III	
Combined treatment: Feasibility of combined treatment of industrial raw wastewater with domestic wastewater. Discharge of raw, partially treated andcompletely treated industrial wastes to streams.	6 hours

Module -IV **Treatment of industrial wastes:** Processes involved, flow chart showing origin of wastes, their characteristics, treatment methods, disposal, reuse, and recovery of by- products. Integrated cotton textile, sugar, dairy, canning, brewery, distillery, and tanning industry.		11 hours
Module-V **Treatment of industrial wastes:** Flow chart of process involved, origin of wastes, characteristics, treatment, disposal, reuse and recovery of by-products of canning, paper and pulp, pharmaceutical industries, metal plating and radio-active wastes.		10 hours
Course Outcomes: On completion of this course, students are able to:		
CO		**BL**
CO1:	Differentiate between domestic wastewater and industrial wastewater.	C1
CO2:	Understand the effects of industrial wastewater on domestic treatment plants and on streams.	C2
CO3:	Understand the different methods of treatment of industrial wastes.	C2
CO4	The feasibility of combined treatment of industrial wastewater with domestic wastewater.	C3
CO5	Understand the origin of wastes in different industries, their characteristics and treatment.	C2 C3
Textbook: 1. Howard S. Peavy, Donald R. Rowe, George T, Environmental Engineering - McGraw Hill International Edition. New York,2000 2. S. K. Garg, Environmental Engineering vol-I, Water supply Engineering – M/s Khanna Publishers, New Delhi2010 3. B.C. Punmia and Ashok Jain, Environmental Engineering I-Water Supply Engineering, Laxmi Publications (P)Ltd., New Delhi2010.		
Reference books: 1. CPHEEO Manual on water supply and treatment engineering, Ministry of Urban Development, Government of India, New Delhi. 2. Mark. J Hammer, Water & Waste Water Technology, John Wiley & Sons Inc., New York,2008. 3. Industrial wastewater treatment – Nelson Nemerow 4. Industrial waste treatment – M N Rao and A K Dutta 5. Industrial waste disposal – Ross R D 6. Pollution control in process industries – Mahajan.		
Nptel Link: https://youtu.be/in3GSRuooRs		
E-Books: www.civilenggebooks.com		

ADVANCED DESGIN OF STEEL STRUCTURES		
Course Code	21CV723	Credit:03
Number Of Lecture Hours/Week	3 Hours/Week	S E E : 5 0
Total Hours	42 hours	SEE:03HR
Prerequisite: Civil Engineering Materials, Strength of Materials, Structural Analysis, Design of steel structures		
Course objectives: To enable the students to obtain the basic knowledge about in the following topics. **1.** Design of welded plate girder as per IS codes **2.** Design of Gantry Girder **3.** Concepts and design of roof truss **4.** Design of rigid and semirigid connections as per the IS provisions **5.** Design of tubular columns and beams		
MODULES		**Teaching Hours**
MODULE-I **Design of Welded Plate Girder**: Design of welded plate girder along with stiffeners, connection design, curtailment of flange		8 hrs.
MODULE- II **Design of Gantry Girder**: Design of Gantry girder for electrically and manually operated travelling crane in single bay.		8 hrs.
MODULE--III **Design of roof trusses**: Types of roof trusses, Design of a typical roof truss (forces in the members to be given), Design of joints and end bearing, design of purlins		10 hrs.
MODULE-IV **Design of rigid and semi rigid connections:** Design of Small moment resistant connections, large moment resistant connections, behavior of semi-rigid connections.		8 hrs.
MODULE-V **Design of Tubular structures** Introduction, permissible stresses, tubular columns, tube tension members. Design of members of tubular roof truss for given member forces and the joints in tubular trusses, design of tubular beams and Purlins		8 hrs.
Question paper Pattern. Two questions are to be set from each module by intermixing contents in the same module. Total five question are to be answered selecting atleast one question from each module		

Reference Books:

Design of Steel structures, T.Y.LIN
Comprehensive Design of Steel Structures, Dr.B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Lakshmi Publications
Design of Steel structures, STEEVE INGLEKIRK
Bureau of Indian Standards, IS800-2007, IS875-1987
Sp 6(1) or Steel Table

E books and online course materials:

www.civilenggebooks.com

Course outcomes:

On completion of the course, the student will have the ability to:

CO#	
CO1	Design the welded plate girder as per IS code
CO2	Design the gantry girder as per IS code
CO3	Design the roof trusses and prepare detailing
CO4	Design rigid beam- column connections and explain the behavior of semi rigid connections.
CO5	Design the axially loaded tabular column design of tubular bream & purlins, Design of tubular tension members

PAVEMENT DESIGN		
Subject code	21CV724	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours
Prerequisite: Transportation Engg		

Course objectives:

To enable students to acquire the knowledge in the fallowing topics:

1. Gain knowledge about the types of pavements, factors affecting pavement design and Excel in the path of analysis of stress, strain and deflection in pavement.
2. Design Pavement using Burmeister Theory
3. Understand design concepts of flexible pavement by various methods.
4. Determine the stresses in Rigid pavements.
5. Design the Rigid Pavement using IRC:58

Modules	Teaching Hours
Module I	
Introduction: Types and component parts of pavements, functions of various components of flexible and rigid pavements, factors affecting design and performance of pavements. Comparison of highway and airport pavements. Advantages and disadvantages of rigid or CC pavement	4 hours
Stresses and Deflections in Flexible Pavements: Stresses and deflections in homogenous masses using Bossiness's theory, Principle, assumptions and limitations. Design of flexible pavement using single layer elastic theory. numerical problems	4 hours
Module II	
Wheel load stresses various factors in traffic wheel loads, ESWL of dual and multiple wheel loads using equal stress and equal deflection criteria. Repeated loads and EWL factors using Macleod and IRC methods, numerical problems on above.	4 hours
Burmeister two-layer theories Principle, assumptions and limitations. Vertical stress distribution in two-layer system. Design of pavement using vertical surface deflections, numerical problems on Above.	4 hours
Module-III	
Burmeister three-layer theories, Principle, assumptions and limitations. stresses and strain using Peattie's charts and forces tables. Numerical problems on above.	4 hours
Flexible Pavement Design Methods for Highways and Airports: Empirical, semi empirical and theoretical approaches. Perpetual pavement. IRC: 37-2012 method of pavement design. Principles of pavement design. Design of flexible pavement with following two pavement compositions. i] granular base and granular subbase. ii] cementitious base and granular sub base with rack relief layer of aggregate above cementitious base.	5 hours

Module -IV **Stresses in Rigid Pavements:** Types of stresses and causes, factors influencing stresses, general considerations in rigid pavement analysis, wheel load stresses, warping stresses, frictional stresses, combined stresses. Numerical problems on above. Types of joints in cement concrete pavements and their functions, contraction, warping ad construction joints**.** Joint spacings and layout. numerical problems	5 hours 3 hours
Module-V **Rigid Pavement Design:** Design of plain jointed rigid pavements for highways using IRC-58:2015. Procedure for slab design. Design of, dowel bars and tie bars by IRC-58:2015. Numerical problems on above.	9 hours

Course Outcomes: On completion of this course, students are able to:

CO		**BL**
CO1:	Explain types of pavements, factors effecting design of pavement and determine stresses and deflection in flexible pavement	**C4**
CO2:	Design Pavement using Burmeister Theory	**C4**
CO3:	Design flexible pavement using empirical, semi-empirical, theoretical and IRC:37 approach	**C4**
CO4	Explain different types of joints in concrete pavement and determine stresses in rigid pavement	**C4**
CO5	Design a Rigid Pavement using IRC:58 method	**C4**

Textbook:

1. Highway Engineering- Khanna, S.K., and Justo, C.E.G.: Nem Chand and Bros. Roorkee.
2. Construction Equipment and its Management- Sharma, S.C. Khanna Publishers.
3. Hot Mix Asphalt Materials, Mixture Design and Construction- Freddy L. Roberts, Kandhal, P.S: University of Texas Austin, Texas. NAPA Education Foundation Lanham, Maryland.

Reference books:.

Reference Books

1. RRL, DSIR, 'Bituminous Materials in Road Construction', HMSO Publication.
2. RRL, DSIR, 'Soil Mechanics for Road Engineers', HMSO Publication.
3. Relevant IRC codes and MoRT& H specifications
4. Yoder E.J and Witczak Principles of pavement design. Edition John Wiley & sons

Nptel Link: https://youtu.be/uJntLOgEHD4

Web links and Video Lectures:

1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org/
4. VTU EDUSAT PROGRAMME - 20

E-Books: www.civilenggebooks.com

DESIGN OF HYDRAULIC STRUCTURES		
Subject code	21CV725	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 Hours

Prerequisite: Fluid Mechanics, Hydrology & water resources engineering

Course objectives:

The students will be able to acquire knowledge in the following topics

The students will be able to acquire knowledge in the following topics.

1. Design of canals and silt theories
2. Design of cross drainage works.
3. Canal regulators
4. Design of weirs and barrages
5. Design of spillways and outlets

Modules	Teaching Hours
Module I **Design of canals and silt theories:** Types of silt, Kennedy's theory and design of lined & Unlined canals by Kennedy's theory, Defects of Kennedys theory, Silt supporting capacity, lacey's regime theory, lacey's equation for velocity, discharge and silt factor, Design of canals by Lacey's theory. Transportation of sediments, Drawbacks of Lacey's theory, comparison between kennedy's and lacey's theory.	8 Hours
Module-II **Design of Cross Drainage work:** Introduction, classification, various types of aqueducts and siphon aqueducts, design consideration for cross drainage works, fluming of canal, Mitra's hyperbolic transition formula, Design of back connection canals, canal wings, and drainage wings (Hydraulic design only). Design of aqueduct and siphon aqueduct.	9 Hours
Module-III **Canal regulation works:** Purpose, canal falls, location, types of Regulators, ogee falls, rapid falls, stepped falls, vertical drop fall, Montague type fall, Inglis type fall, methods of energy dissipation, head regulators, cross regulators, pipe outlet, design of cistern, design of sarda type fall.	8 Hours
Module -IV **Design of weirs and theory of seepage:** Bligh's creep theory, safety against piping and uplift, Khosla's theory, flow nets, exit and critical gradient, Khosla's	8 Hours

method, design of vertical drop weir, Body wall, crest wall of a weir, design of impervious floor and Impervious aprons	
Module-V **Spillways and outlets:** Types, location of spillway, design consideration for spillway, ogee spillway, free overfall and siphon spill way, energy dissipation, scour protection, Design of spillway crest gates, outlet works, design of outlets and sluices of different type.	9 Hours

Course Outcomes: On completion of this course, students are able to:

CO		**BL**
CO1:	Design canals	C3,
CO2:	Understand necessity & Design of CD works	C4
CO3:	Design Regulators	C4
CO4	Design weirs and analyze for controllingSeepage	C4
CO5	Design spillways & Outlets	C4

Textbook:

1. Dr. PN Modi & Seth, Hydrology & Water Resources Engg. Standard Publishers, New Delhi
2. R.K. Sharma and Sharma – Hydrology and Water Resource Engineering
3. Linsley, Kohler and Paulhus: Applied Hydrology, McGraw Hill, New Delhi
4. Garg. S.K: Hydrology and Water resources engineering, Khanna Publications

Reference books:

1. Linsley & Frazini, Water Resources Engineering, McGraw-Hill international Edition
2. Birdie G S & Das, Hydrology & Water Resources Engineering, Dhan path rai Publishers New Delhi
3. B.L. Gupta& Amit Gupta, Water resources systems and management, Standard Publishers distributersNew Delhi

Nptel Link: https://youtu.be/FYYJgSMjYB4

E-Books: www.civilenggebooks.com

RURAL DEVELOPMENT TECHNOLOGY		
Subject code	21CV73OE1	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours
Prerequisite:		

Course objectives:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry-oriented COs associated with the above-mentioned competency:

1.Undertake surveys to decide the status of socio-economic significance.
2.Identify the need of watershed management in rural areas.
3.Suggest relevant government schemes for construction of roads, housing and energy conservation. .
4.Suggest the relevant cottage and agro based industries for the rural areas.
5.Identify water borne diseases, effects of fluoride and methods of fluoride removal in rural water supply.

Modules	Teaching Hours
Module I **Rural Development**: Need, definition, objectives, Rural development as a phenomenon, Rural development as a strategy Significance Of Rural Development Social significance – Rural problems, social change, resource utilization, infrastructure etc. Economic significance – National income, employment, food and fodder, industrial development, internal trade and transport, capital formation, etc. political significance- Political stability, Rural Development Environment, Panchayat raj institution, CAP ART (Council for advancement of people's action and rural technology)-Organizational set up, purposes, objectives, activities. Socio-Economic survey Role of Engineer in Rural Development.	8 Hours
Module-II Indira Awas Yojana – Salient features, beneficiary people, Conversion of Unserviceable blouses into Pucca/Semi-Pucca houses. Credit-cum- Subsidy scheme of rural housing- Salient features, share of Central and state Government, Rural Building Centres-Purpose, technology transfer, skill development, training, eco-friendly materials Pradhan Mantri Gram Sadak Yojna (PMGSY)- Key elements, concept of rural road connectivity.	8 Hours
Module-III Low-Cost Housing- Principles, purposes, use of Local Material for construction Rural Roads- Type, Specifications, Construction Techniques and Road Drainage Biomass – Types of fuel such as Firewood, agricultural residues, dung cakes Renewable energy and Integrated Rural Energy Programme -Objectives, key elements, implementation, financial provisions, sources of renewable energy	8 Hours

Working of Gobar gas and Biogas plant, National project on biogas development-technology, performance and implementation, financial assistance, involvement of Panchayat and local bodies	
Module -IV Cottage Industry- Brick Manufacturing, Concrete hollow Block, Artificial Sandstone crushing plant. Agro based Industry- Dairy, Animal Husbandry, Horticulture, Sericulture, and Fishery sources of funds for rural development Domestic (institutional and non - institutional) foreign institutional and non -institutional)	8 Hours
Module-V Water treatment flow diagram, water borne diseases causes, sources for water borne diseases, its effects., Role of NGO in rural Development Fluoride in water sources, causes effects of fluoride. methods of removal fluoride. Systems of water supply: continuous flow type and intermittent flow type	10 Hours

Course Outcomes: On completion of this course, students are able to:

CO1:	Justify the necessity of planning for the development of the given rural area.
CO2:	Execute the relevant plan at the specified level of the given rural area.
CO3:	Describe the functions of planning at micro and macro levels for the given rural area.
CO4	Describe the process of micro level planning with respect to agriculture.
CO5	Know the water borne diseases, effects of fluoride and types of systems of water supply.

Text book:

1. S.K.garg Environmental engineering (volume I and II), khan publications.
2. Rural development: principle, polices and management Hand cover.
3. Rangwala Engineering Materials.
4. Khan and Justo Khan Publications.

Reference books:

1. S.K.garg Environmental engineering (volume I and II), khan publications.
2. Rural development. Principle polices and management Hand cover.
3. Rangwala Engineering Materials.
4. Khan and Justo Khan Publications.

Nptel Link: https://youtu.be/pv0PhvQ3G4k

E-Books: www.civilenggebooks.com

FINITE ELEMENT METHOD		
Subject code	21CV73OE3	Credit:03
Hours/Week	3Hours theory	SEE: 50 Marks
Total hours:	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Mathematics, Mechanics of Structures

Course objectives:

To enable the students to acquire the knowledge in the following topics:

1.To provide the fundamental concepts of the theory of the finite element method

2.To develop the ability to generate the governing finite element equations for systems governed by partial differential equations

3. To learn basic principles of finite element analysis procedure for structural applications using truss, beams, frame, and plane elements.

4. To learn and apply finite element solutions to linear and non-linear Structural analysis problem and to develop the knowledge and skills needed to effectively evaluate finite element analyses performed by others

. 5. Learn to model complex geometry problems and solution techniques.

Modules	Teaching Hours
Module I Introduction: Basic concepts of elasticity – Kinematics and Static variables for various types of structural problems – approximate method of structural analysis – Rayleigh – Ritz method Finite difference method – Finite element method. Principles of finite element method – advantages & disadvantages – Finite element procedure. Basic principle of variational mechanics.	8 hours
Module II Basic principle of variational mechanics. Discretization of Structures: Finite elements used for one-, two- & three-dimensional problems – Element aspect ratio – mesh refinement vs. higher order elements – minimization of band width.	8 hours
Module-III Displacement Model and Element stiffness formulation: Nodal displacement parameters – Convergence criterion – Compatibility requirements – Geometric invariance – Shape function – Polynomial form of displacement function – Generalized and Natural coordinates – Lagrangian interpolation function – shape functions for one-, two- & three-dimensional elements.	9 hours
Module-IV Hermitian polynomials, Internal nodes, Condensation of internal nodes and higher order elements – Serendipity elements, Development of strain – displacement matrix and stiffness matrix, direct method, and variational approach of formulation of element stiffness, Consistent load vector, Isoparametric Elements, Concept of Isoparametric Elements, sub parametric and super parametric elements –Jacobian transformation Matrix –numerical	9 hours

integration.	
Module - V Application of Finite Element Method for the analysis of one- & two-dimensional problems: Analysis of simple beams and plane trusses – Application to plane stress / strain / axisymmetric problems using CST & Quadrilateral Elements	8 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Understand the concepts behind variational methods and weighted residual methods in FEM	C3
CO2:	Identify the application and characteristics of FEA elements such as bars, Truss, beams, plane and isoperimetric elements, and 3-D element.	C4
CO3:	Develop element characteristic equation procedure and generation of global stiffness equation will be applied	C4
CO4	Able to apply Suitable boundary conditions to a global structural equation, and reduce it to a solvable form.	C4
CO5	Able to identify how the finite element method expands beyond the structural domain, for problems involving dynamics, Continuous beams, Trusses, portal frames, slabs, with different boundary conditions.	C4

Question paper pattern:

Two questions are to be set from each module.
Total five questions are to be answered by selecting minimum one question from each module

Textbook:

Finite Element Analysis" by S.S. Bhavikatti
Finite Element Method: Volume 1 - Basic Concepts and Applications" by G.R. Liu and S.S. Quek
Finite Element Method: Volume 2 - Solid Mechanics" by G.R. Liu and S.S. Quek
Introduction to Finite Element Analysis and Design" by Nam-Ho Kim and Bhavani V. Sankar
Finite Element Method" by A. Chakrabarti

Reference books:

Krishnamoorthy C S, “Finite Element Analysis”- Tata McGraw Hill

1. Bathe K J, “Finite Element Procedures in Engineering Analysis”- Prentice Hall
2. Rajasekaran. S, “Finite Element Analysis in Engineering Design”-Wheeler Publishing

4. Cook R D, Malkan D S & Plesta M.E, “Concepts and Application of Finite Element Analysis” - 3rd Edition, John Wiley and Sons Inc., 1989

3. Shames I H and Dym C J, “Energy and Finite Element Methods in Structural Mechanics”-McGraw Hill, New York, 1985
4. Desai C and Abel J F, “Introduction to the Finite Element Method” – East West Press

Pvt. Ltd, 1972 7. Nilson, N.J., “Principals of Artificial Intelligence”- Narosa, New Delhi.
Adeli, H., “Expert Systems in Constructions and Structural Engg”- Chapman & Hall, New York.
Elaine Rick and Keuin Knight, “Artificial intelligence”- Tata McGraw Hill Edition.
H.Adeli, “Expert system in structural design and construction”- Chapman and Hall, 1988.
. Kostem, “Expert systems in Civil Engineering”- ASCE, 1987.
. C.S.Krishnamoorthy and S Rajeev “Computer Aided Design”

GLOBAL ENVIRONMENTAL ISSUES		
Subject code	21CV73OE4	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours
Prerequisite: **Environmental studies and Environmental Engg.**		

Course objectives: To enable students to acquire the knowledge in the fallowing topics

1. Understand Goals, history global environmental problems
2. Acquire knowledge about Infectious Disease and Pandemic
3. Understand Effects of pollution on humans and ecosystems
4. Understand Effects of Global warming and climate change
5. Understand Effects of Ozone layer depletion, environmental policy & agreements

Modules	Teaching Hours
MODULE-I Introduction: Goals, history global environmental problems, pathologies framework Population Growth, Fisheries Depletion, Eutrophication, Ocean Acidification, Biodiversity Loss, Causes for Tsunami	08 Hours.
MODULE-II Effects: Effects on organisms including humans, effects on ecosystems and productivity, species distribution ranges, spread of diseases, extinction risk for temperature-sensitive species and UV effects, Infectious Disease and Pandemic	09 Hours.
MODULE-III Food Security Deforestation, Nuclear effects, Solid waste management Control measures of urban and industrial waste, special reference e-waste, Biomedical waste e Pollution Tragedies Love canal, Bhopal Gas Endosulfan, Minamata and Flint water	08 Hours.
MODULE-IV Global warming and climate change: Evolution and development of Earth's atmosphere, atmospheric structure and composition, significance of atmosphere in making the Earth, the only biosphere; Milankovitch cycles, atmospheric wind rose, Trends of global warming and climate change, drivers of global warming and Global Warming Potential (GWP) climate change, impact of climate change on atmosphere, weather patterns, sea level rise, agricultural productivity and biological responses-range shift of species, CO2 fertilization and agriculture; impact on economy and spread of human diseases, Energy Audit and Carbon Credits	09 Hours.
MODULE-V **Ozone layer depletion, environmental policy & agreements**: Ozone layer or ozone shield; importance of ozone layer, ozone layer depletion and causes; Chapman cycle, process of spring time ozone depletion over Antarctica, ozone depleting substances (ODS), effects of ozone depletion, mitigation measures and international protocols Environmental policy debate, International agreements, Montreal protocol 1987, Kyoto protocol 1997, Convention on Climate Change, carbon credit and carbon trading: clean development mechanism	08 Hours.

Course outcomes:
On completion of the course, the student will have the ability to:

CO #	Course Outcome (CO)	Blooms Level
CO1	Understand the Environmental Issues and problems	C2
CO2	Understand Bio medical waste E Pollution Tragedies	C3
CO3	Information about spread of diseases, extinction risk for temperature sensitive species and UV effects	C3
CO4	Analyse the impact of climate change on atmosphere, weather patterns, sea level rise, agricultural productivity and biological responses-range shift of species, CO2 fertilization and agriculture; impact on economy and spread of human diseases	C4
CO5	Understand about Environmental and Global Acts	C3

Question paper pattern:

i) Two questions are to be set from each module.

Total five questions are to be answered by selecting minimum one question from each module

Text Book

1. Hardy, JT 2003 Climate Change Causes, Effects and Solutions. John Wiley & Sons Harvey, D. 2000. Climate and Global Climate Change Prentice Hall

Reference books

1. Barry, R. G. 2003. Atmosphere, Weather and Climate. Routledge Press, UK asu, M.and Xavier, S., Fundamentals of Environmental Studies, Cambridge University Press, 2016

2. Mitra, A. K and Chakraborty, R., Introduction to Environmental Studies, Book Syndicate, 2016

Nptel Link: https://youtu.be/ID_gk0aSo0Y

E-Books: www.civilenggebooks.com

MECHANISATION IN CONSTRUCTION		
Subject code	21CV74OE1	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 03 hours
Prerequisite: None		

Course objectives:

This course enables students to understand.

1. Various type of equipment's used in constructions advantage & limitations of theseequipment's.
2. Manufacturing of natural aggregate & recycled aggregate through mechanization.
3. Mechanization in rebar fabrication, concrete production, placement, types of form work &scaffolding and materials used.
4. Construction of bridge/flyover by segmented construction and box pushing technology fortunneling &pile driving equipment.
5. Construction methods of drilling blasting, tunneling &various equipment's used in thisconstruction.

Modules	Teaching Hours
Module I Introduction to mechanization: Definition, advantages and limitations of mechanization, Indian Scenario & Global Scenario Mechanization through construction equipment:, Equipment cost, Machine Power ,Production cycle-Dozers, scrapers, Excavators, finishing equipment, Trucks and Hauling equipment, Hoisting equipment, Draglines and Clamshells	10 hours
Module-II Mechanization in aggregate manufacturing: Natural aggregates and recycled aggregates	8 hours
Module-III Mechanization in rebar fabrication Mechanization in concrete production and placement Mechanization through construction: Formwork and scaffolding types, materials and design principles	8 hours
Module -IV **Mechanization** through construction methods/technologies: Segmental construction of bridges/flyovers, box pushing technology for tunneling, trench-less technology. **Pile driving equipment**: Pile hammers, selecting a pile hammer, loss of energy due to impact, energy losses other than impact.	8 hours
Module-V Mechanization through construction methods of drilling, Blasting and Tunneling Equipment: Definition of terms, bits, Jackhammers, Drifters, wagon drills, chisel drills, piston drills, blast hole drills, shot drills, diamond drills, tunneling equipment, selecting the drilling method equipment, selecting drilling pattern, Environmental issues in mechanization.	8 hours

Course Outcomes: On completion of this course, students are able to:		
CO		**BL**
CO1:	Definition and explaining of various construction equipment's.	C2
CO2:	Explain the manufacturing process of natural & recycled. Aggregate	C3
CO3:	Explain the production and placement of concrete through. Mechanization materials of formwork& design of formwork.	C3
CO4	Explanation on construction of bridge/flyover by segmental Construction&boxpushingtechnologyfortunnelingandpiledrivingequipment.	C3
CO5	Choose the sites for tunneling& drilling method equipment.	C3
Question paper pattern: i) Two questions have to be set for each Module ii) Total Five Questions must be answered by selecting minimum one question from each module		
Textbook: 1) Construction equipment by, S. C. Shrama		
Nptel Link: https://youtu.be/2B7DhQvL8kw		
E-Books: www.civilenggebooks.com		

ALTERNATE BUILDING MATERIALS			
Course Code	21CV74OE3	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	03	SEE Marks	50
Total Hours of teaching	40	Total Marks	100
Credits	3	Exam Hours	03

Course objectives: This course will enable students to:

1. understand environmental issues due to building materials and the energy consumption in manufacturingbuilding materials.
2. study the various masonry blocks, masonry mortar and structural behavior of masonry under compression.
3. Study the alternative building materials in the present context.
4. understand the alternative building technologies which are followed in present construction field.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Blackboard teaching/PowerPoint presentations (if needed)
2. Regular review of students by asking questions based on topics covered in the class.

Module-I	
Introduction: Energy in building materials, Environmental issues concerned to building materials, Global warming and construction industry, environmentally friendly and cost effective building technologies, Requirement for buildings of different climatic regions, Traditional building methods and vernacular architecture	8 hours
Module-II	
ALTERNATIVE BUILDING MATERIALS. Characteristics of building blocks for walls, Stones and Laterite blocks, Bricks and hollow clay blocks. Concrete blocks, Stabilized blocks: mud blocks, steam cured blocks, Fal G- blocks and stone masonry block Lime pozzolana cements Raw materials, Manufacturing process, Properties and uses, Fiber reinforced concretes, Matrix materials, Fibers: metal and synthetic, Properties and applications. Fiber reinforced plastics Matrix materials, Filers: Organic and Synthetic, Properties and applications, Building materials from agro and industrial wastes, Types of agro wastes, Types of industrial and mine wastes, Properties and applications, Field quality control test methods.	8 hours
Module-III	
ALTERNATIVE BUILDING TECHNOLOGIES: Alternative for wall construction, Types, Construction methods, Masonry mortars, Types, Properties, Construction methods, Applications, Alternative roofing systems, Concepts, Filler slabs, Composite beam panel roofs, Masonry vaults and domes.	8 hours

Module-IV	
STRUCTURAL MASONRY: Compressive strength of masonry element, Factors affecting compressive strength, Strength of units, prisms/wallets and walls, Effect of brickwork bond on strength, Bond strength of masonry: Flexure and shear, Elastic properties of masonry materials and masonry, IS Code provisions, Design of masonry compression elements, Concepts bi lateral load resistance	8 hours
Module-V	
COST EFFECTIVE BUILDING DESIGN: Cost concepts bi buildings, Cost saving techniques bi planning, design and construction, Cost analysis: Case studies using alternatives, Equipment for productions of alternative materials: Machines for manufacture of concrete materials, Equipments for production of stabilized blocks, Moulds and methods of production of precast elements.	8 hours

Course outcome (Course Skill Set)
At the end of the course the student will be able to :

CO		BL
CO1	Solve the problems of Environmental issues concerned to building materials and cost-effective building technologies;	C3
CO2	Select appropriate type of masonry unit and mortar for civil engineering constructions; also, they are able to Design Structural Masonry Elements under Axial Compression.	C3
CO3	Analyze different alternative building materials which will be suitable for specific climate and in an environmentally sustainable manner. Also capable of suggesting suitable agro and industrial wastes as a building material	C3
CO4	Recommend various types of alternative building materials and technologies and design a energy efficient building by considering local climatic condition and building material.	C3
CO5	Methods for production of precast elements using various machines & Construction Management	C3

Assessment Details (both CIE and SEE)
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together
Continuous Internal Evaluation:
Three Unit Tests each of 20 Marks (duration 01 hour)
First test at the end of 5th week of the semester
Second test at the end of the 10th week of the semester
Third test at the end of the 15th week of the semesterTwo assignments each of 10 Marks
First assignment at the end of 4th week of the semester
Second assignment at the end of 9th week of the semester
Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for 20 Marks (duration 01hours)
At the end of the 13th week of the semester
The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled

down to 50 marks

(To have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcomedefined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject(**duration 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module

Suggested Learning Resources:

Text Books

1. KS Jagadish, B V Venkatarama Reddy and K S Nanjunda Rao, "Alternative BuildingMaterials and Technologies", New Age International pub.
2. Arnold W Hendry, "Structural Masonry", Macmillan Publishers **Reference**

BooksReference books:

1. RJS Spence and DJ Cook, "Building Materials in Developing Countries", Wiley pub.
2. LEED India, Green Building Rating System, IGBC pub.
3. IGBC Green Homes Rating System, CII pub.
4. Relevant IS Codes.

Web links and Video Lectures (e-Resources):

- Online study material
- NPTEL video lectures

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Assignment on alternative building materials used locally for sustainable construction

PROJECT		
Subject code	21CVP75	Credit: 10
Hours/Week	06 hours	SEE: 50 Marks
Total hours:	CIE: 50 Marks	SEE: 03 hours

Prerequisite:

Course objectives:

To enable the students to conduct the project in the field related to civil engineering such as construction materials, drinking water, wastewater or design of structures, pavement, irrigation structures, Analysis of structures using latest software's Prepare a report containing literature review, objective, methodology.

The project report shall be presented in the following form:

1. Definition of the problem
2. Literature survey
3. Analysis of results and Discussion
4. Conclusions
5. References

The project report shall be submitted in the prescribed standard format (04 copies) to the HOD on or before the last working day of the semester after the certification of the concerned guide and HOD.

Question paper pattern:

Evaluation of CIE marks: 60% marks will be evaluated by concerned guide on the basis of the performance of the student during project work remaining 40% marks will be evaluated by expert committee constituted by HOD containing minimum two experts of the department in the relevant field. Students have to deliver seminar before expert committee.

Evaluation of SEE marks: Viva-voce examination will be conducted in the presence of internal and external examiners appointed by HOD.

Course outcomes:

On completion of the course, the student will have the ability to:

CO #	Course Outcome (CO)	Blooms Level
CO1	Propose an engineering-based project in a clear and concise manner	C5
CO2	Identify and summarize the literature review and relate them to current project.	C5
CO3	Compile and analyze the project data using modern tools and produce agood quality project work.	C5
CO4	Present the project outcomes effectively using good presentation skills..	C4
CO5	Prepare a well-organized and compiled project thesis.	C4

VIII Semester

SEMINAR

Subject code	**21CVS81**	Credit: 01
Hours/Week: 4 hours	CIE: 50 Marks	

Prerequisite: none

Course objectives:
To enable the students to obtain the knowledge about latest development in civil engg field such as new materials, construction techniques, design tools for structures (software's), environmental and water resource engg.

Seminar is intended to give an exposure to the students about recent trends and advances in various field of Civil Engineering. In view of this student shall select the topics from recently published literature in National and International Journal and also topics from conference proceedings of high standards approved by Guide.

Topic of the Seminar to finalized by end of 7th Semester.

Students have to give self-introduction before start of the presentation and give details of choosing topic of seminar.

Mid Term shall be conducted either in Online/Offline mode with industry expert as external Examiner.

Seminar shall be presented in the department in presence of a committee consisting of Batch of minimum two teachers including Guide constituted by HOD. The seminar marks are to be awarded by the committee. Students shall submit the seminar report in the prescribed standard format.

Question paper pattern:

Evaluation of CIE marks: Seminar will be evaluated by expert committee constituted by HOD consisting of guide and one expert faculty of the department in the relevant field. Students have to deliver seminar before expert committee.

Course outcomes: On completion of the course, the student will have the ability to

CO #	Course Outcome (CO)	Blooms Level
CO1	Identify a technical seminar topic using the criteria of recent trends in civil engineering, industrial development and societal issues.	C5
CO2	Collect exhaustive literature relevant to the selected topic	C2
CO3	Summarize effectively the literature review and provide the critical analysis of the selected topic.	C4
CO4	Present the seminar topic using good oral and writing skill.	C4
CO5	Prepare a well-organized and compiled seminar report.	C4

INTERNSHIP

Subject code	21CVI82	Credit: 15
Hours/Week		SEE: 50 Marks
Total hours:	CIE: 50 Marks	SEE: 03

Prerequisite:

Course objectives:

This course will enable students to get the field exposure and experience

Note: Internship /Professional Practice:

1. This shall be carried out by students in industry set-up related to the construction/ materials testing laboratories/research organizations/project management consulting firms/QS and QA organizations/ planning and design offices/Professional organizations like ACCE/ICI/INSTRUCT/RMCMA/QCI, PMI, CIDC etc. and other avenues related to the civil engineering domain in consultation and approval of internship guide/HOD /internship committees of the institutions.

2. The professional certification programs like ACCE(I)- SMP, ICI-BMTPC certifications, NSTRUCT certifications, CIDC certifications, RMC-QCI's RMCPCS Certification Programs, RMCMA-NRMCA'S Concrete Technologist India (CTI) programs and such similar programs by professional bodies with adequate industry exposures at sites/RMC plants can be considered as Internship /Professional Practice with due approvals from the guide/HOD /internship committees of the institutions

3. The industry/organization should issue certificates of internship offer and its completion. The offer letter should clearly have the nature of work to be done by the student and the supervisor's name and duration of internship.

4. The duration of the internship shall be 12 weeks. The student shall make a midterm and final presentation of the activities undertaken during the first 8 weeks and at the end of 12th week of internship respectively, to a panel comprising internship guide, a senior faculty from the department and head of the department. Each student should submit the internship report at the end of semester with internship certificate.

5. Viva-Voce examination shall be conducted by a panel of examiners consisting of internship supervisor from industry or industry professional approved by university and internship guide from the institute.

6. The College shall facilitate and monitor the student internship program.