HANDBOOK

COURSE STRUCTURE AND DETAILED SYLLABUS

B. Tech Programme

Batch: 2018-22

INSTITUTE OF ENGINEERING AND TECHNOLOGY

JK LAKSHMIPAT UNIVERSITY

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Program Education Objectives

The B.Tech programs at IET, JKLU are designed to prepare students for continued learning and successful careers. Our alumni are expected to:

PEO1: Apply their technical knowledge, complex problem solving and research skills in professional practice.
PEO2: Continue their intellectual development through critical thinking, self-study, apprenticeship, higher education, professional development courses, as well as participation in research groups and professional networks.
PEO3: Serve as ambassadors for engineering and sustainability by exhibiting high professional standards with a deep sense of civic responsibility.
PEO4: Effectively communicate about technical and related issues.
PEO5: Embrace the roles of team members and leaders in their careers.

Program Outcomes

The graduates of B.Tech. programs at IET, JKLU will have the following competencies:

PO 1: Life-long learning: Demonstrate inquisitiveness, open mindedness, and the ability to engage in independent and life-long learning in the broadest context of technological, organizational, economic, and societal changes.
PO 2: Citizenship, Sustainability, and Professional ethics
PO 2a: Demonstrate knowledge of constitutional values of liberty, equity, justice, and fraternity with an understanding of the impact of the engineering solutions in societal and environmental contexts as well as a sense of responsibility for sustainable development.
PO 2b: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, cultural, and environmental issues and the consequent responsibilities relevant to professional engineering practice.
PO 2c: Demonstrate commitment for professional integrity and excellence and respect for ethics, responsibilities and norms as prescribed for the engineering practice.
PO 3: Engineering knowledge and Modern tool usage
PO 3a: Demonstrate a clear conceptual understanding of the fundamentals of engineering specialization and cognitive flexibility to appropriately 'transfer' what has been learned in a context, to different situations.
PO 3b: Apply engineering thinking, computational thinking, and the knowledge of mathematics, natural and social sciences, engineering fundamentals, information technology, engineering specialization, and engineering management to the solution of complex engineering problems.
PO 3c: Create, select, modify, and apply appropriate techniques, best practices, standards, resources, and modern engineering and IT tools including prediction and modeling to engineering and social activities with an understanding of the limitations.
PO 4: Complex problem solving, Design and Research
PO 4a: Identify, formulate, review research literature, and analyze complex engineering problems to arrive at substantiated conclusions using critical thinking along with principles of mathematics, computing, engineering as well as natural and social sciences.
PO 4b: Use systems thinking and reflection to identify and consider underlying structures, patterns, volatility, uncertainties, complexities, ambiguities, complications, and risks to

design and develop engineering solutions for complex problems to meet the specified and anticipated needs with appropriate concern for constraints, performance, sustainability, and professional ethics.

PO 4c: Use research-based knowledge and research methods including design of experiments, simulation, analysis and interpretation of data, and synthesis of the information to evaluate and improve the engineering solutions and practice.

PO 5: Individual & teamwork and Engineering management

PO 5a: Ability to work effectively as an individual and as a team member or a leader in diverse and distributed teams, and in multidisciplinary settings.

PO 5b: Ability to apply engineering management principles to one's own and team's work to manage engineering projects and operations and in multidisciplinary environment.

PO 6: Communication: Ability to communicate effectively on complex engineering and technology activities, situations, problems, and solutions using verbal, textual, and pictorial elements with the colleagues, engineering community, users, clients, policy makers, and society at large with intellectual honesty, clarity, empathy, and compassion.

PO 7: Innovation and entrepreneurship:

PO 7a: Demonstrate enthusiasm and understanding to identify opportunities and translate research in engineering and other disciplines to conceive and design innovative engineering solutions for business, industry, and societal problems.

PO 7b: Demonstrate enthusiasm and understanding to conceive and plan technology based new ventures either as independent start-up businesses or within existing corporate structures.

Program Specific Outcomes

B.Tech. (Civil Engineering)

The civil engineering graduates of JKLU will be able to:

CEPSO1: Conceive, design, implement and manage civil infrastructure systems, structures and processes by using principles of structural engineering, transportation engineering, water management, geotechnical engineering, project management, computing, automation, sustainability, and contemporary materials and tools.

CEPSO2: Serve in fields of construction industry, infrastructure management or consultancy services.

JK Lakshmipat University, Jaipur
Institute of Engineering and Technology
Department of Civil Engineering
Course Structure for the B. Tech (Batch 2018-2022)

Semester	Courses							Credits
I	Calculus and Applied Mechanics	Design and Prototyping	The Power of Story Telling					
	BES101	**BES102**	**CCT101**					
	(6 2 0)	**(6 2 0)**	**(2 1 0)**					
	6	**6**	**3**					**15**
II	Computational Data Analysis	Fundamentals of Automation Engineering	Fundamentals of Critical Thinking	Experimental Physics	Environmental Studies	Articulation and Elocution		
	BES201	**BES202**	**CCT201**	**PH202**	**ID201**	**CCT202**		
	(10 2 0)	**(6 2 0)**	**(2 0 0)**	**(1 0 4)**	**(2 0 0)**	**(2 0 0)**		
	10	**6**	**2**	**3**	**1**	**Audit**		**22**
III*	Structure Analysis-I	Fluid Mechanics	Surveying	Computational Engineering Analysis-I	Engineering Measurements and Machines	Perspectives on Contemporary Issues	Programming Week	
	CE305	**CE306**	**CE308**	**ES1106**	**ES1107**	**CC1103**	**CS1104**	
	(3 1 0 0)	**(3 1 2 0)**	**(3 0 2 0)**	**(3 1 2)**	**(3 0 4)**	**(2 0 1)**		
	4	**5**	**4**	**5**	**5**	**2**	**2**	**27**
IV*	Structure Analysis-II	Engineering Geology and Building Construction	Concrete Technology	Hydraulic Engineering	Computational Engineering Analysis-II	Communication and Identity	Introduction to Design	
	CE405	**CE402**	**CE409**	**CE403**	**ES1109**	**CC1104**	**IL1102**	
	(3 1 0 0)	**(3 0 2 0)**	**(3 0 2 0)**	**(3 0 2 0)**	**(3 1 2)**	**(2 0 1)**		
	4	**4**	**4**	**4**	**5**	**2**	**2**	**25**
Practice School - I (PS1101) – (4 to 6 Weeks Duration)								**4**
V*	Design of RCC and Steel Structures	Geotechnical Engineering	Mechanical and Electrical Machines	Departmental Elective-I/ Open Elective-I	Introduction to IoT	Understanding and Managing Conflict		
	CE1107	**CE1108**	**ES1108**		**EE1111**	**CC1105**		
	(3 0 2 0)	**(3 0 2 0)**	**(3 0 2 0)**			**(2 0 0)**		
	4	**4**	**4**	**4**	**2**	**2**		**20**
VI*	Transportation Engineering	Construction Project Management	Departmental Elective-II	Open Elective - II	Critical Thinking for Decisions at Workplace	Automation Project	Emerging Tech Week	
	CE1109	**CE1112**			**CC1106**	**PR1101**		
	(3 0 2)	**(3 0 2 0)**			**(2 0 0 0)**			
	4	**4**	**4**	**4**	**2**	**2**	**2**	**22**
VII*	Departmental Elective-III	Departmental Elective-IV	Departmental Elective-V	Open Elective-III	Minor Project			
					PR1103			
	4	**4**	**4**	**4**	**4**			**20**
VIII*	Practice School - II /Entrepreneurial Project/Research Project/Semester at a Partner University							
	16							**16**
	Total Credits							**171**

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B.Tech (CE) (Batch: 2018-2022)		
Course Code	**Course Name**	**Page No**

Course Title and Code	
Calculus and Applied Mechanics BES101	
Hours per Week	**L-T-P: 6-2-0**
Credits	**6**
Students who can take	**B. Tech Semester-II (Compulsory)**

Course Objective:

This course introduces the basic elements of calculus and mechanics through some engineering projects. The application of multivariable calculus in civil and mechanical engineering is also highlighted. This course will equip students with essential domain knowledge of calculus and applied mechanics in solving basic engineering problems.

On successful completion of this course, the student should be able to:

BES101.1 apply analytical techniques to determine forces in structures

BES101.2 use commercial software (STAAD Pro.) to simulate a structure/frame and determine force in the members

BES101.3 model physical phenomena using calculus and solve using appropriate method

BES101.4 apply Newton's laws of motion and understand the concepts of dynamics concepts (force, momentum, work and energy)

BES101.5 interpret the geometrical significance of differential and integral calculus

BES101.6 solve problems of vector differentiation and integration

BES101.7 calculate the buoyant forces of objects with various shape and carryout the stability analysis

BES101.8 apply the concept of partial differentiation to solve optimization problems

Sr. No	**Specifications**	**Marks**
1	Attendance	--
2	Assignment	10
3	Class Participation	5
4	Quiz	5
5	Theory Exam-I	10
6	Theory Exam-II	10
7	Theory Exam-III	30
8	Report-I	--

9	Report-II	--
10	Report-III	--
11	Project-I	15
12	Project-II	15
13	Project-III	--
14	Lab Evaluation-I	--
15	Lab Evaluation-II	--
16	Course Portfolio	--
	Total (100)	**100**
Evaluation policy for retest		
1	Theory Exam-III	30

Syllabus:

Vectors Algebra: basics of vector algebra, resultant vector, Application of vector equilibrium on structures.

Force systems basic concepts, equilibrium of system of forces, free body diagrams, equations of equilibrium of coplanar systems,structures (trusses), analysis of structures, method of joints, method of section, friction, virtual work, work energy principle, kinematics and kinetics of particle, impulse-momentum (linear, angular); impact, projectile motion.

Function of several variables, functions of one and several variables, partial differentiation, maxima-minima.

Vector Differentiation: Vector functions and derivatives, Arc length and unit tangent vector, Curvature and unit normal vector, Directional derivative and gradient vectors, Tangent plane, Divergence and curl of a vector field

Integral Calculus, area under curve, arc length, double integral, change of order and triple integrals, surface and volume integrals, solids of revolution, moment of inertia, floatation, buoyancy, centroid

Vector Integration: Line integral, flux, work done, circulation, path independence, potential function and conservative fields, Surface area and surface integral, Green's theorem in the plane, Stoke's theorem, Divergence theorem

Text Books:

1. M.D. Weir and J. Hass, Thomas, Calculus, Pearson, India, 2016.
2. R.C Hibbeler, Engineering Mechanics, Pearson India, 2010.

Reference Books:

1. Goldstein et. al., Calculus and Its Applications, Pearson, India, 2018.
2. SS Bhavikatti,Engineering Mechanics, New Age International Publishers, 2019.
3. Beer and Johnston, Vector mechanicsfor engineers, McGraw Hill Education, 2009.
4. S Timoshenko, Engineering Mechanics, McGraw Hill Education, 2017.
5. Erwin Kreyszig,Advanced Engineering Mathematics, Wiley, India, 2013.
6. Srimanta Pal and Subodh C. Bhunia, Engineering Mathematics, Oxford University Press, New Delhi, India, 2015.

Course Title and Code Design and Prototyping: BES102		
Course Description The objective of this course is to open the students to learn free and lateral thinking and initiate creative problem-solving. The course will encourage students to learn through hands-on experience and break away from traditional learning methods. This course will initiate by introducing the role of design thinking in process of designing a product and it will emphasize the role of research in the design process. The course will run by providing the operational skills to conduct design research and how to use the research insights for creating a product. Students will also get the exposure to manufacturing techniques such as casting, forging, joining, laser cutting, 3D printing etc. In a nutshell, the course will move around the user-centric approach of design research and methods for working out an appropriate solution for a problem space.		
Prerequisites		**None**
Hours per Week		**L-T-P: 6-2-0 /In Class-Out Class: 6-12**
Credits		**6**
Sr. No	**Specifications**	**Marks**
01	Attendance	Nil
02	Assignment	10
03	Class Participation	20
04	Quiz	05
05	Theory Exam	Nil
06	Theory Exam	Nil
07	Theory Exam	Nil
08	Report-1	10
09	Report-2	10
10	Report-3	10
11	Project -1	15
12	Project -2	15
13	Project -3	Nil
14	Lab Evaluation	Nil
15	Lab Evaluation	Nil
16	Course portfolio	05
	Total (100)	**100**

Syllabus

Basics engineering drawing with AutoCAD, Fundamental manufacturing processes including metal joining, metal cutting, additive manufacturing, laser cutting, casting, sheet metal working etc.

Basic Design cycle, project definition, vision in product designing, base of pyramid model, context mapping, mind mapping, Life cycle analysis, process tree, SWOT analysis, VRIO

analysis, perpetual mapping, Fish trap model, SCAMPER, WWWWWH, PreMo, C-Box, vALUE, Design Drawing, TecDoc.

Reference / Text Books

1. “The Design of Everyday Things” by Donald A. Norman

The Power of Story Telling

Course Code: CCT101

Credit: 3

L-T-P: 2-1-0

Course Instructor: Ms. Shradha Bhartiya

Course Description:

This course gets students started on the journey of storytelling by observing the world and themselves and weaving a narrative. At the end of this course the students will be able to observe, think, create and narrate their stories in an effective manner

Syllabus:

Concept of a Story- Build common understanding about the course, Introduction of the course and the concept of stories; How Stories Begin- Source of stories in our lives; Story Mapping- Introduction of Story Mapping ,Elements of Story Mapping, Use of elements in creating stories; Story Boarding- Introduction of Story Boarding, How story Boarding is used, Use of Story Boarding in creating stories; Identifying Different Narratives- Everyone and everything has a story, How different stories impact us; Power of Observation - Introduction of sensorium, How sensorium help us to create a story; The Art of Listening- Why listening, Active and passive listening, Be an active listener ; Creating Stories- Detailed practice of different importance components of storytelling- i. Delivery – Overcome stage fear, work on body language, ii. Content – Create story, Edit, iii. Voice - Voice modulation, enunciation, pronunciation

Evaluation Scheme:

Sr. No	Specifications	Marks
01	Attendance	10
02	Assignment	70
03	Class Participation	20
	Total (100)	**100**

References for Reading:

1. Unleash the Power of Storytelling: Win Hearts, Change Minds, Get Results,
   Author: Rob Biesenbach , Publisher: Eastlawn Media (19 February 2018)
2. Story worthy: Engage, Teach, Persuade, and Change Your Life through the Power of Storytelling
   Author: Mathew Dicks, Publisher: Publisher: New World Library - New World Library - New World Library (15 May 2018)

BES201: Computational Data Analysis

Course Description: This course introduces computational analysis of data based on Linear Algebra Principles and Statistics. The computational analysis will include learning and utilizing Python as a programming language.

Course Outcome

After course completion, the student will be able to

BES201.1 Write Simple Python programs using various datatypes, control structures, decision statements, libraries, functions (M1)
BES201.2 Develop Python programs using Objects, Classes and Files (M1, M2)
BES201.3 Develop Programs for analyzing and interpreting Complex situations in various domains including sustainable development by combining various Linear Algebra, Statistics and Other Problem Solving Techniques (M3)
BES201.4 Model Complex systems as Linear simultaneous equations and analyze the same using Matrix methods (M1)
BES201.5 Model Data as matrices and Find Eigen Values and Eigen Vectors and Apply the same for problem solving, e.g., ranking and performance analysis (M1)
BES201.6 Summarize and Visualize different datasets (M2)
BES201.7 Analyze and interpret different datasets using Discrete and Continuous Probability Distributions and Apply the same for problem solving, e.g., Goodness of Fit (M2)
BES201.8 Formulate and validate hypothesis with reference to different datasets (M2)
BES201.9 Apply correlation, regression, least square method and time series analysis for modeling, analysis, interpretation and forecasting (M2)

Teaching Scheme and Credits

Hrs. per Week		Credits	Duration in Weeks
In Class	Out Class	10	15
10+2	20		

Evaluation Scheme

Sr. No	Specifications	Weightage (in percentage)
01	Attendance	Nil
02	Assignment	15
03	Class Participation	Nil
04	Quiz	15
05	Theory Exam (Mid Term I)	Nil
06	Theory Exam (Mid Term II)	20
07	Theory Exam	Nil
08	Report-1	Nil

09	Report-2	Nil
10	Report-3	Nil
11	Project -1	Nil
12	Project -2	30
13	Project -3	Nil
14	Lab Evaluation 1	10
15	Lab Evaluation 2	10
16	Course portfolio	Nil
	Total (100)	**100**

Syllabus

Introduction to Algorithms, Hardware Overview, Python as a Tool, Installing Python and Writing a Program, Variables & Expressions, Decision Statements, How to Debug?, Control Structures: Loops & Iterations, Linear Data Structure: String, List, Tuple, Data Dictionary and Set, Python Library (Pandas, Numpy, PyPlot), Functions, Classes & Objects, Working with Files

Matrix Operations, Eliminations, Matrix Inversion, Transformation, Solution of Linear , Simultaneous Equation, Eigen Values & Eigen Vectors , Linear Transformation, Linear Combination, Vector Spaces and Subspaces

Probability, Baye's Rule, Sampling, Data Processing and Pre-processing, Random Variable, Discrete & Continuous Distribution, Hypothesis Formulation , Test of Hypothesis, ANOVA, Correlation, Curve Fitting, Regression

Reference Books

1. Allen B. Downey. Think Python. Green Tea Press, Massachusetts, USA.
2. Kenneth Hoffman and Ray Kunze. Linear Algebra. PHI Learning Private Limited, 2nd Edition, 2012.
3. Gilbert Strang. Introduction to Linear Algebra. Wellesley-Cambridge Press, 4th edition, 2009.
4. Allen B. Downey. Think Stats. Green Tea Press, Massachusetts, USA.
5. Douglas C. Montgomery and George C. Runger, Applied Statistics and Probability for Engineers, John Wiley & Sons, Inc., 3rd Edition (2004).
6. Rishard A. Johnson, Miller and Freund's probability and Statistics for Engineers, PHI

Course Name: Fundamentals of Automation Engineering (BES202)

Automation engineers design, program, simulate and test automated machinery and processes. This course is aimed at building key technical competencies needed by automation engineers. It is focused on basic knowledge and critical understanding of different technologies in the design and maintenance of automation systems.

General Course Outcomes

On successful completion of this course, the students should be able to:

BES202.1	propose and implement a complete solution for a simple automation problem, including power supply, actuator, sensor, data acquisition and control, sensitized with energy usage and effects on environment.
BES202.2	evaluate the benefits and challenges of automation technologies
BES202.3	explain the importance of adopting suitable engineering standards for automation projects
BES202.4	apply good management practices for automation projects

Unit-specific Course Outcomes

Unit 1 Introduction to Electrical Engineering – U1

1) Analyze electrical circuits using network theorems

2) Measure electrical parameters of passive as well as active electrical components

3) Design rectifier circuit using semiconductor devices.

4) Design filters for power conditioning.

5) Design and test a linear power supply for given specifications

6) Design and build Printed Circuit Boards.

7) Use electrical safety practices while working on electrical projects.

Unit 2 Introduction to Automation Engineering and Control Systems – U2

1) Formulate mathematical models for basic electro-mechanical systems

2) Design and simulate a basic analog open-loop control system

Unit 3 Introduction to Digital Circuits – U3

1) Evaluate and simplify Boolean functions and implement the minimized logic using logic gates.

2) Implement and test basic combinational and sequential circuits with minimum complexity

3) Implement various logic functions using software programming with micro controller, so as to make optimal utilization of resources.

4) Identify the key features of embedded systems in terms of hardware and software

5) Interface sensors and design low power embedded systems projects using microcontroller

NOTE: The following information is only valid for semester September 2020 – January 2121. On-line mode due to COVID-19.

Teaching Scheme and Credits

Hrs. per Week		Credits	Duration in Weeks
In Class	Out Class	3	12
2 (L) + 0(T) +2(P)	2		

Expectations from the Students:

1. To be punctual at sessions and be interactive during discussions
2. To dedicate 2 hours a week for this course (for self-study and assignments)
3. To demonstrate teamwork by contributing to the overall success of the project.
4. To seek prior concern from instructor(s) is required for absentees.
5. Academic integrity is expected from students.
6. To take notes using two notebooks: one for theory and one for activities/practicals
7. Each group must maintain a Project Folder, updated with diagrams, calculations, equations, code, etc.

Expectations from the Faculty Members:

1. To assess student progress by continuous evaluation and provide feedback to students on their performance, fortnightly.
2. To help students to update on latest automation technology used in industry and develop new project ideas.

Course Feedback: Online Every Fortnight

Evaluation Scheme

Sr. No	Specifications	Marks
01	Assignment	10
02	Quizzes	10
03	MID TERM Theory Exam	15
04	END TERM Theory Exam	20
05	Report -1	Included with Project 1
06	Report-2	Included with Project 2
07	Project -1	10
08	Project -2	10
09	Lab Evaluation (Continuous)	15
10	Lab Evaluation (Exam)	10
	Total (100)	**100**

Project Evaluation Components –

Design	Skills demonstrated	Time Mgmt.	Sophistication/ neatness in work	Presentation	
				Presentation Skills	Viva
(20%)	(20%)	(10%)	(20%)	(20%)	(10%)

Syllabus:

Digital circuits for automation: Boolean Algebra, Karnaugh map, Logic gates, Decoders and Multiplexers, Sequential Circuits, Displays, Sensors and Microcontrollers for automation: Working principle of sensors. Architecture of ATMega328 (concepts on ALU, memory, ports). Applications on sensors interfacing with microcontroller.

Project: The course leads to developing a digital measurement system for the device developed in course Design and Prototype.

Professional Skills: Team-work, Leadership, Professionalism, Time Management, Presentation skills, Communication Skills, Technical Report

Reference Books:

1. Digital Logic and Computer Design Fundamental by Morris Mano, Pearson Publication, 5th Edition.
2. Programming and Customizing the AVR Microcontroller by Dhananjay Gadre, 1st Edition, Mc Graw Hill Publication, ISBN-13: 978-0071346665

IT Resources

https://nptel.ac.in/courses/108/105/108105132/

Fundamentals of Critical Thinking

Course Code: CCT201

Credit: 2

L-T-P: 2-0-0

Course Instructor: Ms. Shraddha Bharatiya

Course Description:

This course will train students to observe and think from multiple perspectives, examine information and knowledge critically, analyze skillfully, evaluate and take a well-reasoned position.

Course Outcomes:

Students will be able to

CCT201.1 Formulate intelligent questions
CCT201.2 Evaluate information and evidence for correctness, consistency, and relevance
CCT201.3 Compose well-structured and well-reasoned arguments
CCT201.4 Evaluate an argument for consistency, logical validity, coherence, breadth and width, and relevance.

Course Content:

- **Importance of questioning**-The key to critical thinking is the ability to formulate intelligent questions. Students will be able to create, improve and prioritize their questions. They will be able to use different types of question by using Bloom's taxonomy to understand the root of any situation, problem or subject.
- **Examine data critically**-Students will be able to filter information, separate fact from opinion, identify cognitive biases and become aware of the ladder of inference. They will also be taught to conduct responsible research and basics of bibliography and citation.
- **Construct and reconstruct argument**- Students will be taught to construct arguments with sound reasoning. They will be able to support their claims and opinions with compelling data and facts, and present well-informed arguments.
- **Application of Critical Thinking**- Students will learn to use critical thinking in workplace and business scenarios, case studies and write with a critical voice. They will learn to critique the information they gather.

Evaluation Scheme:

Sr. No	Specifications	Weightage (in percentage)
01	Attendance	10
02	Assignments (4)	35

03	Class Participation	10
04	Theory Exam	25
05	Report-1	10
06	Project -1	10
	Total (100)	**100**

References for Readings:

1. Fisher, A. (2011). *Critical thinking: An introduction*. Cambridge University Press.
2. Fisher, A., & Scriven, M. (1997). *Critical thinking its definition and assessment*. Centre for research in Critical Thinking.
3. Dobelli, R. (2013). *The art of thinking clearly: better thinking, better decisions*. Hachette UK.
4. Budden, L. (2007). Critical Thinking Skills: Developing Effective Analysis and Argument. *Contemporary Nurse, 25*(1-2), 174-175.

Course Title and Code Experimental Physics: PH202	
Hours per Week	**L-T-P: 1-0-4**
Credits	**3**

Course Objective

This course is designed to familiarize the student with the fundamental concepts of different phenomenon related with optics, electromagnetism, and modern physics. This course will expose the students with experimental methods of physics and integrates theoretical knowledge and concepts to practical experience.

Course Outcomes:

On successful completion of this course, the students will be able to:

PH202.1 analyze ferromagnetic properties of any magnetic material and differentiate Soft and hard materials.

PH202.2 analyze thermoelectric effect of metal junctions due to temperature difference.

PH202.3 analyze nuclear radiation with respect to distance and thickness of absorbing media.

PH202.4 measure electrical properties e.g. specific resistance, high resistance, dielectric constant, time constant of various electrical components.

PH202.5 measure resolving power of telescope, dispersive power of prism, specific rotation of optically active medium, e.g., sugar solution, wavelength of radiation, height of objects, coherent length and coherent time of Lasers.

PH202.6 measure numerical aperture of Optical Fibre and classify its structures.

PH202.7 use Schroedinger equation and quantum mechanical approach to analyze behavior of the quantum particle under different potentials.

Prerequisites		**Knowledge of Basic Science**
Sr. No	**Specifications**	**Marks**
01	Attendance	5
02	Assignment	Nil
03	Class Participation	5
04	Quiz	10
05	Theory Exam	Nil
06	Theory Exam	Nil
07	Theory Exam	20
08	Report-1	Nil
09	Report-2	Nil
10	Report-3	10
11	Project -1	Nil
12	Project -2	Nil
13	Project -3	10

14	Lab Evaluation-1	20
15	Lab Evaluation-2	20
16	Course portfolio	Nil
	Total (100)	**100**

Syllabus

1. To determine the ferromagnetic constants retentivity, permeability and susceptibility by tracing I-H curve using C.R.O.

   Description: CRO, ferromagnetic property of materials, retentivity, permeability and susceptibility, hysteresis loop, Soft and hard materials.
2. To study the variation of thermo-e. m. f. of iron copper thermocouple with temperature.

   Description: Thermocouple, thermos-emf, Seeback effect, Peltier Effect, Thomson effect, Effect of temperature difference on metal junctions.
3. To study the Charge & Discharge of a capacitor and determine time constant.

   Description: Capacitor, types, time constant of RC and LR Circuits, application
4. To determine the high resistance by method of leakage, using a Ballistic Galvanometer.

   Description: Ballistic Galvanometer, high resistance determination.
5. To determine dielectric constant of a material using moving coil Ballistic Galvanometer.

   Description: Property of Insulators and Dielectric materials, dielectric constant and dielectric loss
6. To determine the specific resistance of the material of a wire by Carey Fosters Bridge.

   Description: Carey Fosters Bridge, Cell, Specific resistance determination of different materials and study of material property.
7. To convert a Galvanometer in to an Ammeter of range 1.5/3 amp and calibrate it.

   Description: Working principle and different types of Galvanometer and Ammeter and conversion
8. To convert a Galvanometer in to a Voltmeter of range 1.5/3 volt and calibrate it.

   Description: Working principle and different types of Galvanometer and Voltmeter and conversion
9. To study characteristics of G.M. Counting System.

   Description: Nuclear Detectors and Counters, GM Counter, dead time, quenching process, Characteristics, Quantitative analysis of nuclear radiation with distance.
10. To determine the absorption coefficient of lead using lead sheet by G.M. Counting System.

Description: Nuclear Detectors and Counters, GM Counter, dead time, quenching process, Absorption Coefficient.

11. To measure the Numerical Aperture of an Optical Fibre.

    Description: Optical Fibre, Numerical Aperture, and Maximum Angle of Acceptance.

12. To determine coherent length and coherent time of laser using He-Ne Laser

    Description: Coherence, Coherence length, Coherence time and 'Q'factor for light, Theory of Laser Action, Threshold Conditions for Laser Action, He-Ne Laser, Semiconductor Lasers.

13. To verify the expression for the resolving power of a Telescope.

    Description: Diffraction, Resolving Power, Rayleigh Criterion for resolution

14. To determine the wave length of prominent lines of mercury by plane diffraction Grating with the help of spectrometer.

    Description: Diffraction, Grating, determine the wave length of radiations, intensity analysis, XRD, spectrometer

15. To determine the dispersive power of material of a Prism for Violet Red and Yellow colours of Mercury light with the help of a spectrometer.

    Description: Diffraction, dispersion, Grating, determine the wave length of radiations, spectrometer

16. To determine the wave length of monochromatic light with the help of Fresnel's Biprism

    Description: Interference, Determination of wavelength of unknown light

17. To determine the wave length of sodium light by Newton's Ring

    Description: Interference, Determination of wavelength of unknown light, Determination of refractive index of unknown medium.

18. To determine the wavelength of sodium light by Michelson Interferometer

    Description: Interference, Determination of wavelength of unknown light

19. To determine the specific rotation of Glucose (Sugar) solution using a Polarimeter.

    Description: Polarization, Half Wave plate, Quarter wave plate, Optical Activity, Specific Rotation.

20. To determine the height of object with the help of a Sextant.

    Description: Principle, Sextant

Text Books:

1. Dattu R Joshi, "Engineering Physics", Tata McGraw Hill Education Pvt. Ltd. New Delhi, I edn. 2010.

2. Neeraj Mehta, “Applied Physics for Engineers”, PHI, I edn. 2011
3. Lab Manuals for Physics

Reference Books:

1. Arther Beiser, “Concept of Modern Physics” Tata McGrawHill, New Delhi, 5thedn. 1997.
2. Ajoy Ghatak, “Optics”, Tata McGraw Hill, 4th edn.
3. Eyvind H Wichman, “Quantum Physics” Tata McGraw Hill, Volume 4.
4. B.K. Pandey, S. Chaturvedi, “Engineering Physics”, Cengage Learning, 2012.
5. D.K. Bhattacharya, Poonam Tondon, “Engineering Physics”, Oxford University Press, 2015.

Course code	Course Title	Teaching Scheme				
		L	T	P	S	Credits
ID201	Environmental Studies	2	0	0	0	2

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)				
Mid Term Test – I	Mid Term Test – II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks	Mid Term Test - I	End Term Test	Class Participation	Additional Continuous Evaluation *	Total Marks
20	20	40	20	100	-	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Course Syllabi (Theory):

- Understanding environment, The global crisis, Basic Concepts
- Forest and Grassland ecosystems, Desert Ecosystems, Aquatic Ecosystems
- Introduction to Biodiversity, Biodiversity Conservation
- Water Resources, Energy Resources, Forest Resources
- Land, Food, and Mineral Resources
- Air and Noise Pollution, Water, Soil, and Marine Pollution
- Solid Waste Management and Disaster Management
- Population Growth, Environment and Human Health, Sustainable Development
- Global Warming, Acid Rain, and Ozone Depletion
- Different types of laws and regulations

Text Books:

1. Rajagopalan, R., "Environmental Studies: From Crisis to Cure", Oxford University Press, New Delhi, 2e, 2011.

Reference Books:

1. Ranjit Daniels & J. Krishnaswamy "Environmental Studies", Wiley India.
2. Davis & Cornwell "Environmental Engineering", Mc-Graw Hill.

Articulation and Elocution

Course Code: CCT202

Credit: Audit Course

Total Number of Contact Hours: 6 Hrs.

Course Instructor: Ms. Shraddha Bharatiya

Course Outcomes:

On successful completion of this course, the students should be able to:

CCT202.1	Use richer vocabulary in their communication appropriate to the context.
CCT202.2	Use appropriate grammar, vocabulary and style which are essential to professional-level reading, writing, speaking, listening, and editing.
CCT202.3	Apply various strategies to make the speeches/ conversation interesting and captivating.
CCT202.4	Using the sentence structure effectively and connect ideas logically within a paragraph.
CCT202.5	Write descriptions on various objects and topics.

Course Outline (Tentative Session Plan):

Sessions	**Content**	**Activities**
1	Listening	• To inculcate the skills of content prediction, inference and discourse coherence. • Acquire proficiency in Prosodic Features (Pronunciation, enunciation, pitch, intonation/voice modulation)
2	Ideation and Expression	• Proving situation/context to trigger thinking process • Just Minutes • Role Play/ Situational Dialogues • (Oral Narration) Describing people, places, events and things
3	Reading	• Distinguishing the main idea and supporting ideas • Transcoding information to diagrammatic display, recognizing indicators in discourse, understanding conceptual meaning and summarizing. • Reading and writing skills will be targeted simultaneously.
4.	Writing	• To throw some light on the features of the connected speech/ composition such as use transitional words, connectives, etc. • To explain various strategies for the organization of ideas such as introduction, development, transition, conclusion, emphasis, explanation and anticipation.

5	Vocabulary Building	• Introducing Idioms, Proverbs, Phrasal verbs and asking them to use the same. • Connotative and denotative meaning of the words.
6	Collecting and Analyzing Information	• Assigning students to read books, newspapers, magazines and stories to learn from, assess and improve analytical ability. • Allotment will be done before the class.

Evaluation Scheme:

Sr. No.	Evaluation Component	Weightage (%)
1	Attendance	10
2	Assignment(s)	30
3	Class Participation	10
4	Quiz	10
5	Project-I	15
6	Lab Evaluation-I	25
	Total (100)	100

References for Reading :

1. Sanjay Kumar & Pushp Lata “Communication Skills”. New Delhi: Oxford University Press, 2011.
2. M Ashraf Rizvi “Effective Technical Communication”. Chennai, McGraw Hill Education, 2018

Course code	Course Title	Teaching Scheme				
		L	T	P	S	Credits
CE305	Structure Analysis-I	3	1	0	0	4

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation / Additional Continuous Evaluation*	Total Marks	Mid Term Test - I	End Term Test	Class Participation / Additional Continuous Evaluation*	Total Marks
20	20	50	10	100	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Theory)

Basics of Strength of Materials - Types of stresses and strains, Definition of determinate and indeterminate structure, Degree of Freedom, Free Body Diagram, Concept of stress and strain, Mohr's circle of stress and strain, Principle stress and strain examples, Strain – strain relationship, Hook's law, Elastic constants & relation between them, Concept of Principle Axes, Moment of Inertia & Centre of Gravity, Compound and composite bars

Bending Moment and Shear Force – Introduction to bending moment and shear force diagram in beam, simply supported beams, overhanging beams, Beam with varying distributed load, Bending Moment and Shear Force for inclined loading

Concept of Bending & Shear Stresses – Flexural formula, Stress – Strain diagram for beam, Shear stress in beam, Shear stress in beam with different cross-section

Concept of Torsion - Torsion in circular shaft, Torsion Equation, Shear stress in shaft due to torsion, Combined Bending & Torsion

Concept of Slope and Deflection – Introduction to slope and deflection in beam by differential equation, Double Integration method, Moment area method (Mohr's Theorems), Conjugate beam method, Strain Energy Method, Macaulay's method, Maxwell's reciprocal deflection theorem, Betti's theorem of reciprocal deflections, Examples, **Combined Direct & Bending Stresses**

Textbooks:

1. Pytel, A., and Jaan Kiusalaas, "Mechanics of Materials", CL Engineering,2nd edition, 2011
2. Hibbeler, R.C., "Mechanics of Materials SI", 6th SI edition, Prentice Hall
3. Ryder, G.H., "Strength of Materials", Palgrave Macmillan, 1969

Reference Books:

1. Beer, F.P., Johnston, E.R., DeWolf, J.T., "Mechanics of Materials", McGraw Hill, 4th edition,
2. Craig, R.R., "Mechanics of Materials", John Wiley and Sons, 2nd edition, 1999

3. Singh, Sadhu, “Strength of Materials - I”, Khanna Book Publishing, Latest edition
4. Rattan, S.S., “Strength of Materials”, McGraw Hill, New Delhi, 2nd edition

Course code	Course Title	Teaching Scheme				
		L	T	P	S	Credits
CE306	Fluid Mechanics	3	1	2	0	5

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation / Additional Continuous Evaluation*	Total Marks	Mid Term Test - I	End Term Test	Class Participation / Additional Continuous Evaluation*	Total Marks **
20	20	50	10	100	20	50	30	100

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

**The ratio of weightage between Theory and Practical content will be 60%: 40%

Syllabus (Theory)

Unit-I: Introduction: Fluid and continuum, Physical properties of fluids, Rheology of fluids. **Kinematics of Fluid flow:** Types of fluid flows: Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, subcritical, critical and supercritical flows, one, two and three dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential, source, sink, doublet and half-body.

Unit-II: Fluid Statics: Pressure-density-height relationship, manometers, pressure transducers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis. **Dynamics of Fluid Flow:** Euler's Equation of motion along a streamline and its integration, Bernoulli's equation and its applications- Pitot tube, orifice meter, venturi meter and bend meter, , notches and weirs, momentum equation and its Application to pipe bends.

Unit-III: Dimensional Analysis and Hydraulic Similitude: Dimensional analysis, Buckingham's Pi theorem, important dimensionless numbers and their significance, geometric, kinematics and dynamic similarity, model studies.

Unit-IV: Laminar and Turbulent Flow: Equation of motion for laminar flow through pipes, Stokes' law, transition from laminar to turbulent flow, turbulent flow, types of turbulent flow, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, resistance to flow, minor losses, pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and networks.

Unit-V: Boundary Layer Analysis: Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer,

laminar sub layer, separation and its control, Drag and lift, drag on a sphere, a two-dimensional cylinder.

Syllabus (Practical)

1. Determination of viscosity of oil
2. Establish relationship between pressure and height
3. Determination of metacentre of a floating body
4. Verification of conservation of energy in a duct based on Bernouli's theorem
5. Calibration of venturimeter, orificemeter, pitot tube and rotameter
6. Determination of coefficient of friction in close conduit as major losses
7. Determination of minor losses from bend, elbow, sudden contraction, enlargement
8. Lab exercises using Bentley WaterGEMS v8i.

Reference Books:

1. S Narasimhan: First Course in Fluid Mechanics, University Press
2. Som, S.K. & Biswas G.: Introduction of fluid mechanics & Fluid Machines, TMH, 2000, 2nd edition.
3. M M Das: Fluid Mechanics & Turbomachines, Oxford University Press
4. S.K.Agarwal: Fluid Mechanics & Machinery, TMH
5. Garde, R.J., "Fluid Mechanics through Problems", New Age International Pvt. Ltd, New Delhi, 2nd Edition.
6. Hunter Rouse, "Elementary Mechanics of Fluids", John Wiley & Sons. Omc. 1946
7. I.H.Shames, "Mechanics of Fluids", McGraw Hill, Int. Student, Education, 1988.
8. Vijay Gupta and S.K.Gupta, " Fluid Mechanics and its Applications", Wiley Eastern Ltd, 1984.
9. Modi, P.N., and Seth, S.H., "Hydraulics and Fluid Machines", Standard Book, House, 1989.

Course code	Course Title	Teaching Scheme				
		L	T	P	S	Credits
CE308	Surveying	3	0	2	0	4

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation / Additional Continuous Evaluation*	Total Marks	Mid Term Test - I	End Term Test	Class Participation / Additional Continuous Evaluation*	Total Marks **
20	20	50	10	100	20	50	30	100

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

**The ratio of weightage between Theory and Practical content will be 60%: 40%

Syllabus (Theory)

Unit 1: Basic principles, Maps, Topographic Sheets, their scales and uses; Classification of surveys; Linear measurements using chains and tapes, chaining and ranging, principles of chain surveying. Principles of compass survey, Measurement of bearing, whole circle bearings & quadrant bearings, fore bearing and back bearing, Computation of angles from bearings, Plane table survey.

Unit 2: Automatic levels, booking and reducing levels, simple and differential leveling, profile and cross-section leveling, reciprocal leveling, methods of leveling. Contouring: definition, contour interval, characteristics of contours, direct and indirect methods of contouring, interpolation of contours, uses of contour maps, Theodolite, temporary and permanent adjustments, measurement of horizontal and vertical angles.

Unit-3: Modern surveying electronic equipment: digital levels, digital theodolites, EDMs, Total stations; Principles, working and applications; Lasers in surveying.
Total Station: Components Used in Total Station Surveying, functioning and measurements, Slope Staking, Topographic surveys, Construction project layout: building corners, control and offset lines, Leveling , Traverse surveys and adjustments ,Building Face Surveys, Resections, Road (Highway) Surveys.

Unit 4: Global Positioning System: Basic of GPS, Positioning using Satellites, GPS Principles, GPS receivers, GPS Errors and Accuracy, Error sources in GPS observations, References-Global Positioning System, Satellite geometry and Accuracy measures, GPS Measurements Techniques, GPS Algorithms/Navigational Solutions, Other Satellite navigation Systems and GPS Modernization.

Syllabus (Practical)

1. Measurement of offsets for a building
2. Tape and compass traverse survey for a boundary line
3. Simple leveling and measurement of gradients
4. Profile leveling and cross-section leveling for a road line
5. Preparation of a contour sheet for an area
6. Plane table surveying for a land area, traffic junction
7. Measurement of horizontal and vertical angles.
8. Quantity Surveying (Area and Volume Measurement),
9. Field project using total station

Text and References Books:

1. Plain Surveying, AM Chandra, New Age International Publishers
2. Surveying Vol-I, BC Punamia, AK Jain, AK Jain, Laxmi Publishing G.Strang, Linear algebra and its applications (4rh Ed.), Thomson (2006).
3. Surveying and leveling by Subramanian, Oxford Publication.

Course Title and Code

Computational Engineering Analysis – I: **ES1106**

Teaching Scheme	**L-T-P: 3-1-2**
Credits	**5**

Course Objective

The course will cover the basic components of Ordinary Differential Equations (ODE), Complex analysis and Laplace transforms and modelling & simulation of various problems in engineering discipline. Few numerical methods will be introduced to find the numerical solutions of various problems. Various domain specific Engineering problems will be discussed and appropriate simulation tools will be used for solving them.

Course Outcomes:

On successful completion of this course, the students will be able to:

ES1106.1 Solve ordinary differential equations through various techniques.
ES1106.2 Determine the structural behavior of the body by determining the stresses, strains produced by the application of load.
ES1106.3 Analyze the concept of buckling and be able to solve the problems related to column and struts.
ES1106.4 Model the problems of column and struts mathematically in terms of ordinary differential equations and solve them using the appropriate method.
ES1106.5 Simulate the solutions of the above mentioned models of columns and struts.
ES1106.6 Analyze a function of complex variables in terms of analyticity, poles and zeroes.
ES1106.7 Find Laplace and inverse Laplace transforms of given function and use Laplace transform to solve ordinary differential equations.
ES1106.8 Design and Evaluate the LC, RC & RL Networks using Foster'sand Cauer Forms
ES1106.9 Analyze stability criteria for electrical network using pole zero plot and routh-hurwitz polynomials
ES1106.10 Model and simulate electrical networks using Proteus simulator/ Virtual lab.

Prerequisites		**Nil**
Sr. No	**Specifications**	**Marks**
01	Attendance	NA
02	Assignment	NA
03	Class Participation	10
04	Quiz	20

05	Theory Exam I	20
06	Theory Exam II	NA
07	Theory Exam III	30
08	Report-1	NA
09	Report-2	NA
10	Report-3	NA
11	Project -1	NA
12	Project -2	NA
13	Project -3	NA
14	Lab Evaluation-1	10
15	Lab Evaluation-2	10
16	Course portfolio	NA
	Total (100)	100

Evaluation Scheme for Re-Test		
1	Theory Exam-III	30
	Total	30

Syllabus

ODE : Ordinary differential equations of first order and first degree, higher order ODEs with constant coefficients, Differential equation of second order with variable coefficients, Numerical solution of ODEs.

Applications of ODE in structural analysis : column and struts - Definitions, Classifications, Assumptions made in the Euler's Column Theory, Expressions for crippling load of different cases like both the ends are hinged or pinned, one end is fixed and other is free, both ends are fixed, one end is fixed other is hinged, Effective length of column, Slenderness ratio, Crippling stress in terms of Effective length and radius of gyration, limitations of Euler's Formula, Rankine's Formula, Eccentric loading, Johnson's Formula for Columns, both straight line and parabolic formula for columns.

Functions of Complex variables : Complex numbers, complex conjugates, functions of complex variables, real and imaginary parts of a complex function, analytic functions, C-R equations, Poles and zeros of a complex function, Taylor's theorem and Taylor's expansion.

Laplace transform: Basic Laplace transform and inverse Laplace Transforms, solution of ODEs using Laplace transform, solution of system of ODEs using Laplace transform.

Network Functions : Concept of complex frequency, transform independence, network functions of one and two port network, concepts of poles and zeros, properties of driving point and transfer functions, time response stability from pole zero plot, Routh-Hurwitz polynomials.

Network Synthesis: Positive real functions, Basic syntheses procedure, method of syntheses, driving point syntheses of one port network (R-L and R-C and R-L-C).

Transient Analysis: Modeling of Resistors, Inductors, capacitors, operating temperature, transient sources and transient output variables. Complete response of RL, RC, and RLC circuits to step, sinusoidal, exponential, ramp, impulses and the combinations of excitations. Initial value and final value theorem.

Textbook:

1. Advanced Engineering Mathematics, Erwin Kreysig, Wiley, India.
2. Hibbeler, R.C., "Mechanics of Materials", 6th SI edition, Prentice Hall

References :

1. Thomas' Calculus, M.D. Weir and J. Hass, Pearson.
2. Engineering Mathematics, Srimanta Pal and Subodh C. Bhunia, Oxford University Press, New Delhi, India.
3. Higher Engineering Mathematics, B.V. Ramana, Mc Graw Hill Education.
4. T.K.Nagsarkar,M.S. Sukhija,"Basic Electrical Engineering", Oxford University press, 2nd edition, 2011.
5. Roy Choudhary, "Network Theory", TMH, 3rd Edition, 2004.
6. Edminister Joseph A., "Electrical Circuits, Schaum's Outline Series", Tata McGraw Hill, 3rd edition, 2012.
7. Hayt W.H., Kemmerly J. E., Durbin S. M., "Engineering Circuit Analysis", Tata Mcgraw Hill, 6th edition, 2006.
8. Beer, F.P., Johnston, E.R., DeWolf, J.T., "Mechanics of Materials", 4th edition, McGraw Hill. Craig, R.R., "Mechanics of Materials", 2nd edition, John Wiley and Sons.

Course Title and Course Code	**Engineering Measurements and Machines (ES1107)**
Hours per Week	**L T P: 3 0 4**
Credits	**5**
Students who can take	**B. Tech Semester-III**

Course Objectives:

The aim of this course is to impart the knowledge of mechanical and electrical machine used in industries. Students will learn the fundamental of engineering principles governing the engineering process and its use in real-world. Students will get the knowledge of sensors, actuators and its selection process for any industrial application.

Course Outcomes:

On successful completion of this course, the students be able to:

ES1107.1 Evaluate suitable electrical and non-electrical instruments for measuring physical quantities.

ES1107.2 Analyze the construction, characteristics and applications of various types of rotating machines.

ES1107.3 Analyze the working of any mechanical and electrical machine using mathematical model.

ES1107.4 Integrate the sensors for monitoring and automation of electrical and mechanical systems.

ES1107.5 Design electro-mechanical machines as per Indian standards.

Prerequisites	**Basics of Physics**

Evaluation Scheme

Sr. No	**Specifications**	**Marks**
1	Attendance	NIL
2	Assignment	10
3	Class Participation	5
4	Quiz	5
5	Theory Exam-I	10
6	Theory Exam-II	10
7	Theory Exam-III	20
8	Report-I	NIL
9	Report-II	NIL
10	Report-III	NIL
11	Project-I	10
12	Project-II	NIL
13	Project-III	NIL
14	Lab Evaluation-I	10
15	Lab Evaluation-II	10
16	Course Portfolio (MOOC Course)	10
Total (100)		**100**

Evaluation scheme for Retest		**Marks**
1	Theory Exam	20
2	Lab Evaluation (Exam)	10

Total	30

Syllabus (Theory):

Unit-I: Measurement, Instrumentation and Calibration
Introduction, types of applications of measurement instrumentation, performance characteristics, error in measurements, calibration and standards, static and dynamic characteristics of instrument, Measuring Instruments, Digital meters, Function Generators, AC Bridges, Electronic Instruments for Measuring Basic Parameters.

Unit-II: Transducers
Classification of transducers, Selection of transducers, measurement of physical quantities, Elements of data acquisition system, Smart sensors.

Unit-III: Transformers
Construction, principle of operation, equivalent circuit, losses, testing, efficiency and voltage regulation, auto transformer, three phase connections, parallel operation of transformers, tap changing.

Unit-IV: Rotating Machines
DC Machines
Construction, EMF and torque equation, circuit model, armature reaction, methods of excitation, characteristics of generators, characteristics of motors, starting and speed control, testing and efficiency.
Induction Motors: Construction, working principle, classification and applications, equivalent circuit, Torque - slip characteristics, starting and Speed control of induction motors.

Unit-V: Mechanical Machines
Turbines: Introduction to steam turbines, Impulse and Reaction turbines, turbine power and related calculations.
Pumps: Introduction of pumps, centrifugal pumps, working of centrifugal pumps, Cavitation and its effect on pump, working of reciprocating pumps, Application of pumps in industries.
Power Transmission Systems: Mechanical drives and their performance analysis.

List of Experiments:
Measurement
1. To Determine Output characteristics of LVDT and Measure of Displacement Using LVDT.
2. Measurement of Inductance using Maxwell's bridge.
3. Measurement of earth resistance by earth tester and measurement of Insulation resistance by Megger.

Electrical Machines
1. To perform Ratio, Polarity and Load test on a single-phase transformer.
2. To perform open circuit and Short circuit test on a single-phase transformer and hence determine its equivalent circuit parameters.
3. To find the relation between open circuit voltage and field current of:

   (i) Separately excited DC generator, (ii) Self excited DC shunt generator
4. Speed control of DC shunt motor: (i) By varying field current with armature voltage constant. (ii) By varying armature voltage with field current kept constant.

5. To perform No load and blocked rotor test on a three-phase Induction Motor, and hence determine its equivalent circuit parameters.

Mechanical Machines

1. To study the performance of turbines used in steam power plant
2. To study the performance of belt drive system used for power transmission.

Text Books:

1. H S Kalsi, Electronic Instrumentation, McGraw Hill Education (India) Private Limited.
2. Nagrath I. J and Kothari D. P. 'Electric Machines', Tata McGraw Hill Publishing Company Ltd.
3. B. L. Theraja, and A. K. Theraja, Text of Electrical Technology, Vol -2; S. Chand Publication.
4. J B Gupta, Theory and Performance of Electrical Machines, S.K. Kataria and Sons.
5. Ashfaq Hussain, Electrical machines, Dhanpat Rai and Co.
6. P S Bimbhra, Generalised theory of rotating machines, Khanna Publishers.
7. R K Bansal, A Textbook of Fluid mechanics and Hydraulic machines, Laxmi Publication (P) ltd.
8. S S Ratan, Theory of Machines, Tata McGraw-Hill.

Reference Books:

1. Fitzgerald and C. Kingsley Jr., Electric Machinery, McGraw-Hill Book Co.
2. Chapman, Electric Machinery Fundamentals, The McGraw-Hill Companies, Inc.

Online sources:

Electrical Measurement and Electronic Instruments

https://nptel.ac.in/courses/108/105/108105153/

Sensors and Sensor Circuit Design

https://www.coursera.org/programs/j-k-lakshmipat-university-on-coursera-kzogk/browse?index=prod_enterprise_products&productId=487N_QqXEeeqsQo32tjRBA&productType=course&query=Sensor&showMiniModal=true

Electrical Machines

https://nptel.ac.in/courses/108/102/108102146/

Motors and Motor Control Circuits

https://www.coursera.org/programs/j-k-lakshmipat-university-on-coursera-kzogk/browse?index=prod_enterprise_products&page=3&productId=-i5RF2jdEeecwwoEvbWpsg&productType=course&query=Electrical+Machines&showMiniModal=true

Turbines and Pumps

https://nptel.ac.in/courses/112/103/112103249/

Power Transmission Systems
https://www.youtube.com/watch?v=3UaFeNm_ZF8

Course Title – Perspectives on Contemporary Issues
Semester - III
Credit- 2
Course code-CC1103
Faculty: Shraddha Bharatiya

Course Description

In an era of globalization, there is an increasing need for the youth to be able to empathize with others, value diverse perspectives and cultures and understand how events around the world are intertwined. Global issues revolve around social, economic and environmental factors which ultimately add to the interconnectedness of countries. In this course, students will employ key critical thinking concepts to analyze contemporary issues from multiple perspectives. They will explore the impact at micro and macro levels.

Course Outcomes

The students will be able to:

CC1103.1 Identify different perspectives objectively.
CC1103.2 Explain interconnectedness of the issues and their impact at micro and macro levels.
CC1103.3 Recognize their own beliefs, biases, claims and assumptions.
CC1103.4 Evaluate sources, argue and defend effectively.

Methodology

This course will be an amalgamation of brief lectures and activity based learning i.e. films, group discussions, debates, and case studies. The objective behind utilizing activity based learning is for the learners to have a more hands on experience. This will encourage and ensure active participation and longer retention. The idea is for learners to feel engaged and also express their views in a conducive environment. The takeaway from this course will not only be awareness about certain issues but equipping learners with skills of decision making and reasoning in alignment with certain global contexts.

Evaluation Scheme

Prerequisites		**N/A**
Hours per Week		**L-T-P: 2-0-1**
Credits		**2**
Sr. No	**Specifications**	**Weightage**
01	Attendance	Nil
02	**Assignment**	**20**
03	**Class Participation**	**20**
04	**Quiz**	**20**
05	Theory Exam	Nil

06	Theory Exam	Nil
07	**Theory Exam**	**20**
08	**Report-1**	**20**
09	Report-2	Nil
10	Report-3	Nil
11	Project -1	nil
12	Project -2	Nil
13	Project -3	Nil
14	Lab Evaluation	Nil
15	Lab Evaluation	Nil
16	Course portfolio	Nil
	Total (100)	**100**

Course Content	
Introduction to contemporary perspective	Introduction to the course, skills and the topics. Revision of critical thinking.
Research, analysis & evaluation of a topic from local, national and global perspectives	**Climate Change and Sustainability** *Understanding the magnitude of the issue, its impact and future challenges.* *How we can meet our current needs without diminishing the quality of the environment or reducing the capacity of future generations to meet their own needs.*
	Globalization *With increasing development throughout the world, the focus of this theme will be on the impact of globalization in India.*
	Nationalist Movement *There is a sense that excesses of globalization have created an identity crisis across the world, facilitating the rise of nationalist movements. Rising nationalism is seen everywhere, from the election of Donald Trump to Brexit, the success of far-right parties in Italian, German and Austrian elections in 2017 and 2018, nationalism appears to be on rise globally. We will look at its reasons and implication.*
	Technology *Impact of unprecedented technological growth, challenges and opportunities.*
	Social justice and human rights *An understanding of the impact of inequality and discrimination, the importance of standing up for our own rights and our responsibility to respect the rights of others.*

Readings:

Books

1. *Harari, Y. N. (2019). 21 Lessons for the 21st century. Toronto: CELA.*
2. *GUHA, R. (2019). India After Gandhi: the history of the world's largest democracy. NEW YORK: ECCO.*
3. *Rosling, H., Rosling, O., & Rönnlund Anna Rosling. (2019). Factfulness: ten reasons were wrong about the world - and why things are better than you think. London: Sceptre.*
4. *Kolbert, E.(2015). The Sixth Extinction: An unnatural History. Bloomsbury*

Articles
https://www.theguardian.com/environment/2015/mar/08/how-water-shortages-lead-food-crises-conflicts
The Cultural Challenges of Meeting Climate Change Goals: Montreal Weighs an Emissions Ban on Iconic Wood-Fire Bagel Shops Andrew Hoffman Pub Date: Apr 11, 2019 Source: WDI Publishing at the University of Michigan
Prototyping a Scalable Smart Village to Simultaneously Create Sustainable Development and Enterprise Growth Opportunities Solomon Darwin; Henry W. Chesbrough Pub Date: Jan 1, 2017 Source: UC Berkeley - Haas School of Business
bKash: Financial Technology Innovation for Emerging Markets Ishtiaq Mahmood; Marleen Dieleman; Narmin Tartila Pub Date: Jun 28, 2017 Source: Ivey Publishing
The Panic of 2008 and Brexit: Regional Integration versus Nationalism Robert F. Bruner; Kevin Hare Pub Date: Oct 9, 2017 Source: University of Virginia Darden School Foundation
Biblio Credit Union: Social Inequality and the Living Wage Kent Walker; Curtis Labutte Pub Date: Jan 30, 2017 Source: Ivey Publishing

Course Name: Programming Week
Course Code: CS1104
Credits: 2

Course Description: This course teaches object-oriented programming to those who have learnt basic programming concepts and are ready to learn in-depth programming. It focuses on object-oriented programming using JAVA. The main concepts are: Classes, Objects, Data Abstraction, Data Encapsulation, Overloading, Overriding, Polymorphism, Inheritance, Interfaces, Exception Handling, and Database Connectivity. This course also covers basic concepts for software design and reuse.

Course Outcome:

On successful completion of this course, the students should be able to:

CS1104.1	Name and apply some common object-oriented design patterns and give examples of their use.
CS1104.2	Write programs in Core JAVA.
CS1104.3	Design develop and debug software applications taking into account coding and documentation standards.
CS1104.4	Apply concepts like interfaces and abstract classes in Java program design and implementation.
CS1104.5	Design and create web based and other applications using practices of object-oriented concepts.
CS1104.6	Use java collection API.
CS1104.7	Evaluate different integrated development environment e.g. NetBeans, Eclipse with respect to creation.
CS1104.8	Use energy saving programming practices.

Course code	Course Title	Teaching Scheme				
		L	T	P	S	Credits
CE405	Structure Analysis-II	3	1	0	0	4

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation / Additional Continuous Evaluation*	Total Marks	Mid Term Test - I	End Term Test	Class Participation / Additional Continuous Evaluation*	Total Marks**
20	20	50	10	100	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Theory)

Unit 1: Analysis of indeterminate beams & frames: Static determinacy and indeterminacy, strain energy and energy theorems – theorem of minimum potential energy, principle of virtual work, castigliano theorem, betti's law, clerk maxwell's reciprocal theorem, Force Method, displacement method, Three Moment Theorem, Column Analogy Method, moment distribution method.

Unit 2; Analysis of trusses: indeterminate truss by force method, displacement method

Unit 3: Analysis of arches: three hinged arches (determinate) and two hinged arches (indeterminate)

Unit 4: Columns and Struts - Definitions, Classifications, Assumptions made in the Euler's Column Theory, Expressions for crippling load of different cases like both the ends are hinged or pinned, one end is fixed and other is free, both ends are fixed, one end is fixed other is hinged, Effective length of column, Slenderness ratio, Crippling stress in terms of Effective length and radius of gyration, limitations of Euler's Formula, Rankine's Formula, Eccentric loading, Johnson's Formula for Columns, both straight line and parabolic formula for columns, Examples .

Reference Books:

1. Yuan Yu Hsieh (1987) Elementry Theory of Structures, 3rd edition, Prentrice Hall.
2. Ghali, A., Neville, A. M., Structural Analysis (Unified Classical and Matrix Approach), Chapman and Hall Ltd.
3. Menon, Devdas (2008) Structural Analysis Structural Analysis, Narosa Publishing House Narosa Publishing House Pvt. Ltd., New Delhi.
4. Menon, Devdas (2009) Advanced Structural Analysis, Narosa Publishing House, New Delhi. House, New Delhi.
5. R. C. Hibbeller (2002), Structural Analysis, 5th ed, Pearson Education.
6. J. Mc Carmac and R.E.Elling, Structural Analysis: A classical and Matrix Aapproach, Harper and Row Publishers.

Course Code and Name: CE402 Engineering Geology and Building Construction
Teaching Scheme: 3 0 2 0
Credit: 4

Course Outcomes:

On successful completion of this course students will be able to:

CE402.1 Apply the geological concepts for the Civil Engineering applications.

CE402.2 Identify and classify common minerals, rocks and soils, and understand their significance to different types of engineering projects.

CE402.3 Analyze the possible geological problems to evaluate sites for the construction of Dam, Tunnel and Bridges.

CE402.4 Analyze the effect of weathering phenomenon on civil engineering works.

CE402.5 Plan precautions against faulting, folding, bedding planes, joints, cracks, fissures etc. and permeability and ground water conditions

CE402.6 Understand the components of a building and their functions,

CE402.7 Select appropriate building materials required for building construction as per IS Code.

CE402.8 Incorporate principles of sustainability in making building construction decisions that conserve natural resources.

Syllabus (Theory)

Part 1: Engineering Geology

Unit I-Earth Sciences: Introduction,

Basics of Engineering Geology: Scope of Engineering Geology for a Civil Engineer

Types of Geology: Physical geology and mineralogy

Unit II- Petrology: Classification of rocks and their uses as building and road materials

Failures in Earth crust: Historical geology; Structural geology: Folds, faults, unconformity etc.

Unit III-Investigation in Geology: Engineering geology: Geological investigations at dam, tunnel and bridge sites and influence of various structures

Precautions in different earth planes: Precautions against faulting, folding, bedding planes, joints, cracks, fissures, permeability and ground water condition.

Part 2: Building Construction and Materials

Unit IV Components of a building and their functions, foundation, shallow and deep foundation, grillage, raft, inverted arches, causes of failure of foundations and remedial measures, Masonry: types- Bricks and stone masonry, functions, material requirements, different bonds, damp proofing course

Unit V Shoring, under pining, scaffolding, horizontal and vertical shores, purpose and methods of under pinning, different types of scaffolding, floors and roofs: types, details of construction and materials

Unit VI Doors: paneled, glazed, flushed doors, collapsible steel doors, Windows: Casement, Sash, and Skylight windows, Staircase: Requirement of a good staircase, different types of staircases

Unit VII Physical and chemical characteristic of commonly used building materials in Civil Engineering construction – Clay, Sand, Stone, Lime, Cement, Concrete, Bricks, Silica, Aluminum and Timber with reference to its specifications. Plywood, asbestos, plastics and polymer-based materials.

Syllabus (Practical)

1. Megascopic study of minerals
2. Megascopic study: Igneous, Sedimentary, Metamorphic
3. Understand fold and faults within a rock mass
4. Study geological features of rocks such as strike and dip
5. Soil erosion and physical weathering in the rocks
6. Structural analysis using stereo nets or Wulff's net
7. Geological maps representing the geological structure of some segment
8. Use of GPS instrument for geological data generation.

Evaluation Scheme:

Prerequisites		A Basic Civil Engineering Materials Course
Teaching Scheme (Hours per Week)		L T P: 3 0 2
Credits		4
Sr. No.	**Evaluation Component**	**Marks**
1	Attendance	5
2	Assignment	10
3	Class Participation	5
4	Quiz	5
5	Theory Exam-I	10
6	Theory Exam-II	NIL
7	Theory Exam-III	20
8	Report-I	5
9	Report-II	NIL
10	Report-III	NIL
11	Project-I	10
12	Project-II	NIL
13	Project-III	NIL
14	Lab Evaluation-I	10
15	Lab Evaluation-II	20
16	Course Portfolio	NIL
	Total (100)	100

Textbook(s)

1. Prof. Prabin Singh, 'Engineering & General Geology" S K Kataria & Sons, 8th edition, 2008
2. Principles of Engineering Geology, Bangar
3. B.C. Punmia, "Building Construction", Laxmi Publications Pvt. Ltd.
4. Sushil Kumar, Building Construction, Standard Publishers, Delhi.

Reference Book(s)

1. Structural Geology by Billings
2. Petrology by Tyrll
3. Surendra Singh, Engineering Materials, Konark Publishers Pvt. Ltd.
4. D.S. Arora, 'Text Book of Engineering Materials', Kalyani Publishers
5. Building Planning and Drawing by Dr. N. Kumara Swamy, A. Kameshwara Rao, Charotar Publishing House Pvt. Ltd.

Video Links:

https://nptel.ac.in/courses/105105106/
https://youtube.com/results?search_query=engineering+geology++lectures+for+civil+engineering

Course code	Course Title	Teaching Scheme				
		L	T	P	S	Credits
CE409	Concrete Technology	3	0	2	0	4

Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation / Additional Continuous Evaluation*	Total Marks	Mid Term Test - I	End Term Test	Class Participation / Additional Continuous Evaluation*	Total Marks **
20	20	50	10	100	20	50	30	100

**The ratio of weightage between Theory and Practical content will be 60%: 40%

Course Syllabi (Theory):

Review of constituent materials – Cement, Aggregates and mix design, admixtures,
Properties of concrete in fresh and hardened state, special concretes, durability of concrete subjected to extreme environment,
Deterioration mechanisms, assessment and control of corrosion in concrete structures,
In-situ assessment of concrete structures,
Various NDT techniques and their applications, Repair of concrete structures

Syllabus (Practical)

1. Tests on cement – specific gravity, fineness, soundness, normal consistency, setting time, compressive strength on cement mortar cubes
2. Tests on fine aggregate – specific gravity, bulking, sieve analysis, fineness modules, moisture content, bulk density and deleterious materials.
3. Tests on coarse aggregate - specific gravity, sieve analysis, fineness modulus, bulk density.
4. Tests on Fresh Concrete: Workability: Slump, Compaction factor tests, Flow table test.
5. Indian standard method of test for permeability of cement mortar and concrete.
6. Hardened Concrete: Compressive strength on Cubes, Static modulus of elasticity, Flexure tests, Nondestructive testing
7. Mix Design of Concrete.

Textbook(s)/ Reference Book(s)

1. Neville, A.M. and Brooks, J.J.," CONCRETE TECHNOLOGY", ELBS .1990.
2. Mehta, P.K., "CONCRETE Structure, Material and Properties" Prantice Hall Inc.1986.
3. Newman, K., "CONCRETE SYSTEMS in COMPOSITE MATERIALS". EDT BY L.Holliday. Elsevier Publishing Company. 1966.

Powers, T.C., "THE PROPERTIES OF FRESH CONCRETE". JOHN WILEY & SONS, INC. 1968.

Course Code and Name: CE403 Hydraulic Engineering
Teaching Scheme: 3 0 2 0
Credit: 4

Course Outcomes
After course completion, the student will be able to:

CE403.1 Explain the principles governing the open channel flow.
CE403.2 Classify the various types of flow in open channels.
CE403.3 Design the most efficient cross section of channel for uniform flow.
CE403.4 Compute the gradually varied flow profiles in prismatic and non-prismatic channels.
CE403.5 Analyze the flow in channels by open source software HEC RAS.
CE403.6 Compute the rapidly varied flow profile (hydraulic jump) in open channels.
CE403.7 Explain the basic equations and principles of unsteady flow in open channel.
CE403.8 Explain the principles governing the flow in rivers and canals with sediments.
CE403.9 Explain the various forms of river.
CE403.10 Explain the various sources of water in rivers.
CE403.11 Design the canals with and without sediments with IS standards.

Syllabus (Theory)

Unit 1: Basic Principles: open channel flow and its classifications, and properties, energy and momentum principles, Critical flow computation and its applications, transitions with sub critical and super critical flows.
Unit 2: Uniform flow, roughness coefficient, computation of uniform flow in prismatic channel, design of non- erodible channels for uniform flow, Most efficient channel section, compound sections
Unit 3: Gradually varied flow: Theory and analysis, gradually varied flow computations in prismatic channels, gradually varied flow in non-prismatic channels. Rapidly varied flow: Theory of hydraulic jump, evaluation of jump elements in rectangular and non-rectangular channel, location of jump on horizontal floor, channel controls and transitions, free over fall, thin plate weirs, broad crested weirs, and sluice gates.
Unit 4: Unsteady flow in open channels, surge movement in open channels, Numerical methods to solve Saint-Venant Equation
Unit 5 River regions and their characteristics - classification of rivers on alluvial plains - meandering of rivers, design of canals with sediments

Syllabus (Practical)

1. Calibration of triangular notch for field installation
2. Study on velocity distribution in an open channel
3. Study phenomena of hydraulic jump
4. Study on critical depth of flow

5. To perform the Reynolds experiment for determination of different regimes of flow.
6. To study the movement of surge in open channel
7. To study the sediment movement in channels

Course Evaluation for Hydraulic Engineering

Prerequisites		Fluid Mechanics
Teaching Scheme (Hours per Week)		3 0 2
Credits		4
Sr. No.	**Evaluation Component**	**Marks**
1	Attendance	NIL
2	Assignment	5
3	Class Participation	5
4	Quiz	NIL
5	Theory Exam-I	10
6	Theory Exam-II	10
7	Theory Exam-III	40
8	Report-I	NIL
9	Report-II	NIL
10	Report-III	NIL
11	Project-I	NIL
12	Project-II	NIL
13	Project-III	NIL
14	Lab Evaluation-I	10
15	Lab Evaluation-II	20
16	Course Portfolio	NIL
	Total (100)	100

Text /References Books:

1. V.L. Streeter, “Fluid Mechanics”, Mc Graw-Hill, N.Y, USA.
2. 2.R.J. Garde “Fluid Mechanics” RPH, Roorkee.
3. Shames, “Mechanics of fluids”, Mc Graw-Hill (Int. St. ed.) Auckland, NZ
4. A.K. Jain “Mechanics of fluids”, Khanna Publisher., Delhi
5. Subramanya, “Flow in Open channels”
6. K G Ranga Raju, “Flow through open channel”
7. V.T Chow “Open channel Hydraulics”
8. Bakhmeteff, “Hydraulics of open channel”
9. Henderson, “Open channel flow”

Course code	Course Title	Teaching Scheme				
		L	T	P	S	Credits
ES1109	Computational Engineering Analysis – II	3	1	2	0	5

Course Objectives: The course will develop ability to use Partial Differential Equations (PDE), Fourier transforms and Z-transform for a variety of Engineering applications from fluid dynamics, heat conduction and circuit design**.** It also aims to develop skills for using common simulation software i.e. ANSYS Fluent and MATLAB. Few numerical methods will also be introduced to find the numerical solutions of various problems.

Course Outcomes:

On successful completion of this course, the students should be able to:

ES1109.1 Classify various types of partial differential equations and solve them through various analytical and numerical methods.

ES1109.2 Formulate and analyze differential equations especially Navier stokes and energy equations and use numerical methods for solving the same.

ES1109.3 Use CFD software to model relevant engineering flow problems.

ES1109.4 Find Fourier and inverse Fourier transforms of given function and use Fourier transform to solve partial differential equations.

ES1109.5 Find Z-transform and inverse Z-transforms of given functions and use them to analyse control systems.

ES1109.6 Design and analyse various types of filters and attenuators to minimize power losses and improve signal quality.

ES1109.7 Solve problems involving vertex and edge connectivity, planarity and crossing numbers.

Assessment Scheme:

Prerequisites		***Elementary Calculus***
Teaching Scheme (Hours per Week)		L T P 3 1 2
Credits		5
Sr. No.	**Evaluation Component**	**Marks**
1	Attendance	NA
2	Assignment	10
3	Class Participation	NA
4	Quiz	5
5	Theory Exam-I	15
6	Theory Exam-II	15
7	Theory Exam-III	30
8	Report-I	NA
9	Report-II	NA
10	Report-III	NA
11	Project-I	NA
12	Project-II	NA
13	Project-III	NA
14	Lab Evaluation-I	10

15	Lab Evaluation-II (Continuous)	15
16	Course Portfolio	NA
	Total (100)	100
Evaluation Scheme for Re-Test		
1	Theory Exam-III	30
	Total	30

Course Syllabi (Theory):

PDE : Partial Differential Equations of First Order, Variable separable technique for solving PDE. Heat equation, wave equation, Laplace equation
Boundary value problems: Solution of boundary value problems using separation of variables technique.
Numerical solution of PDE.

Application of PDE: Momentum and Energy Transport:
The governing equations of fluid dynamics- models of the flow, continuity equation, momentum equation, Energy equation, boundary conditions. Poisouli's flow, Couette flow, steady and unsteady conduction.
Fourier Transforms : Fourier transform and inverse Fourier transform, properties of Fourier transform, Applications in solving Partial differential equations.
Filter Circuits: Types of passive filters, design low-pass, High-pass, Band-pass, Band-reject filters as constant k type, design low-pass, High-pass, Band-pass, Band-reject filters as m-derived type, Advantages of active filters over passive filters.
Graph Theory : Introduction, Linear graph of a network, Tie-set and cut-set schedule, incidence matrix, cut-set, and tie-set. Graph theory application to a practical radial system.
Z-transform : Introduction, standard z- transform, properties of z – transform, initial and final value theorems, inverse z-transform, applications in control systems.

Textbook:

3. Advanced Engineering Mathematics, Erwin Kreysig, Wiley, India.
4. White F. M., "Fluid Mechanics" Tata McGraw-Hill, New Delhi.
5. Incropera F P "Principles of Heat and Mass Transfer", John Wiley & Sons.
6. Hayt W.H., Kemmerly J. E., Durbin S. M., "Engineering Circuit Analysis", Tata Mcgraw Hill, 6th edition, 2006.

Reference Books –

1. Thomas' Calculus, M.D. Weir and J. Hass, Pearson.
2. Engineering Mathematics, Srimanta Pal and Subodh C. Bhunia, Oxford University Press, New Delhi, India.
3. Higher Engineering Mathematics, B.V. Ramana, Mc Graw Hill Education.
4. Fox and McDonald, "Introduction to fluid dynamics", John Wiley & Sons.
5. Cengel Y. "Heat and Mass Transfer" Tata McGraw-Hill, New Delhi.
6. J. D. Anderson Jr. "Computational Fluid Dynamics" McGraw-Hill International Edition.
7. Roy Choudhary, "Network Theory", TMH, 3rd Edition, 2004.
8. Edminister Joseph A., "Electrical Circuits, Schaum's Outline Series", Tata McGraw Hill, 3rd edition, 2012.

Course Title and Code: Communication and Identity |CC1104| Semester IV

Course Objective:

This course enables students to explore their personal and professional identities, to create their distinctive presence. It intends to help them gain an understanding of the basic purpose, benefits, and responsibilities of self-presence, and to begin the process of defining their values, strengths, and goals, which also helps them enhancing their professional readiness.

Course Outcomes

CC1104.1	Analyse their personal identities, both private and social
CC1104.2	Identify their different values, strengths and areas of professional interest
CC1104.3	Articulate their personal statement and use it to craft an influential pitch
CC1104.4	Express themselves through various communication formats on different platforms

Prerequisites		**N/A**
Hours per Week		**L-T-P: 2-0-0**
Credits		**2**
Sr. No	**Specifications**	**Weightage**
1.	Assignment	40
2.	Class Participation	10
3.	Theory Exam III	30
4.	Presentation	20
	Total	**100**

Syllabus:

Module	Topics	
Identifying Self	Factor that shape our identity	The 3 Types of Diversity that shape our identities. Three things: demographic diversity (our gender, race, sexual orientation, and so on), experiential diversity (our affinities, hobbies, and abilities), and cognitive diversity (how we approach problems and think about things).
	Internal confidence or "principle-centred living"	Living a principle-centred life is the key to excelling in all other areas of our living. A principle is based on the fundamental idea that there is learned behavior that governs human effectiveness.

	Personal Statement	Use of story map to create a personal statement.
Persuasive Communication	Steps to build a Personal Identity	Personal Identity through brand building exercise: meaning, importance and how to create and use it; the three Cs of personal branding
	Online presence	Creating an online presence for professional and personal branding through social media.(LinkedIn, Facebook etc.)
	Elevator Pitch, Cover Letter	Elevator Pitch: Meaning and use of an elevator pitch in interview and workplace; techniques to craft and improve their pitch Purpose of a cover letter, types of the cover letter, the structure of a cover letter and tips on the cover letter, to craft their cover letter to be used for placements
	Presence in Group Discussion and Personal Interviews	Practice different types of group discussions, dos and don'ts of group discussions and use of techniques to perform well in GDs

References for Reading:

1. O'Brien, T. (2019). When your job is your identity, professional failure hurts more. *Harvard Business Review*.
2. Anca, C., & Aragón, S. (2018). The 3 types of diversity that shape our identities. *Harvard Business Review*.
3. Craig, N., & Snook, S. (2014). From purpose to impact. *Harvard business review*, *92*(5), 104-111.
4. Detert, J. R. (2018). Cultivating everyday courage. *Harvard Business Review*, *96*(6), 128-135.

Dutta, S. (2010). What's your personal social media strategy? *Harvard business review*, *88*(11), 127-30.

Course Title: Introduction to Design Course Code: IL1102	
Hours per Week	30
Credits	2
Students who can take	2nd Year B. Tech

Course Objective: Taking an idea forward from an intangible thought to a material-based product or visually communicable form requires a definitive plan of action. Using the methods of design thinking and design process the students will be able to bring their ideas to life.

Course Outcome:

On successful completion of this course, the students should be able to:

IL1102.1	Sketch their ideas on paper to visualize and assess viability.
IL1102.2	Create a plan for process and management to materialize the desired idea.
IL1102.3	Test the material for possibilities and capabilities.
IL1102.4	Develop skills of joinery, material manipulation and various hand tools.
IL1102.5	Develop technical and narrative skills useful for both film and animation.
IL1102.6	Develop Troubleshooting and problem-solving skills.

Evaluation Scheme

Sr. No	Specifications	Marks
1	Attendance	Nil
2	Assignment	20
3	Class Participation	10
4	Quiz	Nil
5	Theory Exam I	Nil
6	Theory Exam II	Nil
7	Theory Exam III	Nil
8	Report-1	Nil
9	Report-2	Nil
10	Report-3	Nil
11	Project -1	35
12	Project -2	35
13	Project -3	Nil
14	Lab Evaluation1	Nil
15	Lab Evaluation2	Nil
16	Course portfolio	Nil
	Total (100)	**100**

Course Contents:

Introduction to Design Process.
Material properties – wire and wood.
Material joinery – Mortise and Tenon, Dowel Joints.
Use of tools – plier, grinder, saw.
Developing creative thinking.
Basic drawing and visualisation skills including 2D to 3D - Form exploration.
Principles of animation.
Technical aspects of animation and film making (Frame rate, persistence of vision).
Building a Narrative – Start, Middle and End of a story.

Mediums of animation.

Suggested Reading Materials:

1. https://www.familyhandyman.com/woodworking/wood-joints/simple-joinery-options/
2. Simple wooden toymaking by Mathias, available at MP Ranjan LRC Call number: 745.592
3. https://www.hsn.com/article/wire-working-how-to-manipulate-wire-to-create-art/449
4. https://savedbylovecreations.com/2013/10/50-awesome-things-to-make-from-wire.html

   (Craft based, to be used as a reference for wire malleability)
5. https://in.pinterest.com/pin/768004542687478864/
6. https://in.pinterest.com/pin/619174648753039614/
7. https://www.youtube.com/watch?v=_ppedXZHhEo (Stop Motion Basics)
8. https://www.youtube.com/watch?v=p5SygzMSLhM (Stop Motion in Movies)
9. https://www.youtube.com/watch?v=GcryIdriSe4 (12 principles of animation)

Course code	Course Title	Teaching Scheme				
		L	T	P	S	Credits
CE1107	Design of RCC and Steel Structures	3	0	2	0	4

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test – I	Mid Term Test - II	End Term Test	Class Participation / Additional Continuous Evaluation*	Total Marks	Mid Term Test - I	End Term Test	Class Participation / Additional Continuous Evaluation*	Total Marks **

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Theory):

RCC with Steel Structures

Design of RCC structures

Reinforced Concrete Materials: Concrete- Grade of concrete, Characteristic strength, Compressive strength, Flexural tensile strength, modulus of elasticity and Poisson's Ratio, creep & shrinkage, Stress-strain behavior, Design stress-strain curve of concrete, Nominal mix and design mix of concrete. **Reinforcing steel**-Types, sizes and grades, Stress-strain behavior, Design stress-strain curve. Sustainable concrete by using Recycled Concrete Aggregates (RCA) & other waste materials.

Basic concepts of Reinforced Concrete Design: Working Stress Method (WSM), Ultimate Load Method (ULM) and Limit State Method (LSM), Characteristic strength of materials, Characteristic loads, Partial safety factors for materials and loads.

Reinforced Concrete Beams: Design of singly & doubly reinforced rectangular sections in flexure, Design for shear, Design for bond and anchorage of reinforcement.

Slabs: Analysis and design of one way and two-way slabs by LSM.

Design of Steel Structures

Introduction and Design Philosophies: Types of Structural Steel, structural steel sections, Working Stress Method (WSM) and Limit State Method (LSM).

Introduction to Connections: Types of Bolts, Bolted and Welded Connections under axial loadings.

Tension Members: Design of axially loaded tension members.

Compression Members: Design of axially loaded compression members, Design of Built-up Columns.

IS Codes:

1. IS 456-2000 *Plain and Reinforced Concrete - Code of Practice*
2. IS: 800-2007 General Construction in Steel-Code of Practice

3. SP 6-1: ISI Handbook for Structural Engineers -Part- 1 Structural Steel Sections

Textbooks:

1. Pillai, S.U. and Menon, D., “Reinforced Concrete Design”, McGraw Hill Education (India) Pvt. Ltd (2003).
2. Sinha, S. N., “Reinforced Concrete Design”, Tata McGraw Hill Education Pvt. Ltd. (Second Edition).
3. Jain, A.K., “Reinforced Concrete Limit State Design”, Nem Chand & Brothers, Roorkee (2012)
4. Subramanian, N., “Steel Structures-Design and Practice”, Oxford University Press (2008).
5. Arya, A.S. and Ajmani, J.L., “Design of Steel Structures”, Nem Chand & Brothers (2000).
6. Duggal SK, “Limit State Design of Steel Structures”, Tata McGraw Hill (Third edition)

Course code	Course Title	Teaching Scheme				
		L	T	P	S	Credits
CE1108	Geotechnical Engineering	3	0	2	0	4

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation / Additional Continuous Evaluation*	Total Marks	Mid Term Test - I	End Term Test	Class Participation / Additional Continuous Evaluation*	Total Marks**
20	-	30	5	80	-	20	-	20

Syllabus (Theory):

Historical Development of Soil Engineering: Origin and general types of soils, Soil structure, Clay minerals, Three phase system, Identification and Classification of soils.

Soil Water-Capillary Phenomena: Concept of effective and neutral stresses, Permeability, Determination of coefficient of permeability in the laboratory, Seepage flow, Head, Gradient, Pressure, Steady state flow, Two-dimensional flow net.

Vertical Stress Distribution in Soil: Boussinesq and Westergaard's equation, Newmark's influence chart, Principle, Construction and Use, Equivalent point load and Other approximate methods, Pressure bulb.

Compaction Shear Strength: Mohr-Coulomb failure criterion, Shear strength tests, Different drainage conditions, Shear properties of cohesionless and cohesive soils, Use of Mohr's circle, Relationship between principal stresses and shear parameters.

Compressibility and Consolidation: Terzaghi's one dimensional consolidation theory, Pressure void ratio relationship, Preconsolidation pressure, Total settlement and time rate of settlement, Coefficient of consolidation, Curve fitting methods, Correction with construction time.

Indian Standard Codes for Geotechnical Engineering (IS 2720, Part 1-41, IS 6403, etc.)

Sustainability in Geotechnical Engineering

COURSE SYLLABUS (Practical):

1. Collection of Soil Sample and Determination of Moisture Content
2. Determination of Specific Gravity by (a) *Density bottle* and (b) *Pycnometer*
3. Grain Size Distribution of Soil Using Dry Sieve Analysis
4. Grain Size Distribution of Soil Using Wet Sieve Analysis
5. Particle Size Distribution Using Hydrometer
6. Determination of Liquid Limit Test by Casagrande Apparatus
7. Determination of Liquid Limit Test by Cone Penetrometer
8. Plastic Limit Test
9. Shrinkage Limit Test
10. Field Density Test by Core Cutter Method
11. Field Density Test by Sand Replacement Method
12. Standard Proctor Compaction Test

13. Modified Proctor Compaction Test
14. Consolidation Test

Text Books:

1. Arora, K. R. (1992). *Soil Mechanics and Foundation Engineering in SI Units*. Standard Publishers Distributors.
2. Coduto, D. P. (1999). *Geotechnical Engineering: Principles and Practices*, Pearson.
3. Lambe, T. W., & Whitman, R. V. (2008). *Soil mechanics SI version*. John Wiley & Sons.
4. Murthy, V. N. S. (2002). *Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering*. CRC press.
5. Punmia, B., & Jain, A. K. (2005). *Soil Mechanics and Foundations*. Firewall Media.
6. Ranjan, G., & Rao, A. S. R. (2007). *Basic and Applied Soil Mechanics*. New Age International.
7. Singh, A., & Chowdhary, G. R. (1967). *Soil Engineering in Theory and Practice*. Asia Publishing House.
8. Venkatramaiah, C. (1995). *Geotechnical Engineering*. New Age International.

Other Important Links:

1. Online Lecture Notes on Geotechnical Engineering: (*https://nptel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/soil_mech/index.htm*)
2. Video Lecture on Geotechnical Engineering:

   (*https://www.youtube.com/watch?v=DuZllNDex6s*)

Course Title and Code: **Mechanical and Electrical Machines**: **ES1108**	
Hours per Week	**L-T-P-S: 3 0 2 0**
Credits	**4**

Syllabus (Theory)

UNIT – I

Transformer: 1-Phase transformer: Working principle, Construction, EMF equation, Equivalent circuit and phasor diagram, losses and Efficiency, O.C. /S.C. Test, Polarity Test, 3-Phase transformer: Construction, Connections and phasor groups. ***Standards: IEC60616***

D. C. Machines: D.C. Generator: Construction, Armature Winding, EMF Equation, Armature reaction, characteristics of dc generators, applications.

D. C. Motor: Construction, Operation of a DC Motor, performance characteristics of DC Motors, Losses in a DC Motors, Methods of Speed Control, applications.

UNIT – II

Boilers: Purpose, Classification of boilers, Fire tube and water tube boilers, Mountings and accessories, construction and working of Cornish, Cochran, Lancashire, Locomotive, Babcock and Wilcox boilers, boiler performance. Construction and working of Loeffler, Velox, Benson, Lamont boiler. Efficiency of boiler.

Turbines: Introduction to steam turbines, Working of Impulse and Reaction turbines, compounding of steam turbines, losses in steam turbines, need of governing, throttle governing, nozzle governing and bypass governing.

UNIT – III

Synchronous Machines:

Synchronous Generator: Basic concepts, types and construction, generated emf, distribution &Pitch factor, armature reaction, phasor diagram.

Synchronous Motor: Working principle and construction, phasor diagrams, speed torque characteristics, starting methods, applications.

UNIT - IV

Induction Motor: Theory and construction of squirrel-cage and wound-rotor motors; equivalent circuit; measurement of equivalent circuit parameters, speed and slip, starting & running torque, speed/torque curves. ***standards: EEMUA132.***

Pumps: Types of pumps, positive displacement pumps, rotary type positive displacement pumps like gear pump, screw pump, rotary vane pumps; reciprocating type positive displacement pumps like piston pumps, plunger pumps. Centrifugal pumps working principle, pressure head, velocity head.

UNIT –V

Stepping Motors: Construction, working and application.

List of Experiments:

1. Open circuit characteristics of D.C. generator

2. Measurement of torque and speed of D.C motor operating in the workshop for lathe operation.
3. Speed control of D.C. shunt motor by (a) Field current control method & plot the curve for speed vs. field current. (b) Armature voltage control method & plot the curve for speed vs armature voltage.
4. To perform O.C. and S.C. test on a 1-phase transformer and to determine the parameters of its equivalent circuit its voltage regulation and efficiency.
5. To perform no load and blocked rotor test on a 3-phase induction motor and to determine the parameters of its equivalent circuits. Draw the circle diagram and compute the following (a) Max. Torque (b) Current (c) slip (d) p.f. (f) Efficiency.
6. To plot OCC & SCC of an Alternator and to determine its regulation by synchronous impedance method.
7. To find efficiency of a given boiler.
8. To find power output & efficiency of a steam turbine.
9. To find efficiency of a reciprocating pump.
10. To find efficiency of a Gear pump.

Textbooks:

1. Nagrath I.J.and Kothari D.P, "Basic Electrical Engineering" TMH, Third Edition 2011.
2. B. L. Theraja, "A Text Book on Electrical Technology" S.Chand, VolumeII. 2012.
3. Electric Machinery and Transformers-Bhag S. Guru,Huseyin R. Hiziroglu-Oxford Publication.
4. J B Gupta, "Theory and Performance of Electrical Machines"4th Edition, S.K.Kataria and Sons
5. Power plant Engineering, P.K. Nag, Tata McGraw-Hill, 2008.
6. Steam and Gas turbines and power plant engineering- Dr. R Yadav, Central Publishing House, Allahabad, 2011.
7. Introduction to Fluid Mechanics and fluid machines- Author: S K som, Gautam Biswas, Mc Graw Hill.

Reference Book(s)

1. Electrical Engineering - Principles and Applications, Allan R. Hambley, PHI, fourth edition- 2007.
2. Electrical Machines by P S Bhimbra- Khanna Publishers.
3. Ashfaq Hussain, "Electrical Machines" 2nd Edition, Dhanpatrai and Sons.
4. A. E. Fitzerald, Charles Kingsley, Stephen. D. Umans, "Electric Machinery" 6th Edition, Tata McgrawHill.

Course code	Course Title	Teaching Scheme				
		L	T	P	S	Credits
EE1111	Introduction to IoT	1	0	2	0	2

Course Objectives:

The course aims to develop understanding of Internet of Things concepts and working on IoT development boards to interface sensors and actuators. The course will enable the students to upload data from sensors on a web server and to use this data for analytical purposes or to actuate some transducers.

Course Outcomes:

On successful completion of this course, the students should be able to:

EE1111.1 Interface the Analog and Digital sensors to Node-MCU
EE1111.2 Develop Embedded C programs to read sensor data and upload to public cloud platform.
EE1111.3 Use Python-based IDE (integrated development environments) for the Raspberry Pi
EE1111.4 Interface Raspberry Pi with I/O devices.
EE1111.5 Visualize sensor data uploaded on public cloud.
EE1111.6 Apply standard protocol(s) for implementation of IoT Systems.
EE1111.7 Analyze and Improve existing systems with innovative IoT based approaches.

Assessment Scheme:

Prerequisites		Basic Programming
Teaching Scheme (Hours per Week)		L T P 1 0 2
Credits		2
Sr. No.	**Evaluation Component**	**Marks**
1	Attendance	NA
2	Assignment	NA
3	Class Participation	NA
4	Quiz	10
5	Theory Exam-I	10
6	Theory Exam-II	NA
7	Theory Exam-III	20
8	Report-I (Case Study on Raspberry Pi, IoT)	20

9	Report-II	NA
10	Report-III	NA
11	Project-I	NA
12	Project-II	NA
13	Project-III	NA
14	Lab Evaluation-I (Continuous)	30
15	Lab Evaluation-II	NA
16	Course Portfolio (MOOC certificate)	10
	Total (100)	100
Evaluation Scheme for Retest		
1	Theory Exam-III	20
2	Lab Evaluation-II	0
	Total (40)	20

Course Syllabi (Theory):

UNIT 1: Introduction to IoT Fundamentals: Definition, Characteristics, Applications, Connectivity Layers, Addressing, Networking.

UNIT 2**:** Sensors and Actuators: Sensors and Transducers, Sensor Classes, Sensor Types, Actuator Basics, Actuator Types,

UNIT 3**:** Basics of IoT Networking & Protocol: IoT Components, Inter-dependencies, SoA, Wireless Networks, Protocol Classification, MQTT, Secure MQTT, CoAP, XMPP, AMQP (Advanced Message Queuing Protocol)

UNIT 4**:** Connectivity Technologies: IEEE 802.15.4, ZigBee, 6LoWPAN, RFID, HART, NFC, Bluetooth, Zwave.

UNIT 5**:** Introduction to NodeMCU and Server: Basic Concepts of Arduino Platform, Examples of Arduino Programming, Interfacing different sensors with NodeMCU. Introductio to Blynk App, Uploading and downloading data from server using Blynk App. Intoduction to ThingSpeak Server, Uploading and downloading data from ThingSpeak server.

UNIT-6 Raspberry Pi: Basic functionality of the Raspberry Pi B+ board, Setup and Configuring Raspberry Pi, programming on the Raspberry Pi using Python, Python functions

to access the Raspberry Pins, how Raspberry Pi interact with online services through the use of public APIs and SDKs, case studies.

References:

1. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
2. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti (Universities Press)
3. Rajkamal, Internet of Things, Architecture and Design Principles, Mc. Graw Hill Education (India) Pvt Ltd.
4. IoT fundamentals: networking technologies, protocols, and use cases for the internet of things : Hanes, David | Salgueiro, Gonzalo | Grossetete, Patrick | Barton, Robert Henry, Jerome, Pearson, 2018, ISBN: 9789386873743.
5. IOT (Internet of Things) Programming: A Simple and Fast Way of Learning IOT by David Etter,

Video lectures:

1. Introduction to internet of things By Prof. Sudip Misra, IIT Kharagpur https://swayam.gov.in/nd1_noc20_cs66/preview
2. https://www.coursera.org/specializations/iot#courses
3. https://www.coursera.org/specializations/embedding-sensors-motors

MOOC course

The Arduino Platform and C Programming

https://www.coursera.org/learn/arduino-platform?specialization=iot#syllabus

Course Title and Code – Understanding and Managing Conflict| CC1105|Semester - V

Course Description

In today's increasingly complex and fragmented world, it is important to be able to resolve conflicts and build healthy relationships. Interpersonal and Group Dynamics is a course designed to prepare students to identify conflicts, manage emotions, analyze the situation and characters, and practice different frameworks to deal with conflicts.

Course Outcomes

The students will be able to:

CC1105.1 Define a group and explain the stages of group development
CC1105.2 Describe conflict and explain types and causes of conflict
CC1105.3 Use inquiry and advocacy to engage with groups
CC1105.4…Give and receive feedback effectively
CC1105.5 Identify sources of conflict and manage them using difference conflict handling styles

Prerequisites		**N/A**
Hours per Week		**L-T-P: 2-0-0**
Credits		**2**
Sr. No	**Specifications**	**Marks**
1.	Attendance	Nil
2.	Assignment	30
3.	Class Participation	20
4.	Quiz	20
5.	Theory Exam-I	Nil
6.	Theory Exam-II	Nil
7.	Theory Exam-III	30
8.	Report-I	Nil
9.	Report-II	Nil
10.	Report-III	Nil
11.	Project-I	Nil
12.	Project-II	Nil
13.	Project-III	Nil
14.	Lab Evaluation-I	Nil
15.	Lab Evaluation-II	Nil
16.	Course Portfolio	Nil
	Total (100)	100

Course Content

1. Introduction to the stages of group development
2. Introduction to Personality, Perception and Learning as source of differences in individual and groups
3. Nature, Types and sources of Conflict
4. Conflict Resolution Strategies
5. Emotional Intelligence
6. Empathy and Feedback

7. Inquiry & Advocacy – Concept of silence (Masking, Avoiding, Withdrawing) and violence (Controlling, Labeling, Attacking)

References for Reading:

1. Fisher, R., & Ury, W. (2011). Getting to yes: Negotiating agreement without giving in. Toronto, ON: Penguin Random House.
2. Harper, G. (2004). The joy of conflict resolution: Transforming victims, villains and heroes in the workplace and at home. Gabriola Island, BC: New Society Publishers.
3. Miles, E. W. (2013). Developing strategies for asking questions in negotiation. Negotiation Journal, 29(4): 383–412. doi: 10.1111/nejo.12034.

Course Title and Code: Transportation Engineering CE1109	
Hours per Week	**L-T-P: 3-0-2**
Credits	**4**
Students who can take	**B.Tech Semester-VI**

Course Objective:

This course aims to develop understanding about concepts of highway planning, design and construction to ensure safe and effective transportation of people and goods through roads.

On successful completion of this course, students will be able to:

CE1109.1 Plan and design the alignment of highway.
CE1109.2 Characterize highway construction materials and application of sustainable highway materials.
CE1109.3 Plan and conduct various types of traffic studies.
CE1109.4 Design geometric features of highway as per IRC:86.
CE1109.5 Design of flexible and rigid pavements as per IRC:37 & IRC:58 respectively.

Prerequisites	NA

Sr. No.	**Evaluation Component**	**Marks (old)**	**Marks (COVID 19 situation)**
1	Attendance	NIL	NIL
2	Assignment	NIL	**10 (02 Assignment)**
3	**Class Participation**	**10**	**10**
4	**Quiz (02 Nos.)**	**10**	**10**
5	**Theory Exam-I**	**10**	**10**
6	Theory Exam-II	NIL	-
7	**Theory Exam-III**	**30**	**20**
8	Report-I	Nil	**10 (Report)**
9	Report-II	NIL	10 (Presentation)
10	Report-III	NIL	
11	**Project-I**	**20**	**NIL**
12	Project-II	NIL	-
13	Project-III	NIL	-
14	**Lab Evaluation-I (Continuous Evaluation)**	**10**	**10 (Physical Lab and Virtual Lab)**
15	**Lab Evaluation-II (Examination)**	**10**	**10**
16	Course Portfolio	NIL	NIL

	Total (100)	**100**	**100**
	Theory Exam	**30**	**30**

Course Syllabus (Theory):

Highway Development & Planning: Importance of transportation in economic activity and social effects, characteristics of road transport. Current road development plans in India, Classification of roads, road patterns. Highway alignment and preparation of highway Detailed Project Report (DPR).

Highway Materials: Desirable properties, laboratory test and MORTH specifications on materials: sub-grade soil; aggregate and bitumen Grading systems for bitumen: penetration grading, viscosity grading and super-pave performance grading. Modified bitumen: PMB & CRMB, cutback bitumen and bitumen emulsions. Green highways: Importance and application of sustainable materials in highway construction RAP (Recycled Asphalt Pavement) and RCA (Recycled Concrete Aggregates).

Highway Geometric Design: Cross sectional elements, camber, sight distance (SSD, OSD and ISD). Design of horizontal alignment: super elevation, extra widening, transition curves, grade compensation. Design of vertical alignment: gradients, vertical curves. Recommendations for highway geometric design parameters as per IRC code of practice (IRC: 73, IRC: 86).

Traffic Studies: Objects, methods and data presentation of various traffic studies such as classified traffic volume studies; spot speed studies; travel time and delay studies; origin & destination studies. Parking studies: Investigations and determination of parking demand; Accident studies: Objectives & causes of accidents; 3Es measures used for the reduction of accident rate.

Highway Flexible Pavement: Factors affecting design & performance of flexible pavements, component layers, structural design of highway flexible pavement as per IRC:37guidelines.

Highway Rigid Pavements: Component layers, factors affecting design & performance of rigid pavements. Types of joints in rigid pavements: longitudinal, contraction, expansion & construction joints. Temperature stresses: warping and frictional stresses, Wheel load stresses, Design of rigid pavements as per IRC:58 guidelines.

Text and reference books:

1. Highway Engineering by S.K. Khanna, C.E.G. Justo & A. Veeraragavan, Nem Chand and Bros., Roorkee.

2. Bituminous Road Construction in India by Prithvi Singh Kandal, PHI Learning Private Limited, Delhi.
3. Traffic Engineering & Transport Planning by L R Kadiyali, Khanna Publishers, New Delhi.
4. Principles of Transportation Engineering by Partha Chakroborty & Animesh Das, PHI, New Delhi.
5. Highway and Traffic Engineering by Subhash C. Saxena, CBS Publishers and Distributors Pvt. Ltd.
6. Specifications for Road and Bridge Works, Fifth Revision, Ministry of Road Transport and Highways (MORTH)I, ndian Roads Congress, New Delhi.
7. Indian Road Congress standards (IRC: 73, IRC: 86, IRC: 37, IRC:58).

Syllabus (Practical)

1. CBR test for subgrade soil (Virtual Lab)
2. To determine the flakiness index & elongation Index of given sample of aggregate (Physical Test)
3. Aggregate Impact test (Physical & Virtual Lab)
4. Los angles abrasion test (Virtual Lab)
5. Aggregate crushing value test (Virtual Lab)
6. Ductility of bitumen (Physical & Virtual Lab)
7. Softening point of bitumen (Physical & Virtual Lab)
8. Flash and fire point of bitumen (Physical Test)

Ref: Virtual Lab by NIT Karnataka
http://vlabs.iitb.ac.in/vlabs-dev/labs/nitk_labs/Transportation_Engineering_Lab/labs/index.html

Course Title and Code **Construction Project Management:** CE 1112	
Hours per Week	**L-T-P: 3-0-2**
20Credits	**4**
Students who can take	B. Tech Sem VI sem (2017-2021) (CE)
Course Objective: This course aims to develop understanding for importance of estimation, costing and evaluation, construction project management, project planning, cash flow and time management and safety measures at the project site. Topics include estimation, costing, evaluation, management, role of civil engineer, project scheduling with PERT, methods to reduce the project cost, contract management and safety measures at excavation, demolition, roads and other construction sites.	

Course Outcomes

On completion of the course, the student should be able to:

CE 1112.1 Calculate the estimated cost of the project
CE 1112.2 Compute the Benefit cost ratio of various type of projects.
CE 1112.3 Asses the risks in various Civil Engineering projects.
CE 1112.4 Analyze the project schedule by CPM and PERT.
CE 1112.5 Evaluate various types of contracts.
CE 1112.6 Develop various methods of safety in various construction projects.
CE 1112.7 Incorporate sustainability in project planning and execution.
CE 1112.8 Develop project scheduling using M S project.

Prerequisites			
Teaching Scheme (Hours per Week)		3 0 2	
Credits		4	
Sr. No.	**Evaluation Component**	**Marks (Pre COVID 19)**	**Marks (Post COVID 19 situation)**
1	Attendance	Nil	Nil
2	Assignment	Nil	10 (5 Nos)
3	Class Participation	5	10
4	Quiz (3)	5	0
5	Theory Exam-I	10	10
6	Theory Exam-II	10	NIL
7	Theory Exam-III	25	25
8	Report-I	5	5
9	Report-II	Nil	0
10	Report-III	Nil	0
11	Project-I	10	10
12	Project-II	10	0
13	Project-III	10	20

14	Lab Evaluation-I	5	5 (Physical Lab and Online Sessions)
15	Lab Evaluation-II	5	5
16	Course Portfolio	Nil	Nil
	Total (100)		
	Evaluation scheme for retest		
	Theory Exam III	25	25
	Lab Evaluation II	5	5

Syllabus (Theory)

CONSTRUCTION AND PROJECT MANAGEMENT: Construction Project, Importance of Construction and Construction Industry, Indian Construction Industry, Project Management and Its relevance, Stake holder of a construction Project, Role of Civil Engineer in Project Management, Stages in Construction, Project Organization: Construction Company, Structure of construction Organization, Management levels, Construction Economics: Benefit cost ratio, Average Annual rate of return, Major cause of project failure, Role of arbitrator in project management

PROJECT PLANNING: Importance of project planning, Types of Project Plans, determining activities involved, work breakdown structure, assessing activity duration, duration Estimate procedure, Project work scheduling, Project management techniques – CPM and PERT networks analysis, concept of precedence network analysis.

PROJECT COST AND TIME CONTROL: Monitoring the time progress and cost controlling measures in a construction project, Time cost trade-off process: direct and indirect project costs, Cost slope, Process of crashing of activities, determination of the optimum duration of a project, Updating of project networks, resources allocation.

CONTRACT MANAGEMENT: Elements of tender operation, Types of tenders and contracts, Contract document, Legal aspects of contracts, Contract negotiation & award of work, breach of contract, determination of a contract, arbitration.

SAFETY AND OTHER ASPECTS OF CONSTRUCTION MANAGEMENT: Causes and prevention of accidents at construction sites, Safety measures to be followed in various construction works like excavation, demolition of structures, explosive handling, hot bitumen work. Project Management Information System – Concept, framework, benefits of computerized information system. Environmental and social aspects of various types of construction projects.

Syllabus (Practical)

Various modes of measurements, measurement sheet and abstract sheet;

Types of estimate, plinth area rate, cubical content rate, preliminary, original, revised and supplementary estimates

Basic schedule of rates. (C.S.R.)

Preparing detailed estimates of various types of buildings, R.C.C. works, earth work calculations for roads and estimating of culverts, Services for building such as water supply, drainage and electrification.

Various percentages of overhead charges, Contingencies and work charge establishment different services in building.

Text /Reference Books:

1. Dutta B. N. Estimating & Costing in Civil Engineering, UBS Publishers, 2016
2. Jha N K. Construction project Management Pearson, 2015.
3. Chitkara K K. Construction Project Management, Mc Graw Hill 2014.
4. Punmia B C and Khandelwal K K. Project Planning and Control with PERT and CPM. Laxmi Publication 2014.

Course Title and Code: Critical Thinking for Decisions at Workplace |CC1106

Course Description: In today's world, the idea of right and wrong is being challenged by businesses, use of technology, economic conditions, and norms of societies. The relevance of a well-reasoned decision is crucial. This course intends to make students take better decisions keeping in mind purpose, context, and ethics.

Course Outcomes

The students will be able to:

CC1106.1 Apply techniques of critical thinking to analyse organisational problems through positive inquiry

CC1106.2 Describe and analyse appropriate problem-solving and ethical decision-making processes

CC1106.3 Choose the most effective and logical decision among multiple alternatives

CC1106.4 Evaluate solutions and anticipate likely risks based on purpose, context and ethics

Prerequisites		**N/A**	
Hours per Week		**L-T-P: 2-0-0**	
Credits		**2**	
Sr. No	**Specifications**	**Weightage**	
		Original	**Revised**
1	Attendance	Nil	10
2	Assignment	20	30
3	Class Participation	20	10
4	Quiz	Nil	-
5	Theory Exam-II	20	15 (Individual viva)
6	Theory Exam-III	30	15 (online mode)
	Presentation	20	20
	Total (100)	100	**100**

References for Readings:

1. Lehrer, J. (2010). *How we decide*. Houghton Mifflin Harcourt.
2. Heath, C., & Heath, D. (2013). *Decisive: How to make better choices in life and work*. Random House.
3. Hammond, J. S., Keeney, R. L., & Raiffa, H. (2015). *Smart choices: A practical guide to making better decisions*. Harvard Business Review Press.
4. Cases and scenario will be shared in the class.

Course code	Course Title	Teaching Scheme	
		NA	Credits
PR1101	Automation Project		2

Course Objectives: The course aims to train students for designing and implementing solutions for Automation using Internet of Things.

Course Outcomes:

On successful completion of this course, the students should be able to:

PR1101.1 Design and implement a complete project in IoT using Node-MCU and sensors using Embedded C programs

Or

Design and implement a complete project in IoT using Raspberry pi and sensors using Python programs

PR1101.2 Apply one/more standard protocol(s) during project implementation

PR1101.3 Demonstrate sensitivity to sustainability issues for power consumption / Bandwidth utilization/economic solutions during implementation of projects**.**

Assessment Scheme:

Sr. No.	Evaluation Component	Marks
1	Attendance	Nil
2	Assignment	Nil
3	Class Participation	Nil
4	Quiz	Nil
5	Theory Exam-I	Nil
6	Theory Exam-II	Nil
7	Theory Exam-III	Nil
8	Report I (Synopsis)	30
9	Report II (Midterm Progress Presentation and Viva)	30
10	Report III	Nil
11	Project I (with Report)	Nil
121	Project II	Nil
13	Project III (With working model)	40
14	Lab Evaluation I	Nil
15	Lab Evaluation II	Nil
16	Course Portfolio	Nil
	Total (100)	**100**
Evaluation scheme for retest.		
	Project III (with Report)	**40**
	Total (100)	**40**

Course Title and Code: Minor Project PR1103	
Prerequisites	**Nil**
Hours per Week	**L-T-P:**
Credits	**04**
Students who can take	**B.tech. Semester VII**

Course Objective:

In Minor Project, Students are expected to work towards the goals and milestones set in Minor Project. The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format. At the end there would be a demonstration of the solution and possible future work on the same problem. The student will have to present the progress of the work through seminars and progress reports. (in continue contact with Faculty Supervisor Assigned)

Operation Procedure

- Student has to devote full semester for Minor Project.
- Student has to report to the Supervisor regularly.
- Seminars s evaluation has to be carried out in the presence of atleast two-member Committee comprising.
- Experts in the relevant area constituted by the Supervisor.
- Final Seminar Report to be submitted has to be in formal hard bound cover bearing of the Institute emblem.

Assessment Scheme:

Sr. No	**Specifications**	**Marks**
01	Attendance	NIL
02	Assignment	NIL
03	Class Participation	NIL
04	Quiz	NIL
05	Theory Exam(Mid Term)	NIL
06	Theory Exam	NIL
07	Theory Exam(Final)	NIL
08	Report-1 (Synopsis) (Panel)	15
09	Report-2	NIL
10	Report-3	NIL
11	Project -1 (Mid Term) (Panel)	20
12	Project -2 (Day to Day work) (Demo, Presentation, Viva, Report)	25
13	Project -3 (End Term) (Panel) (Demo, Presentation, Viva, Report)	40
14	Lab Evaluation – I	NIL
15	Lab Evaluation – II	NIL
16	Course portfolio	NIL
	Total (100)	**100**

PR 1104 – Practice School II

Course Syllabi:

This course is for five four and half months (summer and one semester) in VII or VIII Semester. The objective of this programme is to provide the students, an opportunity to work on live projects of corporate world in various fields. During this programme, they will work on real world applications of their curricula through organizational function of their choice. The students are expected to be involved directly in problem solving efforts of specific interest to the host organization. The learning of PS-I will help them in completing PS-II successfully. PS-II duration of internship is 4 - 4.5 months. PS -II W