आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

IFTM University, Moradabad, Uttar Pradesh

NAAC ACCREDITED

IFTM UNIVERSITY
Lodhipur Rajput, Delhi Road, Moradabad – 244102 (U.P.)
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Study & Evaluation Scheme of
Bachelor of Technology (B.Tech) Civil Engineering
[Session 2020-21]

Programme:	***Bachelor of Technology in* Civil Engineering**
Course Level:	***Graduate Degree***
Duration:	***04 Years (Eight semesters) Full Time***
Medium of instruction:	***English***
Minimum Required Attendance:	***75%***
Maximum credits:	***228***

Programme Outcomes (POs):

Students completing this programme will be able to:

- Apply principles of mechanics and basic sciences to analyze civil engineering structures
- Survey, map, measure and analyze data for sustainable infrastructure planning.
- Characterize and evaluate materials for adoptability in civil engineering projects
- Analyze and design concrete & steel structures, earthen embankments, irrigation structures, water supply, waste treatment systems and transport systems.
- Apply best management practices for construction and maintenance of infrastructure facilities.
- Predict and forecast societal needs, floods, droughts, pollution and travel demand.
- Work and lead in multi disciplinary projects and demonstrate social responsibility and professional ethics.
- Engage in research and life-long learning to adapt to changing environment.

SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING
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Bachelor of Technology (B.Tech) Civil Engineering
STUDY AND EVALUATION SCHEME
Effective from Session 2020-21
YEAR I, SEMESTER- I

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	EMA -101	**Engineering Mathematics-I**	3	1	0	20	10	30	70	100	4
2.	EPH -101	**Engineering Physics-I**	3	1	0	20	10	30	70	100	4
3.	ECE -101 / ECH -101	**Environmental Science**/ Engineering Chemistry	3	1	0	20	10	30	70	100	4
4.	PSD -101 / EME -101	**Professional Skill Development-I** / Engineering Mechanics	3	1	0	20	10	30	70	100	4
5.	EEE -101 / EEC -101	**Electrical Engineering** / Electronics Engineering	3	1	0	20	10	30	70	100	4
6.	EME -102 / ECS -101	**Materials & Manufacturing** / Computer Fundamentals & Programming	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
7.	EPH -151 / ECH -151	**Physics Lab** / Chemistry Lab	0	0	2	20	10	30	70	100	1
8.	EEE -151 / EEC -151	**Electrical Engg. Lab** / Electronics Engg. Lab	0	0	2	20	10	30	70	100	1
9.	EME-152 / ECS -151	**Materials & Manufacturing Lab** / Computer Lab	0	0	2	20	10	30	70	100	1
10.	EME-153 / EME -151	**Engineering Graphics Lab** / Mechanical Engg. Lab	0	0	2	20	10	30	70	100	1
11.	GP-101	**General Proficiency**	-	-	-	-	-	100	-	100	1
		TOTAL	**18**	**06**	**08**	**-**	**-**	**-**	**-**	**1100**	**29**

YEAR I, SEMESTER- II

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	EMA -201	**Engineering Mathematics-II**	3	1	0	20	10	30	70	100	4
2.	EPH -201	**Engineering Physics-II**	3	1	0	20	10	30	70	100	4
3.	ECH -201 / ECE -201	**Engineering Chemistry**/ Environmental Science	3	1	0	20	10	30	70	100	4
4.	EME -201 / PSD -201	**Engineering Mechanics** / Professional Skill Development-I	3	1	0	20	10	30	70	100	4
5.	EEC -201/ EEE -201	**Electronics Engineering** / Electrical Engineering	3	1	0	20	10	30	70	100	4
6.	ECS -201 / EME -202	**Computer Fundamentals & Programming** / Materials & Manufacturing	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
7.	ECH -251 / EPH -251	**Chemistry Lab** / Physics Lab	0	0	2	20	10	30	70	100	1
8.	EEC -251 / EEE -251	**Electronics Engg. Lab** / Electrical Engg. Lab	0	0	2	20	10	30	70	100	1
9.	ECS -251 / EME -252	**Computer Lab** / Materials & Manufacturing Lab	0	0	2	20	10	30	70	100	1
10.	EME -251 / EME-253	**Mechanical Engg. Lab** / Engineering Graphics Lab	0	0	2	20	10	30	70	100	1
11.	GP-201	**General Proficiency**	-	-	-	-	-	100	-	100	1
		TOTAL	**18**	**06**	**08**	**-**	**-**	**-**	**-**	**1100**	**29**

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Effective from Session 2020-21

EMA – 101: ENGINEERING MATHEMATICS –I **L T P 3 1 0**

Objective:
The main aims of this course are to recall and remember basics of matrices, differential, integral and vector calculus. The focus of the subject to understand the concepts of basic mathematical methods to solve engineering problems analyze engineering problems and evaluate the results.

UNIT – 1 **(08 Sessions)**
Matrices : Introduction of matrices, Special type of matrices, Elementary row and column transformation, Adjoint & inverse of matrices , Rank of matrix, , Consistency of linear system of equations, Characteristic equation, Cayley-Hamilton theorem, Eigen values and Eigen vectors, Linear dependency and Independency of vector, Diagonalisation of matrices.

UNIT – 2 **(08 Sessions)**
Differential Calculus–I: Successive differentiation, Leibnitz's theorem, Partial differentiation, Euler's theorem, Change of variables, Total differentiation, Jacobian, Expansion of function of several variables.

UNIT – 3 **(08 Sessions)**
Differential Calculus–II: Asymptotes, Curve tracing, Approximation of errors, Maxima & Minima of functions of several variables, Lagrange's method of multipliers.

UNIT – 4 **(08 Sessions)**
Multiple Integrals : Definite integral, Double and triple integral, Change of order, Change of variables, Beta and Gamma functions, Dirichlet integral, Liouville's extension formula, Applications to area and volume.

UNIT – 5 **(08 Sessions)**
Vector Calculus: Point functions, Gradient, Divergence and Curl of a vector and their properties, Line, Surface and Volume integrals, Green's, Stoke's and Gauss divergence theorems, Statements and problems (without proof).

Course Outcome:
The student is able to:
- Remember terminologies and formulae in matrices, differential, integral and vector calculus.
- Understand and interpret the concepts of matrices, differential, integral and vector calculus.
- Compare and analyze the methods in matrices, differential, integral and vector calculus.
- Predict and evaluate the problems in matrices, differential, integral and vector calculus.

Suggested Readings:

- Prasad C. Advanced Mathematics for Engineers, Prasad Mudralaya.
- B. S .Grewal, Engineering Mathematics, Khanna Publishers.
- E.Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
- C.Ray Wylie & Louis C .Barrett , Advanced Engineering Mathematics ,Tata Mc Graw –Hill Publishing Company Ltd.
- Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya.

Website Sources:
- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- onlinecourses.nptel.ac.in
- en.wikipedia.org

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EPH-101: Engineering Physics-I **L T P 3 1 0**

Objective:
The aim of this course is to impart knowledge of statistical mechanics, quantum mechanics, Laser system and their applications. The broad education is necessary to understand special theory of relativity.

UNIT- I **(08 Sessions)**
Relativistic Mechanics: Frame of reference, Michelson-Morley Experiment, Lorentz transformation equation, Length contraction & Time dilation, Addition of velocities, Variation of mass with velocity and Mass energy relation.

UNIT- II **(08 Sessions)**
Statistical Mechanics: Concept of phase space, Density of states as a function of energy, Maxwell- Boltzmann statistics, Distribution law and its application in case of ideal gas, Energy and velocity distribution.
Bose -Einstein statistics Distribution Law and its application to Black body radiation to obtain Plank's law of radiation.
Fermi –Dirac statistics, Distribution law and its application to electrons in metals, Calculation of Fermi energy and average energy of electrons in metals.

UNIT- III **(08 Sessions)**
Quantum Mechanics: De-Broglie Hypothesis, Davisson -Germer Experiment, wave function and its properties, Uncertainty principle. Time Dependent & Time Independent Schrodinger Equation, Particle in one dimensional box, Eigen values and eigen function

UNIT- IV **(08 Sessions)**
Laser: Principle of Laser, Stimulated and spontaneous emission, Population inversion, Einstein's Coefficients, He-Ne Laser, Ruby Laser, Application of Lasers.

UNIT- V **(08 Sessions)**
Fibre Optics: Fundamental ideas of optical Fiber, Propagation Mechanism, Numerical aperture, Acceptance angle and Acceptance cone, Single and multi-mode fibers, Applications of optical fibres.

Course Outcome: The students completing this course will be able to:
- Learn Frame of reference, Lorentz transformation equation
- Understand Statistical Mechanics, Maxwell- Boltzmann statistics and its applications.
- Study Bose -Einstein statistics and Fermi –Dirac statistics
- Understand De-Broglie Hypothesis, Davisson -Germer Experiment
- Study Time Dependent & Time Independent Schrodinger Equation and applications of these equations.
- Attain basic knowledge on different types of LASERs and their applications.
- Gain knowledge of optical fibre.

Suggested Readings:

- Beiser, "Concepts of Modern Physics
- Kittel, "Mechanics", Berkeley Physics Course, Vol.- I.
- W.T. Silf vast, "Laser Fundamental" Cambridge University Press (1996).
- G. Keiser "Optical Fiber Communication" New york.
- K.M. khanna" Statistical Mechanics"
- C.Kittel" Elementary Statistical Mechanics"

Website Sources:
- https://web.stanford.edu
- https://sites.google.com
- https://en.wikipedia.org
- https://www.khanacademy.org
- https://www.rp-photonics.com
- https://nptel.ac.in
- https://www.eatm.in

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ECE-101/201: Environmental Science **L T P 3 1 0**

Objective:
The goals of environmental science are to provide every student with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment. To develop and reinforce new patterns of environmentally sensitive behavior among individuals, groups and society as a whole for a sustainable environment. Understand the trans-national character of environmental problems such as global warming, climate change, ozone layer depletion etc. and ways of addressing them, including interactions across local to global scales.

Unit I: **(10 Sessions)**
Environment: Definition of environment. Environmental education. Need for the public awareness. : Concept of Ecology: Ecosystem, energy and nutrients flow in ecosystem food chain.
Environmental segment: Atmospheric structure. Classification of air pollutants, sources of air pollution and their effect on human health and property

Unit II: **(10 Sessions)**
Air quality and standard: Meteorological phenomenon and their influence on air quality, lapse rates, dispersion of pollutants. Air pollution control: Introduction to particulates and gaseous pollutants such as SOx, NOx & CO, and their effects.
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Unit III: **(10 Sessions)**
Water quality: Physical. Chemical&biological parameters. Water quality standard, BOD. COD and BOD COD calculations. :
Environmental Analysis: pH, alkalinity, conductivity, ammonia, fluoride, sulphate, chloride. Analysis and measurement of gaseous pollutants.

Unit IV: **(10 Sessions)**
Pollution: Pollution from industry and agriculture. Polymers and plastic, food additives, fertilizers, insecticides, fungicides and herbicides. Heavy metal and energy their environmental implications. Solid waste and its managements. Pollution and public health aspect Environmental Protection- Role of government, initiatives by non-governmental organizations (NGO).

Course outcome: After completion of this course student will be able to:

- Understand the issues and challenges related to environmental and ecosystem due to some human activities.
- Understand key concepts from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
- Appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
- Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

Suggested Readings:

- "Environmental studies" Benny Joseph, Tata McgrawHill-2005
- "Environmental studies"-Dr D.L. Manjunath, Pearson Education-2006
- "Environmental studies" R. Rajagopalan, Oxford Publication-2005
- "Text book of environment science & Technology", M.Anji Reddy, BS Publication.

Website Sources:

- https://www.india.gov.in/official-website-ministry-environment-and-forests-0
- https://www.earthshare.org/environews/

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PSD-101 / 201: PROFESSIONAL SKILL DEVELOPMENT-I **L T P 3 1 0**

Objective:
The objectives of Professional Skill Development-I are:

- To develop knowledge and understanding of grammar.
- To develop abilities to make use of the grammar in own writing English.
- To increase understanding and recall of what is read and listen including facts and main idea.
- To enhance competencies in writing paragraph, gist or abstract/précis of the passage in own words/ language and in writing resume, bio-data, letters and applications of different kinds.
- To develop all the four skills of English language.

Unit I **(10 Sessions)**
Basic Applied Grammar and Usage
The Sentences: Parts – Subject and Predicate; Kinds of Sentences and their Transformation. Parts of Speech. **Noun:** Kinds; Gender; Case; Number; Usage**. Pronouns:** Definition; Kinds; Usage. **Adjectives:** Kinds, Degrees of Comparison, Transformation of Degrees. **Determiners:** Kinds: many, many a, a great many; less and fewer; each and every; elder, eldest and older, oldest; much, many; little, a little, the little. **Articles:** Kinds, Articles and Number system, Articles and Gender system, Omission of Articles, Repetition of Articles. **Verbs:** Kinds; Auxiliaries: Principal Auxiliaries; Modal Auxiliaries; Semi-Modals; Usage

Unit II
Basic Applied Grammar Continued **(06 Sessions)**
Non-Finite Verbs: Kinds; Infinitives; Gerund; Participle. **Adverbs:** Kinds and Usage. **Prepositions:** Kinds and Usage. **Conjunctions:** Kinds; Usage. **Interjections:** Definition; Usage.

Unit III **(10 Sessions)**
Clauses and Phrases, Tenses, Active and Passive Voice, Direct and Indirect Speech

Unit IV **(06 Sessions)**
Précis Writing: Techniques of Précis Writing; examples**. Paragraph Writing:** Structure of Paragraph, Construction of Paragraphs; Techniques of Paragraph Writing: Unity, Coherence, Emphasis. **Reading Comprehension. Listening Comprehension.**

Unit V **(08 Sessions)**
Writing of Resume, Bio-Data. **Writing of Letters and Applications:** Formats; Elements; Kinds: Leave Applications, Job Applications, Order Letters, Letters of Claims and Complaints, Letters of Adjustment.

Course Outcome: Students completing this course will be able to:

- Write paragraph, gist or abstract/précis of the passage in own words/ language and resume, bio-data, letters and applications of different kinds.
- Use targeted grammatical structures meaningfully and appropriately in oral and written production.
- Enhance competence in the four modes of literacy: writing, speaking, reading & listening.
- Understand and recall of what read and listen is including facts and main idea.

Suggested Readings:

- Remedial English Language by Malti Agarwal, Krishna Publications, Meerut.
- Professional Communication by Malti Agarwal, Krishna Publications, Meerut.
- High School English Grammar & Composition by Wren & Martin, S. Chand & Company LTD., New Delhi.

Website Sources:

- www.wikipedia.com
- www.englishgrammar.org
- www.usingenglish.com
- www.grammarly.com

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Effective from Session 2020-21

EEE-101/201: ELECTRICAL ENGINEERING L T P 3 1 0

Objective:

- To provide comprehensive idea about AC and DC circuits and its analysis
- To provide the working principles and applications of basic machines in electrical engineering.

UNIT-I **(08 Sessions)**

D.C. Circuit Analysis: Network, Active And Passive Elements, Concept of Linearity And Linear Network, Unilateral And Bilateral Elements, Sources, Source Transformation, Kirchhoff's Laws, Star-Delta Transformation, **Network Theorems:** Thevenin's Theorem, Superposition Theorem, Norton's Theorem, Maximum Power Transfer Theorem.

UNIT-II **(08 Sessions)**

Single Phase AC Circuits: AC Waveforms, Average and Effective Values, Form and Peak Factors, Analysis of Series, Parallel and Series-Parallel RLC Circuits, Active, Reactive and Apparent Powers, Power Factor, Causes of Low Power Factor, Resonance in Series and Parallel Circuits.

UNIT-III **(08 Sessions)**

Three Phase AC Circuits: Three Phase System, Advantages, Phase Sequence, Star and Delta Connections, Balanced Supply and Balanced Load, Three-phase Power and its Measurement,

Measuring Instruments: Types of Instruments, PMMC and Moving Iron Instrument, Single-Phase Dynamometer Wattmeter, Induction Type Energy Meter

UNIT-IV **(08 Sessions)**

Magnetic Circuits: Magnetic Circuit Concepts, Analogy between Electric & Magnetic Circuits, Magnetic Circuits with DC and AC Excitations, B-H Curve, Hysteresis and Eddy Current Losses,

Single Phase Transformer: Principle, Working, Construction, E.M.F. Equation, Power Losses, Efficiency, Introduction to Auto-Transformer (Excluding Numerical)

UNIT-V **(08 Sessions)**

Principles of Electro-Mechanical Energy Conversion,

DC Generator: Construction & Working, E.M.F. Equation of Generator, Types of D.C. Generator, Applications, **D.C. Motor:** Principle of operation, Torque Equation of a Motor, Types of D.C. Motor, Applications (Excluding Numericals)

Three Phase Induction Motor: Construction-(Squirrel cage and slip-ring motor),Principle of Operation, Applications (Excluding Numericals)

Course Outcome: On completion of the course students will be able to:

- Predict the behavior of any electrical and magnetic circuits.
- Formulate and solve complex AC, DC circuits.
- Identify the type of electrical machine used for that particular application.
- Realize the requirement of transformers in transmission and distribution of electric power and other applications.
- Function on multi-disciplinary teams.
- Awareness of general structure of power systems.
- Acquire knowledge about the single phase and three base electrical circuits

Suggested Readings:

- V. Del Toro, "Principles of Electrical Engineering" Prentice Hall International
- I.J. Nagarath, "Basic Electrical Engineering" Tata McGraw Hill
- D.E. Fitzgerald & A. Grabel Higginbotham, "Basic Electrical Engineering" Mc- Graw Hill
- T.K. Nagsarkar & M.S. Sukhija, "Basic Electrical Engineering" Oxford University Press
- W.H. HaytP, "Engineering Circuit Analysis" Mc Graw Hill

Website Sources:

- www.lecturenotes.in
- www.examupdates.in
- www.iare.ac.in
- www.notes.specworld.in
- www.ocw.mit.edu
- www.nptel.ac.in
- www.vlab.co.in

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B.Tech – I Year (I Semester)
Effective from Session 2020-21

EME-102/202: MATERIALS & MANUFACTURING L T P 3 1 0

Objective:
The objective of this course is to familiarize the students with different types of engineering materials and manufacturing processes and to understand the design, selection and processing of materials for a wide range of applications in engineering and elsewhere.

UNIT I **(09 Sessions)**
Basic Manufacturing: Importance of Materials & Manufacturing towards Technological & Socio-Economic developments, Classification of manufacturing processes, Plant location, Plant layout and its types, Production and its classification, Production versus Productivity, Misc. Processes: Powder-metallurgy process and its applications, Plastic-products manufacturing, Galvanizing and Electroplating, Properties of Engineering Materials: Mechanical properties, Chemical properties, Electrical properties, Dielectric and Magnetic properties, Optical and Physical properties, Introduction to elementary corrosion and oxidation, Elementary ideas of fracture, fatigue & creep.

UNIT II **(09 Sessions)**
Engineering Materials: Ferrous Materials, Iron ore and its extraction, Furnaces, Cast iron, Steels & its classification based on percentage of carbon, its properties & applications. Alloy steels: stainless steel and tool steel, Non-Ferrous metals & alloys: Various non-ferrous metals, Common uses of various non-ferrous metals. Alloying elements and their effect, Cu-alloys: Brass, Bronze, Al-alloys such as Duralumin, Non-Metallic Materials: Common types & uses of different non-metals such as Wood, Cement-concrete, Ceramics, Rubber, Plastics and Composite materials.

UNIT III **(09 Sessions)**
Introduction to Metal Forming and its applications: Basic metal forming process: hot working and cold working process, Rolling, Forging, Extrusion, Drawing, Wire & Tube-drawing, Product applications and their defect. Press - work, Die & Punch assembly, Sheet metal operations, Cutting and forming and its applications. Casting: Casting terms. Casting processes, Pattern & allowances, Pattern and mold making materials and its desirable properties, Molding method, mould making with the use of a core, Gating system, Die-casting and its uses, Casting defects & remedies, Heat Treatment: Elementary introduction to Heat- treatment of carbon steels: annealing, normalizing, quenching, tempering and case-hardening.

UNIT IV **(07 Sessions)**
Introduction to Metal Cutting: Cutting tool, Chips and its formation process; Working principle, classification and operations performed on Lathe machine, Shaper machine and Planer machine. Operations performed on Drilling, Milling & Grinding machine.

UNIT V **(06 Sessions)**
Introduction to Welding and its applications: Importance and basic concepts of welding, Classification of welding processes. Gas-welding, Types of flames, Electric-Arc welding, Resistance welding, Soldering & Brazing and its uses.

Course Outcome: Students completing this course will be able:
- To understand how and why the properties of materials are controlled.
- To understand how and why the structure and composition of a material may be controlled by processing.
- To identify the positive and negative impacts of manufacturing on society.
- To apply the knowledge in industries and organizations.

Suggested Readings:

- *Manufacturing Process*, B.S Raghuvanshi, Dhanpat Rai Publication.
- *Manufacturing Processes*, R.S. Khurmi and J.K. Gupta, S. Chand Publishing.
- *Materials Science*, Narula & Narula, McGraw Hill Education Private Limited.
- *Manufacturing Technology*, R. K. Rajput, Laxmi Publications Private Limited.
- *An Introduction to Engineering Materials and Manufacturing Processes*, NIIT, Prentice Hall of India Private Limited.

Website Sources:
- www.wikipedia.org
- www.sciencedaily.com
- www.youtube.com
- www.slideshare.net
- https://onlinecourses.nptel.ac.in

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EPH-151/251: Physics Lab **L T P 0 0 2**

Lab Objective:
To achieve perfectness in experimental skills. The study of practical applications will bring more confidence and to learn the usage of electrical and optical systems for various measurements.

List of Experiments: (Minimum 10 experiments are required to be performed) **(16 Sessions)**

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinalpoints.
4. To determine the specific rotation of cane sugar solution using half shade polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To determine the specific resistance of the material of given wire using Carey Foster's bridge.
7. To determine the variation of magnetic field along the axis of a current carrying coil and thento estimate the radius of the coil.
8. To verify Stefan's Law by electrical method.
9. To calibrate the given ammeter and voltmeter.
10. To study the Hall Effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall-effect set up.
11. To determine energy bank gap of a given semiconductor material.
12. To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
13. To draw hysteresis curve of a given sample of ferromagnetic material and from this to determine magnetic susceptibility and permeability of the given specimen.
14. To determine the ballistic constant of a ballistic galvanometer.
15. To determine the viscosity of a liquid.

Lab Outcome: The students completing this course will be able to:

- Understand principle, concept, working and application of technology and comparison of results with theoretical calculations.
- Apply the various procedures and techniques for the experiments.
- Understand usage of instruments and real time applications in engineering studies.
- Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.

Suggested Readings:

- Engineering Practical Physics by S. L. Gupta
- Engineering Practical Physics by Navneet Gupta
- Engineering Practical Physics by S. K. Gupta

Website Sources:

- http://www.iiserpune.ac.in
- https://www.toppr.com
- https://wp.optics.arizona.edu
- https://www.gopracticals.com
- http://vlab.amrita.edu
- https://circuitglobe.com

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EEE-151/ 251: ELECTRICAL ENGINEERING LAB **L T P 0 0 2**

Lab Objective:

- To design electrical circuits on bread board.
- To analyze a given network by applying various network theorems.
- To expose the students to the operation of dc generator
- To expose the students to the operation of dc motor and transformer.
- To examine the self -excitation in dc generators.

List of Experiments: (Minimum 08 experiments are required to be performed) **(16 Sessions)**

1. Verification of Kirchhoff's current law.
2. Verification of Kirchhoff's voltage law
3. Verification of Superposition theorem.
4. Verification of Thevenin's Theorem.
5. Verification of Maximum Power Transfer Theorem.
6. To study a Single phase induction motor and its various methods of starting.
7. To study running and speed reversal of a Three Phase Induction Motor and determine the slip.
8. To determine the transformation ratio and turns ratio and current ratio of a single-phase transformer.
9. To study the construction of a dc machine.
10. To study a single phase Induction type Energy meter.

Lab Outcome: After successfully studying this course, students will be able to:

- Explain the concept of circuit laws and network theorems and apply them to laboratory measurements.
- Be able to systematically obtain the equations that characterize the performance of an electric circuit as well as solving both single phase and DC Machines
- Acknowledge the principles of operation and the main features of electric machines and their applications.
- Acquire skills in using electrical measuring devices.

Suggested Readings:

- V. Del Toro, "Principles of Electrical Engineering" Prentice Hall International
- I.J. Nagarath, "Basic Electrical Engineering" Tata McGraw Hill
- D.E. Fitzgerald & A. Grabel Higginbotham, "Basic Electrical Engineering" Mc- Graw Hill
- T.K. Nagsarkar & M.S. Sukhija, "Basic Electrical Engineering" Oxford University Press
- W.H. HaytP, "Engineering Circuit Analysis" Mc Graw Hill

Website Sources:

- www.iare.ac.in
- www.ocw.mit.edu
- www.nptel.ac.in
- www.vlab.co.in

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EME-152/252: MATERIALS & MANUFACTURING LAB **L T P 0 0 2**

Lab Objective:
The objective of this lab is to meet curriculum requirements and provide knowledge of different types of tools, instruments and machines and their applications in manufacturing to produce different metal components and articles and develop skills in the students.

List of Experiments: (Minimum 10 experiments are required to be performed)

1. Carpentry Shop: **(03 Sessions)**
a. Study of tools & operations and carpentry joints.
b. Simple exercise using jack plane.
c. To prepare half-lap corner joint, mortise & tenon joints.
d. Simple exercise on woodworking lathe.

2. Fitting Bench Working Shop: **(03 Sessions)**
a. Study of tools & operations
b. Simple exercises involving fitting work.
c. Making perfect male-female joint.
d. Simple exercises involving drilling/tapping/dieing.

3. Black Smithy Shop: **(03 Sessions)**
a. Study of tools & operations
b. Simple exercises based on black smithy operations such as upsetting, drawing down, punching, bending, fullering & Swaging.

4. Welding Shop: **(03 Sessions)**
a. Study of tools & operations of Gas welding & Arc welding
b. Making simple Butt and Lap arc welded joints.
c. Simple exercises involving Oxy-acetylene Gas welding.

5. Sheet-metal Shop: **(02 Sessions)**
a. Study of tools & operations.
b. Making Funnel complete with 'soldering'.
c. Fabrication of tool-box, tray, electric panel box etc.

6. Machine Shop: **(03 Sessions)**
a. Study of machine tools and operations.
b. Simple exercises involving Plane turning.
c. Simple exercises involving Step turning
d. Simple exercises involving Taper turning.

7. **Foundry Shop:** **(03 Sessions)**
a.Study of tools and operations.
b. Preparation of sand for moulding.
c. Mould making using core.

Course Outcome: Students completing this course will be able:

- To define and use different manufacturing process e.g. casting, forging, turning, drilling etc.
- To define and use different welding processes e.g. gas welding and electric arc welding.
- To acquire thorough knowledge of carrying out various operations in this lab.
- To acquire skills for creating different objects from raw materials.

Suggested Readings:

1. *Manufacturing Process,* B.S Raghuvanshi, Dhanpat Rai Publication.
2. *Manufacturing Processes,* R.S. Khurmi and J.K. Gupta, S. Chand Publishing.
3. *Materials Science,* Narula & Narula, McGraw Hill Education Private Limited.
4. *Manufacturing Technology*, R. K. Rajput, Laxmi Publications PVT. LTD.

Website Sources:

- www.wikipedia.org
- www.brcmcet.edu.
- www.slideshare.net
- https://onlinecourses.nptel.ac.in

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EME 153/253: Engineering Graphics Lab **L T P 0 0 2**

Lab Objective:

- The course is aimed at developing Basic Graphic skills.
- Develop Skills In Preparation Of Basic Drawings.
- Skills in Reading and Interpretation of Engineering Drawings.

1. Introduction **(03 Sessions)**

Introduction, Drawing Instruments and their uses, BIS conventions, Lines & Lettering, Dimensioning and free hand practicing. Coordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale.

2. Orthographic Projections **(04 Sessions)**

Introduction, Definitions- Planes of projection, reference line and conventions employed. Principle of Orthographic projections, First and Third Angle projections. Projection of Points, Pictorial view. Terms used in Projection of lines. Projection of lines parallel to both the planes. Parallel to one and inclined to other, Inclined to both the planes. Application to practical problems. **(First Angle Projection Only)**

3. Projections of Solids (First Angle Projection Only) **(05 Sessions)**

Introduction, Definitions- Projections of right regular- tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions. Sections and Development of Lateral Surfaces of Solids, Sectional views, apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. Development of lateral surface of above solids, their frustums and truncations.

4. Isometric Projection (Using Isometric Scale Only) **(04 Sessions)**

Introduction, Principle of isometric projection, Terminology, Isometric scale, Isometric Projection of simple plane figures, Isometric Projection of tetrahedron, hexahedron (cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres and combination of solids.

Lab outcome: Students completing this course will be able to:

- Use the drawing instruments effectively and able to dimension the given figures
- Appreciate the usage of engineering curves in tracing the paths of simple machine components
- Understand the concept of projection and acquire visualization skills, projection of points
- Able to draw the basic views related to projections of Lines, Planes

Suggested Readings:

- Engineering Drawing – N.D. Bhatt & V.M. Panchal, 48th edition, 2005 Charotar Publishing House, Gujarat.
- A Primer on Computer Aided Engineering Drawing-2006, Published by VTU, Belgaum.
- Engineering Graphics – K.R. Gopalakrishna, 32nd edition, 2005 – Subash Publishers Bangalore.
- Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production – Luzadder Warren J., duff John M., Eastern Economy Edition, 2005 – Prentice- Hall of India Pvt. Ltd., New Delhi.
- Engineering Drawing with an introduction to Auto CAD by Dhananjay A Jolhe, Tata Mc Graw Hill Book Company, New Delhi.

Website Sources:

- https://lecturenotes.in/
- http://home.iitk.ac.in/
- http://www.fkm.utm.my/
- https://lecturenotes.in/

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EMA – 201: ENGINEERING MATHEMATICS – II L T P 3 1 0

Objective:
The main aims of this course are to develop the basic Mathematical skills of engineering students that are imperative for effective understanding of engineering subjects. The topics Differential equation, series solutions, Fourier series and PDE introduced to serve as basic tools for specialized studies in many fields of engineering and technology.

UNIT – 1 **(08 Sessions)**
Differential Equations: Ordinary differential equations of first order and first degree, Linear differential equations of n^{th} order with constant coefficients, Complementary functions and particular integrals, Simultaneous linear differential equations, Solutions of second order differential equations by changing dependent and independent variables, Method of variation of parameters, Applications to engineering problems (without derivation).

UNIT – 2 **(08 Sessions)**
Series Solutions and Special Functions: Series solutions of ODE of 2nd order with variable coefficients with special emphasis to differential equations of Legendre and Bessel, Legendre polynomials, Bessel's functions**.**

UNIT – 3 **(08 Sessions)**
Fourier Series: Periodic functions, Trigonometric series, Fourier series of period 2π , Euler's formulae, Functions having arbitrary period, Change of interval, Even and odd functions, Half range sine and cosine series.

UNIT – 4 **(08 Sessions)**
Partial Differential Equations: Introduction of partial differential equations, Solution of first order differential equations, Linear partial differential equations with constant coefficients of second order and their classification – Parabolic, Elliptic and Hyperbolic with illustrative examples.

UNIT – 5 **(08 Sessions)**
Applications of Partial Differential Equations : Method of separation of variables for solving partial differential equations, Wave equation upto two dimensions, Laplace equation in two-dimensions, Heat conduction equations upto two-dimensions, Equations of transmission Lines.

Course Outcome: The student is able to
- Classify differential equations according to certain features.
- Solve first order linear differential equations and nonlinear differential equations of certain types and interpret the solutions.
- Solve second and higher order linear differential equations with constant coefficients and construct all solutions from the linearly independent solutions.
- Find series solutions about ordinary and regular singular points for second order linear differential equations.
- Apply Fourier series to analyze the engineering problem.
- Solve partial differential equations with methods & its Applications.

Suggested Readings:

- Prasad C. Advanced Mathematics for Engineers, Prasad Mudralaya.
- A Textbook of Differential Equations, Pitamber Publications.
- B. S .Grewal , Engineering Mathematics , Khanna Publishers, New Delhi.
- E.Kreyszig, Advanced Engineering Mathematics , John Wiley & Sons.
- C.Ray Wylie & Louis C .Barrett , Advanced Engineering Mathematics ,Tata Mc Graw –Hill Publishing Company Ltd.
- Chandrika Prasad ,Advanced Mathematics for Engineers, Prasad Mudranalaya.

Website Sources:
- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- onlinecourses.nptel.ac.in
- en.wikipedia.org

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EPH-201: Engineering Physics-II **L T P 3 1 0**

Objective:
The goal of this course is to familiarize students about electromagnetic theory, magnetic materials, solid state Physics, superconductors and their applications.

UNIT- I **(10 Sessions)**
Electromagnetic Theory
Gauss law, continuity equation, Ampere's Law, Maxwell's equations (differential and integral forms), Pointing vector and Pointing Theorem, propagation of plane electromagnetic waves in free space Non conducting and in conducting media, Skin depth.

UNIT- II **(08 sessions)**
Dielectric and Magnetic Properties of Materials
Dielectric Properties: Dielectric constants, Polarization of dielectric materials, Polarizability, Claussius- Mossotti Equation, Application of dielectric.
Magnetic Properties: Magnetization, Magnetic moment, Dia, Para and Ferro magnetism, Langevin theory for diamagnetic material, Hysteresis Curve.

UNIT - III **(08 Sessions)**
Solid State Physics
Energy bands in metals, Semiconductors and insulators, Intrinsic and extrinsic semiconductors, Fermi energy levels for doped, undoped semiconductors, P-N junction, Tunnel diode, Zener diode.

UNIT- IV **(08 Sessions)**
Superconductivity: Meissner Effect, Type I and Type II Superconductors, BCS theory (Qualitative only), London's Equation, Properties of superconductors & applications of superconductors.
Nano Materials: Basic principle of nano science and technology, Structure, properties and uses of Fullerene and carbon nano tubes, Application of nano technology.

Unit- V **(08 Sessions)**
X-Rays: Diffraction of X-rays, Production and properties, Bragg's Law, Bragg's spectrometer, Applications of X-rays.
Ultrasonics: Introduction, Production of Ultrasonics (Magneto striction and piezoelectric methods), properties & applications of Ultrasonic waves.

Course outcome: The students completing this course will be able to:
- Understand Gauss law, Ampere's Law, Maxwell's equations and their applications.
- Study of Propagation of plane electromagnetic waves in free space.
- Understand Dielectric and magnetic properties of the materials.
- Explain Intrinsic and extrinsic semiconductors.
- Construction, Operation and characteristics of diodes.
- Understand concepts of superconductors, Properties of superconductors & applications of superconductors.
- Gain basic knowledge on the properties, production and applications of X-rays.
- Basic principle of nano science and technology and applications of nanotechnology.

Suggested Readings:
- Concept of Modern Physics: A. BEISER
- Atomic Physics: Rajam
- Greiner : Quantum Physics
- Griffth : Introduction to Electrodynamics
- S. K. Gupta: Engineering Physics
- Beiser : Perspective of Modern Physics

Website Sources:
- https://www2.ph.ed.ac.uk
- http://web.mit.edu
- http://pcwww.liv.ac.uk
- http://sites.science.oregonstate.edu
- https://eng.libretexts.org
- https://shodhganga.inflibnet.ac.in
- https://www.electrical4u.com
- https://vardhaman.org

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ECH – 101 / 201: ENGINEERING CHEMISTRY **L T P 3 1 0**

OBJECTIVE:

- To emphasize the relevance of fundamentals and applications of chemistry in the field of engineering.
- To take into account appropriate combinations of old and new emerging concepts for the potential uses in engineering.
- To address the principles of general chemistry and specific topics relevant to various engineering disciplines.
- To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
- To bring potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

UNIT-I: MATTER - CHEMICAL BONDING AND ITS STATES: **(08 Sessions)**

Types of bonds (Ionic, covalent and chemical bonds), valence bond theory, molecular orbital theory and its applications to homo and hetero (CO & NO) diatomic molecules. Solid state- Types of unit cells, space lattice (only cubes) calculation of density of the unit cell, two dimensional solids such as graphite and its conduction properties. Fullerenes and their applications.

UNIT-II: CHEMICAL KINETICS AND ELECTROCHEMISTRY: **(08 Sessions)**

Molecularity and order of reactions, zero, first and second order reactions, theories of reaction rates, electrode potential, electrochemical cells (galvanic and concentration), Nernst equation, electrochemical and galvanic series, definition, significance and classification of corrosion, electrochemical corrosion.

UNIT-III: REACTION MECHANISM AND SPECTROSCOPY: **(08 Sessions)**

Electrophile, Nucleophile (SN^1 and SN^2reactions)
Mechanism of the following reactions:
(i) Aldol condensation (ii) Beckmann rearrangement (iii) Cannizaro reaction
(iv) Hoffmann rearrangement (v) Diels-Alder reaction and ((vi) Friedel craft reaction
Basic principle, instrumentation and general application of UV, Visible, IR/ FTIR &^{1H}NMR spectroscopy (excluding specific applications).

UNIT-IV: POLYMERS: **(08 Sessions)**

Polymers, classification and applications, polymerization (addition and condensation), Thermoplastic and Thermosetting polymers, preparation, properties and uses of PVC, Dacron, nylon66 and Bakelite. Elastomers (Natural rubber, buna-N, buna-S) vulcanization, conducting polymers (Intrinsic & Extrinsic), doping, ion exchange resins, biodegradable polymers.

UNIT-V: WATER TREATMENT AND FUELS: **(08 Sessions)**

Hardness of water, calculation on hardness and its determination by EDTA method, sludge and scale formation, causes and prevention of scale formation (colloidal, phosphate, and calgon conditioning), removal of hardness (Soda lime process, zeolite process & ion-exchange process), calculations based on lime soda process.
Definition of fuels, classification of fuels, calorific value, determination by Dulong's formula, analysis of coal (Proximate and ultimate analysis), petroleum, important fractions of petroleum and their uses, gaseous fuels (CNG & LPG)

COURSE OUTCOME:

- Demonstrate knowledge of science behind common impurities in water and methods to treat them and also different methods to remove hardness of water.
- Students will also be able to understand and relate electrochemistry and corrosion.
- to analyze the basic knowledge of various types of Fuels, their properties and Industrial Applications ALONG WITH THE determination OF the calorific value of fuels .
- Apply the science for understanding corrosion and its prevention.
- Demonstrate knowledge of superconducting and organic electronic materials.
- Students will be able to understand about different polymers.

SUGGESTED READINGS:

- Text Book of Polymer Science by F.W. Billmeyer, John Wiley & sons, 1994.
- Liquid Crystals and Plastic Crystals, vol.-I, edited by G.W. Gray and P.A. Winsor, Ellis Harwood Series in Physical Chemistry, New York.
- Corrosion Engineering by M.G. Fontana McGraw Hill Publications
- Engineering Chemistry by J C Kuriacose and J. Rajaram, Tata McGraw-Hill Co, New Delhi (2004)
- Chemistry of Engineering Materials by C.P. Murthy, C.V. Agarwal and A. Naidu BS Publication Hyd.

WEBSITE SOURCES:

- http://www.commonchemistry.org/
- https://uri.idm.oclc.org/login?url=https://www.engineeringvillage.com/search/quick.url?CID=quickSearch&database=1
- https://www.technicalsymposium.com/

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EME – 101 / 201: ENGINEERING MECHANICS **L T P 3 1 0**

Objective:
The primary purpose of the study of engineering mechanics is to develop the capacity to predict the effects of force and motion while carrying out the creative design functions of engineering. This capacity requires more than a mere knowledge of the physical and mathematical principles of mechanics; also required is the ability to visualize physical configurations in terms of real materials, actual constraints ,and the practical limitations which govern the behavior of machines and structures.

Unit-1 **(10 Sessions)**
Two Dimensional Force Systems: Basic concepts, Laws of motion, Principle of Transmissibility of forces, Transfer of a force to parallel position , Resultant of a force system, Simplest Resultant of Two dimensional concurrent and non-concurrent force systems, Free body diagrams, Equilibrium and Equations of Equilibrium, Applications.

Unit-2 **(08 Sessions)**
Trusses: Introduction, Simple Truss and solution of simple truss, Method of Joints and Method of Sections.
Friction: Introduction, Laws of Coulomb Friction, Equilibrium of Bodies involving Dry-friction, Belt friction, Application.

Unit-3 **(08 Sessions)**
Centroid and Moment of Inertia: Centroid of plane, curve, area, volume and composite bodies, Moment of inertia of plane area, Parallel Axes Theorem, Perpendicular axes theorem, Principal Moment Inertia, Mass Moment of Inertia of Circular Ring, Disc, Cylinder, Sphere and Cone about their Axis of Symmetry.

Unit-4 **(06 Sessions)**
Beam: Introduction, Shear force and Bending Moment, Differential Equations for Equilibrium, Shear force and Bending Moment Diagrams for Statically Determinate Beams.

Unit-5 **(08 Sessions)**
Kinematics of Rigid Body: Introduction, Plane Motion of Rigid Body, Velocity and Acceleration under Translation and Rotational Motion. Relative Velocity.
Kinetics of Rigid Body: Introduction, Force, Mass and Acceleration, Work and Energy, Impulse and Momentum, D'Alembert's Principles and Dynamic Equilibrium.

Course outcome: Students completing this course will be able to:
- Recognize different force systems, moments and couple.
- To draw Free Body Diagram and label the reactions on it.
- Apply equilibrium equations in statics.
- Understand Newton's law in motion, and recognize different kinds of particle motions.

Suggested Readings:
- Engineering Mechanics by Irving H. Shames, Prentice-Hall
- Mechanics of Solids by Abdul Mubeen, Pearson Education Asia.
- Engineering Mechanics by R.K.Bansal, Laxmi Publications, New Delhi.
- Engineering Mechanics by SS Bhavi Katti, New age International Publisher, New Delhi.

Website Sources:
- https://nptel.ac.in/courses/122/104/122104014/
- https://www.coursera.org/learn/engineering-mechanics-statics
- https://www.edx.org/course/engineering-mechanics-2
- https://www.youtube.com/watch?v=ADR04oYgpAM

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EEC 101/ 201: ELECTRONICS ENGINEERING **L T P 3 1 0**

Objective:
The objective of the course is to familiarize the students with concepts of semiconductor and its working along with their applications in real life.

UNIT – I **(08 Sessions)**
Theory of Semiconductor material: Energy band Theory of crystals, Insulators, Semiconductors and Metals, classification of semiconductors, Mobility and Conductivity, Donor and Acceptor Impurities, Mass- Action law, Variation in semiconductor parameters with Temperature, Hall – Effect.

UNIT – II **(08 Sessions)**
Semiconductor Diodes and Applications: p-n junction, depletion layer, V-I characteristics, diode resistance, capacitance, p-n junction as rectifiers, filter (Shunt capacitor filter), clipping circuits, clamping circuits, breakdown mechanism, breakdown characteristics, zener resistance, zener diode application as shunt regulator. Introduction of LED, and Photo diode.

UNIT– III **(08 Sessions)**
Bipolar Junction Transistor (BJT): construction, transistor action, CB, CE and CC configurations, concept of voltage gain, current gain. Field Effect Transistor (FET): JFET: construction, principle of working, concept of pinch-off, drain saturation current, characteristics, characteristic equation, CG, CS and CD configurations, MOSFET: depletion and enhancement type, construction.

UNIT – IV **(08 Sessions)**
Number system: conversion of bases (decimal, binary, octal and hexadecimal numbers) addition and subtraction, BCD numbers, Boolean algebra, logic gates, concept of universal gates. Canonical forms, minimization using K-map (Upto four variable, don't care conditions also)

UNIT – V **(08 Sessions)**
Operational Amplifier (Op-Amp): concept of ideal operational amplifier, parameters. Inverting, non-inverting and unity gain configurations, Op-amp as adder, subtractor, Block diagram of Communication Systems, Introduction to Modulation, Need for modulation, Definition of AM and FM.

Course Outcome:
- Understand the basic of semiconductor technology
- Define the purpose of different diodes used in several applications
- Develop understanding and impact of resistance regions
- Discuss how basic communication occurs over wireless medium
- Discuss the benefits of transistors over conventional vacuum tubes

Suggested readings:

- S. Salivahanan, N Suresh Kumar, "Electronic Devices and circuits" 2nd Edition, TMH
- Robert L. Boylestad/ Louis Nashelsky "Electronic Devices and Circuit Theory", 9th Edition, Pearson Education
- Jacob Millman, Christos C. Halkias, "Integrated Electronics", TMH
- Morris Mano "Digital Computer Design", PHI 2003
- Kennedy, Davis, "Electronics Communication System" 4th Edition, TMH.

Website sources:

- www.sanfoundary.co.in
- Grade up online course on transistors (www.gradeup.org)
- www.nptel.ac.in
- en.wikipedia.org

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ECS-101/201: Computer Fundamentals and Programming **L T P 3 1 0**

Objective:

- This course introduces the concepts of computer basics & programming with particular attention to Engineering examples.
- The C programming language is used but the course will stress on fundamental parts of programming language, so that the students will have a basic concept for understanding and using other programming language.
- C is the easiest language to understand so basic constructs of C will be cleared.

Unit-I **(08 Sessions)**

Introduction: Introduction to Computer Systems, Generation of Computers, BIOS, Various types of memories, CPU organization, ALU, registers. Introduction to various operating Systems. Number systems: Binary, hexadecimal, octal and their inter conversions. Computer Languages and Software & hardware: High Level Languages and Low Level Language, Various types of software. Firmware, Compiler, Interpreter and Assembler. File Allocation Table, Hardware.

Unit –II **(08 Sessions)**

Input, Output and storage Units: Introduction to various Input and output DevicesPrinters: Various type of Impact and Non- Impact Printers. Introduction to algorithm and Flow chart: Representation of an algorithm, flowchart symbols and levels of flow chart, advantage and limitations of flowchart and pseudo code. Basics of programming: Introduction to the design and implementation of correct, efficient and maintainable programs. Use of high level programming languages for the development of programs.

Unit-III **(08 Sessions)**

Standard I/O in "C", Fundamental Data Types and Storage Classes: Character types, Integer, short, long, unsigned, single and double-precision floating point, storage classes, automatic, register, static and external, Operators and Expressions: Using numeric and relational operators, mixed operands and type conversion, Logical operators, Bit operations, Operator precedence and associatively.

Unit-IV **(08 Sessions)**

Conditional Program Execution: Applying if and switch statements, nesting if and else, restrictions on switch values, use of break and default with switch, Program Loops and Iteration: Uses of while, do and for loops, multiple loop variables, assignment operators, using break and continue.

Unit-V **(08 Sessions)**

Modular Programming: Passing arguments by value, scope rules and global variables, separate compilation, and linkage, building your own modules. Arrays: Array notation and representation, manipulating array elements, using multidimensional arrays, arrays of unknown or varying size, Structure, union, enumerated data types, Functions: Introduction, types of functions, functions with array, recursive functions, Introduction to pointers, Introduction to file handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler.

Course Outcome: On completion of the course students will be able to:

- Understanding the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming
- Write, compile and debug programs in C language and use different data types for writing the programs.
- Design programs connecting decision structures, loops and functions.
- Explain the difference between call by value and call by address.
- Understand the dynamic behavior of memory by the use of pointers.
- Use different data structures and create or manipulate basic data files and developing applications for real world problems.

Suggested Readings:

- "Let us C", Yashvant Kanitkar.
- "Programming with C", Byron Gottfried
- "Computer Fundamentals", Anita Goel, Pearson Education
- "Computer Concepts and Programming in C", E Balaguruswami, McGraw Hill
- "C programming", Kernighan and Ritchie, PHI
- "Computer Fundamentals and Programming in C", Reema Thareja, Oxford Publication

Website Sources:

- www.nptel.ac.in
- www.toptal.com/c/the-ultimate-list-of-resources-to-learn-c-and-c-plus-plus
- www.learn-c.org

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ECH 151/251: CHEMISTRY LAB **L T P 0 0 2**

Lab Objective:

- Practical implementation of fundamental concepts of qualitative and quantitative analysis.
- To gain the knowledge on existing future upcoming devices, materials and methodology used in chemistry practicals.
- To rely on elementary treatment and qualitative analysis and makes use of concepts involved.
- To provide an overview of preparation and identification of organic compounds

List of Experiments: (Minimum 08 experiments are required to be performed) **(16 Sessions)**

1. Determination of alkalinity of the given sample of water.
2. Determination of temporary and permanent hardness of water sample by Versinate method
3. Determination of available chlorine in bleaching powder.
4. Determination of quantity of dissolve oxygen in given sample of water.
5. Determination of iron content in the given water sample by Mohr's methods.
6. Determination of ion exchange capacity of given sample of ion-exchange material.
7. Determination of Equivalent weight of iron by the chemical displacement method. The equivalent weight of copper is 63.5.
8. Determination of viscosity of polystyrene by Ostwald Viscometer.
9. Preparation of Bakelite resin.
10. Element detection and functional group identification in organic

Lab Outcome:

- Students are able to estimate the impurities present in water.
- Ability to prepare advanced polymer materials.
- Ability to know the strength of an acid present in secondary batteries.
- Ability to find the Fe^{+2}, Ca^{+2}& Cl^{-} present in unknown substances using titrimetric and instrumental methods.

Suggested Readings:

- Applied Chemistry by R. S. Katiyar & J.P. Chaudhary Publication B.B.P. & Co. Meerut
- March's Advanced Organic Chemistry: Reactions, Mechanisms and Structure Smith, Michael B./March, Jerry, John Willey & sons, 6th Edition, 2007.
- Elements of Physical Chemistry, Glasstonne, Samuel B. ELBS, 2005.
- Organic Chemistry, Finar, I.L.: Addision – Wesley Longman, Limited, 2004.
- Principles of Physical Chemistry, by Puri B.R., Sharma L.R., S. Nagin & Company, Delhi

Website Sources:

- https://www.gopracticals.com/basic-engineering/
- https://edu.rsc.org/resources/practical
- https://play.google.com/store/apps/details?id=com.softwareindiavinod.chemistrypracticals&hl=en&gl=US

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EEC 151/251: ELECTRONICS ENGINEERING LAB **L T P 0 0 2**

Lab Objective:
The objective of this lab is to familiarize the students with the basic working of diodes and also help them calculate voltage and currents through simple devices such as multimeter.

List of Experiments: (Minimum 08 experiments are required to be performed) **(16 Sessions)**

1. To study of Digital Multimeters (measurement of AC and DC voltage, measurement of current, measurement of resistance, capacitance), passive components (resistor, capacitor) and verify using colour code.
2. To Study Cathode Ray Oscilloscope (To study of controls of CRO, to measure amplitude, time period and frequency of time varying signals), function generator, power supply & Bread Board.
3. To study the Characteristics of a P-N Junction diode in forward & reverse bias connection.
4. To draw wave shape of the electrical signal at input and output points of the half wave rectifier.
5. To draw wave shape of the electrical signal at input and output points of the full wave rectifiers.
6. To study the Zener diode characteristic graphical measurement of forward and reverse resistance.
7. To Plot input / output characteristics for common base transistor.
8. To verify the truth table of basic logic gates (AND, OR, NOT)
9. To build and test the clipper circuit using diode.
10. To build and test the clamper circuit using diode

Lab Outcome: Students taking this lab will be able to:

- Measure voltage, current through multimeter.
- Understand the practical working of a diode
- Understand the graph transitions of a transistor
- Understand the concept of logic gates.

Suggested Readings:

- S. Salivahanan, N Suresh Kumar, "Electronic Devices and circuits" 2nd Edition, TMH
- Robert L. Boylestad/ Louis Nashelsky "Electronic Devices and Circuit Theory", 9th Edition, Pearson Education 2007
- Jacob Millman, Christos C. Halkias, "Integrated Electronics", TMH
- Morris Mano "Digital Computer Design", PHI

Website Sources:

- www.nptel.ac.in
- www.gradeup.in
- en.wikipedia.org
- www.electr_basic.in

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ECS-151/251: Computer Lab **L T P 0 0 2**

Lab Objective:
The following student learning outcomes, goals, assessment methods and core competencies have been identified for the Learning Center computer lab:

- To provide students with an open access computer lab using up-to-date technology to complete their studies.
- To increase retention in reading, study skills, English, foreign language, nursing, psychology and other academic classes by providing a lab where students can make use of software products to supplement instruction.

List of Experiments: (Minimum 10 experiments are required to be performed) **(16 Sessions)**

1. Object: Apply basic operations in windows on a folder.
2. Object: Design front page of your practical file
3. Object: Prepare a PERSONAL LETTER.
4. Object: Create your resume using given Templates.
5. Object: Create a report containing the pay details of the employee.
6. Object: Create a student result sheet
7. Object: create a pie chart for a sample data and give legends.
8. Object: Prepare a Time Table in MS-Excel.
9. Object: Prepare a presentation in MS-Power point about "Fundamentals of Computer".
10. Object: Create your E-Mail ID on Gmail
11. Object: Search any topic related to your syllabi using any search.
12. Object: Write a program in C to print "I am a student of IFTM University".
13. Object: Write a program in C to take input from user using scanf.
14. Object: Write a program to add, subtract, multiplication and division of two numbers.
15. Object: Write a program in C to calculate Factorial of a Number
16. Object: Write a program in C to print a Table.
17. Object: Program to compute the compute the average.
18. Object: Write a program to check whether a number is even or odd.
19. Object: Write a program to check whether a number is prime number or not.
20. Object: Write a program to check whether a year is leap year or not.
21. Object: Write a program to find largest of three numbers. 28
22. Object: Program to compute the factorial of a given number.

Lab Outcome: The end of this course:

- Students will be able to identify the Learning Center as a place for utilizing computers with specialized software as a resource for supplemental study.
- Students will find the Learning Center equipment, software, and facility adequate to meet their educational needs.
- The Learning Center will support or facilitate a positive learning or service environment for students.
- Each student should be able to choose appropriate data structures to represent data items in real world problems.
- Each student should be able to analyze the time and space complexities of algorithms .
- Each student should be able to design programs using a variety of data structures such as stacks, queues, hash tables, binary trees, search trees, heaps, graphs, and B-trees.
- Each student should be able to analyze and implement various kinds of searching and sorting techniques.

Suggested Readings:

- "Let us C", Yashvant Kanitkar.
- "Programming with C", Byron Gottfried
- "Computer Fundamentals", Anita Goel, Pearson Education
- "Computer Concepts and Programming in C", E Balaguruswami, McGraw Hill
- "C programming", Kernighan and Ritchie, PHI
- "Computer Fundamentals and Programming in C", Reema Thareja, Oxford Publication

Website Sources:

- www.nptel.ac.in
- www.toptal.com/c/the-ultimate-list-of-resources-to-learn-c-and-c-plus-plus
- www.learn-c.org

SCHOOL OF ENGINEERING & TECHNOLOGY
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Bachelor of Technology (B.Tech) Civil Engineering
B.Tech – I Year (II Semester)
Effective from Session 2020-21

EME – 151 / 251: Mechanical Engineering Lab **L T P 0 0 2**

Lab Objective:
The objective of the course is to introduce students to different engineering material and create an understanding of different mechanical properties by using Destructive testing methods. Also the students will be familiar with the basic working of IC engines & boilers.

List of Experiments: (Minimum 08 experiments are required to be performed) **(16 Sessions)**

1. To conduct tensile test and determine the ultimate tensile strength, percentage elongation for a steel specimen using UTM Machine.
2. To conduct compression test and determine the ultimate compressive strength for a specimen using UTM Machine.
3. To conduct Impact-tests (Izod / Charpy) on Impact-testing machine to find the toughness.
4. To determine the hardness of the given specimen using Brinell/Rockwell hardness testing machine.
5. To study 2-stroke & 4-stroke I.C. Engine models.
6. To study Lancashire, Babcock Wilcox and Locomotive boiler models.
7. To study Steam Engine & Steam Turbine models.
8. To study vapor compression Refrigerator unit tutor / refrigerator.
9. To study window type Air conditioner.
10. To conduct torsion test on mild steel or cast iron specimens to find out modulus of rigidity.

Lab outcome: Students completing this course will be able to:

- Describe the behavior of materials upon normal external loads.
- Predict the behavior of the material under impact conditions.
- Recognize the mechanical behavior of materials.
- Recognize parts of IC engines.
- Recognize components of boilers.

Suggested Readings:

- Engineering Mechanics by Irving H. Shames, Prentice-Hall
- Mechanics of Solids by Abdul Mubeen, Pearson Education Asia.
- Engineering Mechanics by R.K.Bansal, Laxmi Publications, New Delhi.
- Engineering Mechanics by SS Bhavi Katti, New age International Publisher, New Delhi.

Website Sources:

- https://www.sciencedirect.com/topics/engineering/izod-impact
- https://www.twi-global.com/technical-knowledge/faqs/faq-what-is-charpy-testing
- https://www.hardnesstesters.com/test-types/brinell-hardness-testing
- https://www.youtube.com/watch?v=liiopCScMck

SYLLABUS

B.TECH – II YEAR

SCHOOL OF ENGINEERING & TECHNOLOGY
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STUDY AND EVALUATION SCHEME
Effective from Session 2020-21
YEAR II, SEMESTER-III

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	EMA -301	Engineering Mathematics -III	3	1	0	20	10	30	70	100	4
2.	ECE-301	Engineering Geology	3	1	0	20	10	30	70	100	4
3.	ECE-302	Building Materials & Construction	3	1	0	20	10	30	70	100	4
4.	ECE-303	Surveying Practice - I	3	1	0	20	10	30	70	100	4
5.	ECE-304	Fluid Mechanics	3	1	0	20	10	30	70	100	4
6.	ECE-305	Strength of Materials	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
7.	ECE-351	Engineering Geology Lab	0	0	2	20	10	30	70	100	1
8.	ECE -352	Building Material Lab	0	0	2	20	10	30	70	100	1
9.	ECE -354	Fluid Mechanics Lab	0	0	2	20	10	30	70	100	1
10.	ECE -353	Surveying - I Lab	0	0	2	20	10	30	70	100	1
11.	EGP-301	General Proficiency	-	-	-	-	-	100	-	100	1
		TOTAL	**18**	**06**	**08**	**-**	**-**	**-**	**-**	**1100**	**29**

YEAR II, SEMESTER-IV

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	EMA -401	Computer Based Numerical & Statistical Techniques	3	1	0	20	10	30	70	100	4
2.	ECE -401	Concrete Technology	3	1	0	20	10	30	70	100	4
3.	ECE -402	Surveying Practice - II	3	1	0	20	10	30	70	100	4
4.	ECE -403	Structural Analysis - I	3	1	0	20	10	30	70	100	4
5.	ECE -404	Estimation, Costing Evaluation	3	1	0	20	10	30	70	100	4
6.	PSD-401	Professional Skill Development - II	3	1	0	20	10	30	70	100	4
7.	EHU-401	Disaster Management (Audit Course) #	2	1	0	20	10	30	70*	100*	3*
PRACTICALS / PROJECT											
7.	ECE -451	Concrete Technology Lab	0	0	2	20	10	30	70	100	1
8.	ECE -452	Surveying - II Lab	0	0	2	20	10	30	70	100	1
9.	ECE -453	Building Planning & Drawing Lab	0	0	2	20	10	30	70	100	1
10.	EMA -451	Computer Based Numerical & Statistical Techniques Lab	0	0	2	20	10	30	70	100	1
11.	EGP-401	General Proficiency	-	-	-	-	-	100	-	100	1
		TOTAL	**18**	**06**	**08**	**-**	**-**	**-**	**-**	**1100**	**29**

 # The Subject (EHU-401) Disaster Management will be offered as a compulsory audit course and each student has to pass the subject with minimum 35 out of 100 marks.
*** Internal Assessment**

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B.Tech – II Year (III Semester)
Effective from Session 2020-21
EMA – 301: Engineering Mathematics – III **L T P 3 1 0**

Objective: - The main aims of this course are to exposing the students to learn the Laplace transform and Z-transform and introduce the fundamental ideas of the functions of complex variables and developing a clear understanding of the fundamental concepts of Complex Analysis such as analytic functions, complex integrals and a range of skills which will allow students to work effectively with the concepts in the field of engineering.

UNIT – 1 **(12 Sessions)**
Laplace Transform : Existence theorem, Laplace transform of derivatives & Integrals inverse Laplace transforms, Unit step functions delta functions, Laplace transform of periodic functions, Convolution theorem, Applications to solve simple linear and simultaneous differential equations.

UNIT – 2 **(08 Sessions**
Integral Transform: Fourier integral, Fourier complex transform, Fourier sine and cosine transforms and applications to simple heat transfer equations. Z- transforms and its applications to solve difference equations.

UNIT – 3 **(10 Sessions)**
Functions of a complex variable – I : Analytic functions, C- R equations and harmonic functions,Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic functions, Liouville's theorem, Fundamental theorem of algebra.

UNIT – 4 **(10 Sessions)**
Functions of a Complex Variable – II : Representation of a function by power series ,Taylor's series and Laurent's series, Singularities, Zeroes and poles, Residue theorem, Evaluation of real integrals of type $\int_0^{2\pi} f(cos\theta, sin\theta)d\theta$and $\int_{-\infty}^{+\infty} f(x)dx$, Conformal mapping and Bilinear transformations.

UNIT – 5 **(12 Sessions)**
Method of least squares and curve fitting of straight lines, Polynomials, Exponential curves etc., Solution of cubic and Bi-quadratic equations.

Course Outcomes:
The student is able to
• Know the use of Laplace transform solving Boundary Value Problems.
• Use Z-transform in development of scientific simulation algorithms.
• Apply the concept and consequences of analyticity and the Cauchy-Riemann equations to Analyze the results on harmonic and including the fundamental theorem of algebra.
• Evaluate complex contour integrals directly and by the fundamental theorem, apply the Cauchy integral theorem and theCauchy integral formulain its various versions.
• Represent functions as Taylor, power and Laurent series, classify singularities and poles, find residues and evaluate complex integrals using the residue theorem.
•Know the use and show the curve fitting of different functions.

Suggested Readings:

1. B. S .Grewal , Engineering Mathematics, Khanna Publishers, New Delhi.
2. B . S . Grewal , Higher Engineering Mathematics , Khanna Publishers,New Delhi.
3. E.Kreyszig, Advanced Engineering Mathematics , John Wiley & Sons
4. C.Ray Wylie & Louis C . Barrett , Advanced Engineering Mathematics ,Tata Mc Graw –Hill Publishing Company Ltd.
5. Chandrika Prasad ,Advanced Mathematics for Engineers, Prasad Mudranalaya.

Website Sources:

- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- onlinecourses.nptel.ac.in
- en.wikipedia.org

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Effective from Session 2020-21

ECE – 301: Engineering Geology **L T P 3 1 0**

Course Objective: The objectives of the course are:

- To study the physical properties of rocks, minerals and various defects in rocks.
- To understand the various natural dynamic processes their influence on the surface features, natural material and their consequences such as earthquake, landslide etc.
- To identify different types natural materials like rocks & minerals and soil.
- To know the importance of geological maps and terms helpful in various Civil Engineering related projects.

UNIT I **(05 Sessions)**
Minerals: Type physical and detailed study of certain rock forming minerals.

UNIT II **(12 Sessions)**
Defect in Rocks: The origin, structure, texture and classification of igneous, sedimentary and metamorphic rocks and their suitability as Engineering Materials. Terminology: Stratification, Lamination bedding. Outcrop- its relation to topography, dip and strike of bed, overlap, outlier and inliers. Folds, faults and joints-causes, types, classification, engineering importance to these defects

UNIT III **(10 Sessions)**
Earthquake: Its causes, classification, seismic zones of India and Geological consideration for construction of building, projects in seismic areas. Landslides and its causes, classification and preventive measures.

UNIT IV **(10 Sessions)**
Underground water: Origin, Aquifer, Aquicludes, Artesian Wells, underground provinces of India and its role as geological hazard

UNIT V **(08 Sessions)**
Geological investigations for site selection of Dams and reservoirs tunnels, bridges and Highways

Course Outcomes:
Students completing this course will be able to:
- Know about natural material like rocks and minerals and their usage as well as their availability and information about their formation.
- Understand the influence of natural processes and geological factors on civil structures and help them to take decision while planning, design and execution stage of the structures in their professional life.
- Know the significance of geological investigations for civil engineering projects and site selection as well as for the preparation of feasibility reports and others.
- Get the knowledge of subject will also help them to understand the geological maps and terminologies for the discussion on geological reports to resolve civil engineering issues.

Suggested Readings:

- "Text Book of Engineering Geology" , K V G K Gokhale ; B S Publication
- "Engineering and General Geology", Prabin Singh ; Katson Publishing House.

Website sources:

- https://nptel.ac.in/courses/105/105/105105106/
- https://bis.gov.in/other/quake.htm

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B.Tech – II Year (III Semester)
Effective from Session 2020-21

ECE-302: Building Materials and Construction **L T P 3 1 0**

Objective:
- To recognize materials to be used for the construction work.
- To gain knowledge of different types of masonry.
- Selection of materials, design and supervision of suitable type of floor and roof.
- To gain knowledge about doors, windows, plastering, painting, damp proofing, scaffolding, shoring, underpinning and to take suitable engineering measures.

UNIT I **(10 Sessions)**
Classification of materials, materials and their performance, economics of the building materials
Stones: Requirement of good building stone, characteristics of stones and their testing. Common building stones.Preservation of stones
Bricks: Manufacture of clay bricks, and their classification. Properties of clay bricks and their testing problems of efflorescence & lime bursting in bricks & tiles.
Timber: Classification and identification of timber, Fundamental Engineering properties.

UNIT II **(08 Sessions)**
Components of building area considerations, Construction Principle and Methods for layout, Damp proofing ant termite treatment, Vertical circulation means staircases ramp design and construction. Different types of floors, and flooring materials (Ground floor and upper floors). Bricks and stone masonry construction. Cavity wall hollow block and Waffle slab construction.

UNIT III **(06 Sessions)**
Doors, Windows and Ventilations, Construction details types and relative advantages & disadvantages. Roofs, types and treatments, Lintels and Chhajja Functional efficiency of Buildings

UNIT IV **(08 Sessions)**
Natural Ventilation, Water Supply and Sanitary fittings (Plumbing), Electricity. Heating Ventilation & Air conditioning, Mechanical Lifts and Escalators, Fire Fighting, Acoustics. Plastering different types, pointing, Distempering, Color washing, Painting etc. Principles & Methods of building maintenance.

UNIT V **(08 Sessions)**
Chemistry of Plastics manufacturing process, classification, advantages of plastics, Mechanical properties and their use in construction. Paints varnishes and distempers, Common constituents, types and desirable properties, Cement paints.types Glass: Ingredients, properties and use in construction. Insulating Materials: Thermal and sound insulating material desirable properties and type.

Course Outcomes:
On the completion of the course one should be able to understand:
- Property, use, advantage and disadvantage of different materials used in building construction.
- Various components of building with their function.
- Construction procedure of different components of building.

Suggested Readings:
- "Building Materials", S K Duggal; New Age International
- "Building Materials", P.C. Varghese; PHI
- "A Text Book of Building Construction", B.C. Punmia; Laxmi Publications, Delhi.
- "Civil engineering Materials and Construction Practices", R.K. Gupta, Jain Brothers, (New Delhi).

Website Sources:
- https://en.wikipedia.org/
- https://www.aboutcivil.org/engineering-materials.html
- https://www.aboutcivil.org/building-construction-and-design.html
- https://nptel.ac.in/
- http://www.nptelvideos.in/2012/11/building-materials-and-construction.html

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Effective from Session 2020-21

ECE – 303: Surveying Practice – I **L T P 3 1 0**

Course Objective:

The objective of this course is to introduce the students about the basic concept of measurement such as distance, direction and elevation and to explore the knowledge of instruments used for measurement such as Auto level, theodolite, compass, total station. The objectives of surveying may vary depending on the type of project such as roads, public transit systems, bridges, power plants, dams, pipelines and waste management systems.

UNIT – I **(8 Sessions)**

Linear and direction measurement: Importance of surveying to engineers, plane and geodetic surveying, principles of surveying, classification of surveys. Linear measurement, chain survey, compass survey, bearing, meridian, survey station and survey line.

UNIT – II **(12 Sessions)**

Elevation measurement: Methods of determining elevations, Direct leveling- basic terms and definitions, principle, booking and reduction of field notes, curvature and refraction, automatic levels, Contouring- methods and uses. Definition, Principles of stadia systems, sub-tense bar and tangential methods.

UNIT – III **(10 Sessions)**

Curves: Elements of simple circular curves, theory and methods of setting out simple circular curves, transition curves- types and their characteristics, ideal transition curve, equations of various transition curves, Introduction to vertical curves.

UNIT – IV **(10 Sessions)**

Theodolite surveying: Principles of traversing by compass and theodolite, computations of traverse coordinates, Principles and classification of triangulation systems, strength of figures, satellite stations, inter-visibility of stations, triangulation field work.

UNIT – V **(8 Sessions)**

Plane table surveying: Principles, plane table equipments, methods, resection by three point problem

Course Outcomes:

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

- Apply the principle and knowledge of surveying for civil Engineering Applications
- Calculation of areas, Drawing plans and contour maps using different measuring equipment.
- Use and operate measurement related traditional and modern instruments.

Suggested readings:

- "Surveying Vol 1 & 2", S K Duggal; McGraw Hills Publication.
- "Surveying & Leveling"; R Subramanian; Oxford University Press
- "Surveying & Leveling"; B C Punamia, Laxmi Publications
- "Text Book of Surveying"; C Venkatramaih University Press

Website resources:

- https://nptel.ac.in/courses/105/107/105107122/
- http://ecoursesonline.iasri.res.in/course/view.php?id=523
- https://freevideolectures.com/course/98/surveying

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Effective from Session 2020-21

ECE -304: Fluid Mechanics **L T P 3 1 0**

Course Objective: The objective of this course is to familiarize the students with the properties of fluids and the applications of fluid mechanics. To formulate and analyze the problems related to fluid flow. To understand the concept of flow measurement, types of flows and dimensional analysis.

UNIT I **(10 Sessions)**
Fundamental Concepts of Fluid Flow: Flow characteristics, Classification, Fluid properties, Foundations of flow analysis.
Fluid statics: Fluid pressure and its measurement, hydrostatic forces on submerged bodies, buoyancy and floatation, liquids in relative equilibrium.
Fluid kinematics: Continuity equation, rotational and irrotational flow, circulation and vorticity, velocity potential and stream function, flow net.

UNIT II **(10 Sessions)**
Fluid dynamics: Euler's equation, energy equation and Bernoulli's equation, application of Bernoulli's equation-orifice meter, venture meter, pivtot tube etc., flow through orifice, mouth piece, weir and notches, impulse momentum equation and its application, pipe junction, bends, stationary flat and curved vanes.
Flow through pipes: Darcy-Weisbach equation, energy losses in pipelines, equivalent pipes, multiple pipe systems.

UNIT III **(8 Sessions)**
Laminar flow: Laminar flow through circular pipes, parallel plates, open channel, Porous media, Stokes law, measurement of viscosity, transition from laminar to turbulent flow.
Turbulent flow: Shear stresses, establishment of flow, types of boundaries, mixing length concept, velocity distribution, mean velocity and resistance to flow in smooth and rough pipes, friction in non-circular conduits.

UNIT IV **(6 Sessions)**
Dimensional analysis and similitude: Dimensional homogeneity, Buckingham's π theorem, important dimensional numbers and their significance, geometric, Kinematic and dynamic similarity, model studies.

UNIT V **(6 Sessions)**
Boundary Layer Theory and Applications: Concepts of boundary layer, boundary layer thickness and equations, momentum integral equation, boundary layer separation and its control, Circulation, Drag and lift on immersed bodies, Magnus effect.

Course Outcomes:

Students completing this course will be able to:

- Understand stress-strain relationship in fluids, classify their behavior and also establish force balance in static systems.
- To apply Bernoulli principle and compute pressure drop in flow systems of different configurations.
- To describe function of flow measuring devices and apply Bernoulli equation to determine the performance of these devices.
- To measure the fluid pressure using various types of pressure measuring devices.

Reference Books:

- "Fluid Mechanics" Dr A.K. Jain
- "Hydraulics and Fluid Mechanics" P.N.Modi and S.M.Seth
- "Fluid Mechanics" Wiley and Streeter
- "Engineering fluid mechanics" R.J Gardeand A.G. Mirajkaoker

Website Sources:

- nptel.ac.in/course.html
- www.nsf.gov
- en.wikipedia.org
- www.sciencedirect.com
- www.slideshare.net
- www.researchgate.net

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Effective from Session 2020-21

ECE -305: Strength of Materials **L T P 3 1 0**

Course Objectives:
To provide the basic concepts, principles and knowledge for determining the mechanical properties (stress, strain, elastic constants, deflection etc.,) produced in structural members under various type of loading. The students will be able to design for engineering applications with the knowledge of this course.

UNIT I **(08 Sessions)**
Introduction: Properties of Materials-Elasticity, Plasticity, Ductility, Brittleness, Strength, etc.
Simple stresses and strains: Types of stresses and strains, stress strain diagram, Hooke's law, Principle of superposition, bars of varying section of different materials, compound bars, temperature stresses etc.

UNIT II **(08 Sessions)**
Elastic Constants: Modulus of elasticity, Poison's Ratio, Modulus of Rigidity and bulk modulus, and their relationships.
Principal Stresses: Stresses induced due to uniaxial stress, stresses induced by state of simple shear, stresses induced due to biaxial stress, Mohr Circle, Ellipse of stress, principal stresses and principal planes, maximum shear stresses, Principal strains. Theory of failure

UNIT III **(08 Sessions)**
Strains Energy, Resilience and Impact loading: Load deflection diagram: Strain energy of prismatic bars with varying section, for non- prismatic bars with stresses under gradual, sudden and impact loadings, shear resilience, Relation between Elastic moduli and strain energy.

UNIT IV **(08 Sessions)**
Shear Force and Bending Moment: Types of structures, loading, supporting conditions, structural actions, equation of equilibrium, SFD and BMD under different loads for determinate beams, frames and arches.
Stresses of Beam: Theory of simple bending, Distribution of bending stresses, distribution of shear stresses. Deflection in beams.

UNIT V **(08 Sessions)**
Columns and Struts: Concept of structural stability, analysis of long and short columns by Euler's, Rankin's and Secant formulae, analysis of eccentrically and laterally loaded columns.
Combined bending and Torsion: Introduction, Torsion of shafts of circular section, Torsion Equation, Torque and Twist, Shear stress due to torque,

Course Outcomes: After completion of this course the students will be able:
- To design and analyze structural members subjected to the stresses like tension, compression, torsion and combined by applying the fundamental concepts.
- To utilize of proper selection of solid material in design considering engineering properties, sustainability, cost and weight.
- To work as an engineer with ethics to the design of structures.

Reference Books:
- "Strength of Materials" Ryder.
- "Strength of Materials" Dr. R.K.Bansal.
- "Strength of Materials" Timoshenko and &Yσungs.
- "Strength of Materials" R.C. Hibbler

Web Sources:
- www.nptel.ac.in
- www.utube.com
- gradeup.co/gate-me-notes
- alphalearning.in/ese-gate/strength-of-material

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Bachelor of Technology (B.Tech) Civil Engineering
B.Tech – II Year (III Semester)
Effective from Session 2020-21

ECE – 351: Engineering Geology Lab **L T P 0 0 2**

Lab Objective: The objective of this lab is to understand the role of geology in the design and construction process of underground openings in rock and study of rocks using basic geologic classification systems and various physical properties such as color, texture etc .

List of Experiments: **(16 Sessions)**

1. Identification of minerals based on their physical properties- five samples
2. Identification of rocks based on their physical properties- five samples
3. To draw contour patterns of hills, valleys, rivers, plateau, saddle, topographic basin etc
4. To draw geological section from the given map
5. To determine the strike & dip of rock formation.
6. To determine the thickness of beds of the geological formation

Lab Outcomes: After completion of this lab student will be able

- To Identity different types of rocks on the basis of their physical properties.
- To draw and analysis topographic maps and contour maps of different terrain features

Suggested Readings:

- "Text Book of Engineering Geology" , K V G K Gokhale ; B S Publication
- "Engineering and General Geology", Prabin Singh ; Katson Publishing House.

Website sources:

- https://nptel.ac.in/courses/105/105/105105106/
- https://bis.gov.in/other/quake.htm
- https://www.britannica.com/science/rock-geology#ref80177

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Effective from Session 2020-21

ECE-352: Building Material Lab **L T P 0 0 2**

Objective:
To impart knowledge of tests on cement, course aggregates, fine aggregates, concrete, bricks used as building materials including measurement, calculation and sampling.

List of Experiments: **(16 Sessions)**

I. Cement (Two turns only)
1. Normal Consistency of cement.
2. Initial & final setting time of cement
3. Compressive strength of cement
4. Fineness of cement by air permeability and Le-chatalier's apparatus.
5. Soundness of cement.

II. Coarse Aggregate (Two turns only)
1. Crushing value of aggregate
2. Impact value of aggregate
3. Water absorption of aggregate
4. Sieve Analysis of Aggregate
5. Specific gravity & bulk density
6. Grading of aggregates.

III. Fine Aggregate: (one turns only)
1. Sieve analysis of sand
2. Silt content of sand
3. Bulking of sand

IV. Destructive and non destructive testing on concrete.

V. Bricks:
1. Water absorption.
2. Dimension Tolerances
3. Compressive strength
4. Efflorescence

Course Outcomes:
On the completion of the course one should be able to:
- Reproduce the basic knowledge of mathematics and engineering in evaluating the properties of building materials like cement, aggregates, bricks, etc.
- Use the techniques and testing methods of modern engineering necessary for building materials.
- Identify, formulate and solve engineering problems related to civil engineering materials.

Suggested Readings:
- "Building Materials", S K Duggal; New Age International
- "Building Materials", P.C. Varghese; PHI
- "Civil Engineering Materials and Their Testing", Syed Danish Hasan; Alpha Science International, 2006

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Website Sources:
- http://www.iricen.gov.in/iricen/books_jquery/material_testing.pdf
- https://nptel.ac.in/
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ECE – 353: Surveying – I Lab **L T P 0 0 2**

Lab Objective:

The objective of this lab is to impart the practical knowledge of distance and direction measurements in the field, perform various methods of leveling and familiarize students with various advance surveying tools such as theodolite, total stations etc.

List of Experiments: **(16 Sessions)**

1. To find out the distance between two station by Chain survey
2. To find out the angle with the help of Compass
3. Study of different types of topographical maps and to prepare conventional symbols chart.
4. To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.
5. To find out reduced levels of given points using dumpy/Auto level.
6. To perform fly leveling with Auto / tilting level.
7. To study parts of a Vernier / Electronic theodolite and practice for taking angle measurements.
8. To measure vertical angle of given points by Electronic theodolite.
9. To measure horizontal angle between two objects by repetition method with three repetitions.
10. To measure horizontal angle by method of reiteration.
11. To determine the elevation of chimney top by trigonometrical leveling by taking observations in single vertical plane.
12. To set out a simple circular curve by Rankine's method.

Lab Outcomes:

At the end of the Lab work, the student will be able to:

- Apply the principle of surveying for civil Engineering Applications.
- Calculate area, distance, elevation, drawing plans and contour maps using different measuring equipment at field level.
- Measure horizontal and vertical height by direct and indirect measurement.
- Write a technical laboratory report.

Suggested Readings:

- "Surveying", Vol.2. S K Duggal, Tata McGraw Hill publications
- "Surveying, Vol. II and III, Dr B C Punmia, Laxmi Publications
- "Advanced Surveying" Satheesh Gopi, Pearson Education.

Website sources:

- https://nptel.ac.in/courses/105/107/105107122/
- http://ecoursesonline.iasri.res.in/course/view.php?id=523

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EME -354: Fluid Mechanics Lab **L T P 0 0 2**

Lab Objective:

The objective of this lab course is to familiarize the students with the application of Bernoulli's theorem for calculating velocity, flow and discharge through different types of notches and weirs, calculation of the discharge through orifice meter and venture-meter. To study the significance of Reynolds number and friction factor in pipe flow.

List of Experiments: **(16 Sessions)**

1. Verification of Bernoulli's theorem
2. To calibrate a venture-meter and to determine its coefficient of discharge
3. To calibrate an orifice meter and study the variation of the coefficient of discharge with the Reynolds number
4. To determine the hydraulic coefficient of discharge of a mouth piece.
5. To determine the coefficient of friction of pipes of different diameters.
6. To determine the form losses in a pipe line
7. To verify the momentum equation experimentally
8. To study the flow over V- notch (weir) and to find the coefficient of discharge
9. To measure the surface tension of a liquid.
10. To study the flow behavior in a pipe bend and to calibrate the pipes bend for discharge Measurement.

Lab Outcomes:
Students completing this lab will be able to:

- Understand the application of Bernoulli's theorem to various flow measuring devices.
- Understand the significance of Reynolds number.
- Learn the concept of surface tension of various liquids.
- Understand the application of momentum equation in turbines.
- Understand the concept of friction factor in pipe flow.

Suggested Readings:

- Som, S K & Biswas, G: Introduction of fluid mechanics and fluid machines, TMH, 2000, 2nd edition.
- Das, M M: Fluid mechanics & turbomachines , Oxford University Press.
- Agarwal, S K: Fluid mechanics and machinery, TMH.
- Garde, R J: Fluid mechanics through problems, New Age International Pvt. Ltd, New Delhi, 2nd Edition.
- Rouse, H: Elementary mechanics of fluids, John Wiley & Sons, 1946.
- Gupta, V and Gupta, S K: Fluid Mechanics and its Applications, Wiley Eastern Ltd, 1984.

Website Sources:

- nptel.ac.in/course.html
- www.nsf.gov
- en.wikipedia.org
- www.sciencedirect.com
- www.slideshare.net
- www.researchgate.net

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EMA – 401: Computer Based Numerical & Statistical Techniques L T P 3 1 0

Objective: - The main aims of this course are to provide suitable and effective methods by numerical analysis, for obtaining approximate representative numerical results of the problems. To have a proper understanding of Statistical applications in different areas.

UNIT – 1 **(12 Sessions)**
Introduction: Numbers and their accuracy, Computer Arithmetic, Mathematical preliminaries, Errors and their Computation, General error formula, Error in a series approximation
Solution of Algebraic and Transcendental Equations: Bisection Method, Iteration method, Method of false position, Newton- Raphson method, Methods of finding complex roots, Muller's method, Rate of Convergence, Polynomial equations.

UNIT – 2 **(10 Sessions)**
Solution system of linear equations: Gauss-Seidal method, LU decomposition method.
Interpolation: Finite differences, Differences tables
Polynomial Interpolation: Newton's forward and backward formula**.**
Interpolation with unequal intervals: Lagrange's interpolation, Newton divided difference formula.

UNIT – 3 **(10 Sessions)**
Numerical Integration and Differentiation: Introduction to numerical differentiation, Numerical integration: Trapezoidal rule, Simpson's one-third rule, Simpson's three-eighth rule, Boole's rule, Waddle's rule.
Solution of differential equations: Picard's method, Euler's method, Taylor's method, Runga- Kutta methods, Predictor-Corrector methods.

UNIT – 4 **(10 Sessions)**
Statistical Techniques –I: Moments, Moment generating functions, Skewness, Kurtosis, Linear, non- Linear and multiple regression analysis, Probability theory, Correlation, Binomial, Poisson and Normal distributions.

UNIT – 5 **(10 Sessions)**
Statistical Techniques –II: Sampling theory (small and large), Test of significances: Chi-square test, t- test, Analysis of variance (one way), Application to engineering, medicine, agriculture etc. Time series and forecasting (moving and semi-averages), Statistical quality control methods, Control charts, X, R, p, np, and c-charts

Course Outcomes:

The student is able to
- Apply Numerical analysis which has enormous application in the field of Science and Engineering.
- Understand numerical integration and differentiation, numerical solution of ordinary differential equations.
- Compare and analyze the methods statistical analysis and the omnipresent role of variability.
- Predict and evaluate the efficient design of studies and construction of effective sampling plans.
- Exploratory data analysis and formal inference process.

Suggested Readings:
- V. Raja Raman: "Computer Oriented Numerical Methods", PHI.
- P.P. Gupta & G. S. Malik: "Numerical Analysis", Krishna Prakashan media, Meerut.
- B. S. Grewal: "Numerical methods in Engineering and Science", Khanna Publishers, Delhi.
- Pradip Niyogi: "Numerical Analysis and Algorithms", TMH.
- S. C. Gupta & V.K. Kapoor: "Fundamentals of Mathematical Statistics", Sultan Chand& Sons, Delhi.

Website Sources:
- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- onlinecourses.nptel.ac.in
- en.wikipedia.org

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ECE- 401: Concrete Technology **L T P 3 1 0**

Course Objective:
The objectives of this course are to define and understand concepts related Concrete technology which involves types and property of concrete and different adhesive materials and its vital use for safe, economic development for the buildings. The aim of this course also includes designing of various grades of concrete.

UNIT I **(6 Sessions)**
Cements & Admixtures: Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrate cement – Test on physical properties – Different grades of cement – Admixtures – Mineral and chemical admixtures.

UNIT II **(8 Sessions)**
Aggregates: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded aggregate – Maximum aggregate size.

UNIT III **(10 Sessions)**
Fresh Concrete: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water.
Special Concretes: Light weight aggregates – Light weight aggregate concrete – Cellular concrete – No-fines concrete – High density concrete – Fiber reinforced concrete – Different types of fibers – Factors affecting properties of F.R.C – Applications – Polymer concrete – Types of Polymer concrete – Properties of polymer concrete – Applications – High performance concrete – Self consolidating concrete.

UNIT IV **(8 Sessions)**
Hardened Concrete: Water /Cement ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength - Curing.
Mix Design: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods.

UNIT V **(8 Sessions)**
Testing of Hardened Concrete: Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Non-destructive testing methods – Elasticity, Creep & Shrinkage – Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage.

Course Outcomes:
After completion of this course students will able to:

- Understand of constituent materials for properties of fresh and hardened concrete properties.
- Get basic understanding of hydration as well as important physical and chemical properties of the hydration products
- Basic curing technology models (maturity, property development)
- Know the different mechanisms causing volume change from fresh (plastic settlement, shrinkage) via young (temperature, autogeneous shrinkage) to hardened concrete (drying shrinkage)

Suggested readings:

- "Properties of Concrete", A.M.Neville
- "Concrete Technology", M.S.Shetty., S.Chand & Co
- "Concrete Technology", M.L. Gambhir., Tata Mc. Graw Hill Publishers, New Delhi
- "Concrete Technology", Indian Concrete Institute. P Kumar Mehta, Monteiro;

Website Resources:

- https://nptel.ac.in/courses/105/102/105102012/
- https://civilengineeringnotes.com/cement-concrete-specification/

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ECE- 402: Surveying Practice – II **L T P 3 1 0**

Course Objective:
The objective of this course is to introduce the students about the some advance techniques of surveying which may be used for measurement such as distance, direction and elevation and to explore the knowledge of instruments used for measurement such as Auto level, theodolite, compass, total station, GPS and EDM. Also apply geometric principles to arrive at solutions to surveying problems and analyze spatial data using appropriate computational and analytical techniques.

UNIT I **(8 Sessions)**
Remote Sensing: Introduction, Electromagnetic energy, electromagnetic spectrum, interaction of Electromagnetic energy with matter, effect of atmosphere on electromagnetic radiation, energy interaction with earth surface features, remote sensing sensor systems, platforms, data acquisition and interpretation, resolution concept in remote sensing, Application of remote sensing in civil engineering.

UNIT II **(8 Sessions)**
Photogrammetry: Introduction, Comparison between a map and an aerial photograph, Aerial photography, Definitions and mathematical relationships, Type of aerial photographs, Stereo-scopic vision, Different types of stereoscopes, stereo model, Ground control, Aerial Triangulation, Advantages and limitation of air photo interpretation, Visual Interpretation, Computer techniques in image interpretation.

UNIT III **(10 Sessions)**
Geographic Information System: Introduction, Subsystems of GIS, Hardware of GIS Data for GIS Representation of Features, Data Structure for GIs, Vector vs Raster Data Structures, Data format conversions, Capabilities/Functionalities of GIS, Map Overlay Analysis, Data Quality, Sources of Errors in GIS, Application of GIS, Selective GIS Software.

UNIT IV **(8 Sessions)**
Global Positioning Systems: GPS Overview, Satellite Constellation, Equipment Segment, Principle of Position Determination via Satellite Generated Ranging Signals, GPS Surveying Techniques, GPS Accuracy, Uses and Applications of GPS

UNIT V **(6 Sessions)**
Electro-Magnetic Distance Measurement (EDM): Introduction, Electromagnetic waves, Modulation, Types of EDM Instruments, Geodimeter, Tellurometer, Wild 'Distomats'.

Course outcomes:
After a successful completion of the course, the student will be able to:
- Apply the knowledge of geometric principles to arrive at surveying problems
- Use modern instruments to obtain geo-spatial data and analyze the same to appropriate engineering problems.
- Capture geodetic data to process and perform analysis for survey problems with the use of electronic instruments such as GPS , Total station etc;
- Perform some practical works by advanced instruments and get more accurate and precise result compare to traditional instrument.

Suggested Readings:
- "Surveying", Vol.2. S K Duggal, Tata McGraw Hill publications
- "Surveying, Vol. I and II, Dr B C Punmia, Laxmi Publications
- "Advanced Surveying" Satheesh Gopi, Pearson Education.

Website Sources:

- https://www.gisresources.com/total-station-and-its-applications-in-surveying/
- https://www.photomodeler.com/uav-photogrammetry-for-surveying/
- https://nptel.ac.in/courses/105/104/105104100/
- https://www.wwu.edu/huxley/spatial/tut/tutorials.htm

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ECE-403: Structural Analysis-I **L T P 3 1 0**

Objective:
To have better understanding about types of structures and their responses to various applied loading and to enable students to determine forces, stresses, deflection and behavior of various structural members when subjected to different types of loading.

UNIT I **(08 Sessions)**
Classification of structure, static and kinematic indeterminacy of structure (determent and in determent structure) Structural Systems**:** Conditions of equilibrium, degrees of freedom, simple systems, Compound systems, redundant systems, Linear and non-linear structural systems.

UNIT II **(08 Sessions)**
Deflection of beams: Moment area theorems, derivation of moment area theorems, sign convention in the moment area method applied to beams, moment area method and conjugate beam theorems, conjugate beam method.

UNIT III **(08 Sessions)**
Strain energy : Strain energy and complementary strain energy, Strain energy due to axial load, bending and shear, theorem of minimum potential energy, principle of virtual work, the first theorem of Castigilano, Betti's law, Clark Maxwell's theorem of reciprocal deflection; deflections of beams and frames using Strain energy method.

UNIT IV **(08 Sessions)**
Rolling loads and influence lines: Influence line diagrams for simply supported, cantilever, overhanging beams, use of influence line diagrams, criteria for maximum shear force and bending moment values due to moving loads, series of loads and uniformly distributed loads.

UNIT V **(08 Sessions)**
Redundant Structures : Consistent deformation method for propped cantilever, fixed beams and frames – fixed end moments for beams due to UDL, central load, uniformly varying load, Analysis of frames (maximum two degree of indeterminacy).

Course Outcomes:
On successful completion of the course, the students shall be able to understand the following
- Classify & discuss statically determinate & indeterminate structure.
- Apply & analyze the concept of influence lines for deciding the critical forces and sections while designing.
- Apply the concept of strain energy to analyze beams and frames.
- Identify, analyze, & solve problems using moment area method and conjugate beam method.
- Concept of redundant structures and their analysis.

Suggested Readings:
- "Structural analysis-I" SS Bhavikatti,Vikas publishing house pvt ltd
- "Elementary structural analysis" Norris and Wilber.
- "Statically indeterminate structures" C.K.Wang
- "Basic structural Analysis" C.S. Reddy

Website Sources:
- https://civildigital.com/powerpoint-presentations/
- https://www.aboutcivil.org/structural-engineering.html
- https://en.wikipedia.org/
- http://www.nptelvideos.in/2012/11/advanced-structural-analysis.html
- https://www.asce.org/

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ECE-404: Estimation, Costing and Evaluation **L T P 3 1 0**

Objective:
To provide the student with the ability to estimate the quantities of item of works involved in buildings, water supply and sanitary works, road works and irrigation works, and also to equip the student with the ability to do rate analysis, valuation of properties and preparation of reports for estimation of various items.

UNIT I **(10 Sessions)**
Importance of estimation, different types of estimates, specifications: general and detailed. Methods of estimation, Estimates of RC works, Estimates of Buildings.

UNIT II **(10 Sessions)**
Analysis of rates, Prime cost, Work charge establishment, Quantity of materials per unit of work for major Civil Engineering items, Resource planning through analysis of rates, market rates, P.W.D. Schedule of rates and cost indices for building material and labour. Introduction to valuation.

UNIT III **(06 Sessions)**
Project cycle, Organization, Planning, Scheduling, Monitoring, Updating and Management System in Construction. Bar Chart, Milestone charts, Work down structure and preparation of networks.

UNIT IV **(06 Sessions)**
Project monitoring, cost planning, resources allocation through network techniques. Time value of money, Present economy studies, Equivalence concept, financing of projects, economic comparison, present worth method, equivalent annual cost method, discounted cash flow method.

UNIT V **(08 Sessions)**
Legal aspects of contracts, their relative advantages and disadvantages, Different types of contracts, their relative advantages and disadvantages, Elements of tender preparation, process of tendering, pre-qualification of contracts, Evaluation of tender preparation process of tendering, Evaluation of tender.

Course Outcomes:
On the completion of the course one should be able to understand:
- Analyze and assess the quantity of materials required for civil engineering works as per specifications.
- Evaluate & estimate the cost of expenditure and prepare a detailed rate analysis report.
- Construct detailed report on estimation and valuation process.
- Financial Planning and Management for the construction project, Economical analysis.
- Utilize contracts and tenders in construction practices.

Suggested Readings:

- "Estimating and Costing in Civil Engineering", B.N. Dutta; UBS Publishers & Distributors Pvt. Ltd., 2003.
- "A Text Book of Estimating and Costing (Civil)", D DKohli and R.C. Kohli, S.Chand& Company Ltd., 2004
- "Civil Estimating, Costing &Evaluation",A. Aggarwal& A K Upadhyay,S K Kataria& Sons
- "Civil Estimating & Costing", S.P. Mahajan.

Website Sources:
- https://en.wikipedia.org/
- https://theconstructor.org/search/estimation+and+costing/posts/
- https://civildigital.com/powerpoint-presentations/
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PSD- 401: Professional Skill Development - II **L T P 3 1 0**

Objectives:

The objectives of Professional Skill Development-II are:

- To develop critical thinking, creativity and effective communication.
- To provide the essential foundational elements for leadership skill-building and student success.
- To explore self-awareness that involves identification and articulation of various facets – cultural, social, and familial that contribute to the formation of one's identity.
- To develop mutually beneficial relationships through communication and cooperation with others, collaborate to achieve group goals, practice living and leading with integrity, and learn about issues of local and global significance in order to become active members of their communities.

Unit I: Communicative Skills **(05 Sessions)**

Communication: Concept, Classification, Purpose, Process, Importance, Flow & Level of Communication, Barriers & Gateways in Communication, 7 C's of Communication, Types of Communication & communication without words

Unit II: Intrapersonal Relationship Skills **(07 Sessions)**

Personality: Characteristics of Healthy & Sick Personality
Self Awareness
Self Esteem
Self Confidence
Assertiveness V/S Aggressiveness
Values: Types & Importance

Unit III: Interpersonal Relationship Skills **(08 Sessions)**

Group: Concepts, Types, Stages
Team: Concepts, Elements, Types, Stages
Presentation Skills& strategies
Interview: Concepts, Types, Process, Interview Preparation Checklist, Interview Handling Skills, Common Interview mistakes

Unit IV: Argumentative Skills **(10 Sessions)**

Debate Role Play Speeches Elocution Group Discussion

Unit V: Campus to Company Skills **(10 Sessions)**

The corporate Fit: Dressing and Grooming
Basic Etiquette: Office (Do's and Don'ts for men and women), Telephone, Email
Dealing with People in Corporate

Course Outcomes:

Students completing this course will be able to:

- Apply the comprehensive set of skills and knowledge for life success.
- understand the communication process, its benefits and challenges
- Learn to effectively lead others on a project or in an organization
- Develop and articulate respect for the diversity of talents, ways of knowing and learning.

Suggested Readings:

- M.K. Sehgal & V. Khetrapal's Business Communication published by Excel Books.
- Rajendra Pal's Business Communication published by Sultan Chand & Sons Publication.
- P. D. Chaturvedi's Busines Communication published by Pearson Education, Delhi.
- Elizabeth B. Hurlock's Personality Development by Tata McGraw Hills, Delhi.

Website Sources:

- www.wikipedia.com
- www.fluentu.com
- www.mindstool.com
- www.digitalcommons.pace.edu

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EHU-401: DISASTER MANAGEMENT **L T P 2 1 0**

Objective: The objective of this course is to provide students an understanding to the concepts and aspects of disaster and its relationship with development. To ensure awareness of Disaster Risk Reduction (DRR) approaches among students. To assist students develop ability to respond to their environment with potential response to disaster.

UNIT I: Introduction to Disasters **(12 Sessions)**
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks; Types of disasters – Earthquake, Landslide, Flood, Drought, Fire, campus shooting, bomb threat, terrorist incidence and financial emergency etc.; Causes and Impacts including social, economic, political, environmental, health, psychosocial, etc.; Differential impacts- in terms of caste, class, gender, age, location, disability; Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II: Approaches To Disaster Risk Reduction **(10 Sessions)**
Disaster life cycle – its analysis, phases, culture of safety, prevention, mitigation and preparedness; Community based DRR (Disaster Risk Reduction), Structural-nonstructural measures; Roles and responsibilities of community: Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders

UNIT III: Inter-Relationship between Disasters and Development **(08 Sessions)**
Factors affecting Vulnerabilities, impact of Development projects such as dams, embankments, changes in Land-use etc.; Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India – Relevance of indigenous knowledge, appropriate technology and local resources; Role of international cooperation's in Disaster Management

UNIT IV: Disaster Risk Management In India **(08 Sessions)**
Hazard and Vulnerability profile of India. Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management; Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy – Other related policies, plans, programmes and legislation; Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V: Disaster Management: Applications, Case Studies and Field Works **(07 Sessions)**
The project /fieldwork are meant for students to understand vulnerabilities and to work on reducing disaster risks and to build a culture of safety. Projects must be conceived creatively based on the geographic location and hazard profile of the region where the college is located. A few ideas or suggestions are discussed below:
Several governmental initiatives require Urban Local Bodies (ULBs) and Panchayati Raj Institutions (PRIs) to be proactive in preparing DM plans and community based disaster preparedness plans. Information on these would be available with the district collector or Municipal corporations.
Teachers could ask students to explore and map disaster prone areas, vulnerable sites, vulnerability of people (specific groups) and resources. The students along with teacher could work on ways of addressing these vulnerabilities, preparing plans and consultation with local administration or NGOs.
Students could conduct mock drills in schools, colleges or hospitals. They could also work on school safety, safety of college buildings, training in first aid.
Other examples could be- identifying how a large dam, road/ highway or an embankment or the location of an industry affects local environment and resources or how displacement of large sections of people creates severe vulnerabilities may be mapped by student project work.

The suggested topics for Project work for student could be as follows:
- Monitoring and evaluation plan for disaster response
- Low cost Home based water purification methods
- Planning Nutrition intervention programmes
- Safety tips before during and after earthquake, cyclone, floods and fire accidents.
- Mock Drills
- Major disasters in India
- Disaster Management in India
- Flood affected areas and damages in India
- Heat waves in India
- Earth quakes in India
- Historical Tsunamis in India
- Nuclear emergence
- Traffic accidents in India
- Train Accidents
- Major disease outbreak
- Disaster management structure in India
- Precaution, mitigation of disaster in India
- Warning system in India to prevent disaster
- Bhopal gas tragedy

- Kutch earth quake
- Tsunami (2004)
- Kosi Calamity 2008
- Mayapuri radiation exposure Delhi (2010)
- Mock exercises

Course Outcome: The students will be able to identify the nature and causes of disaster. Also the students will be able to apply the disaster risk reduction mechanism.

Suggested Readings:

- Satish Modh, Introduction to Disaster Management, Macmillan Publisher India Ltd
- Alexander David, Introduction in 'Confronting Catastrophe', Oxford University Press
- Blaikie, P, Cannon T, Davis I, Wisner B 1997. At Risk Natural Hazards, Peoples' Vulnerability and Disasters, Routledge.
- Damon P. Coppola, Introduction to International Disaster Management, Butterworth-Heinemann,
- Singhal J.P. "Disaster Management", Laxmi Publications. ISBN-10: 9380386427 ISBN-13: 978-9380386423
- Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., . ISBN-10: 1259007367, ISBN-13: 978-1259007361]
- Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi
- KapurAnu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi.
- Carter, Nick. Disaster Management: A Disaster Manager's Handbook. Asian Development Bank, Manila Philippines.
- Cuny, F. Development and Disasters, Oxford University Press. Document on World Summit on Sustainable Development.
- Govt. of India: Disaster Management Act 2005, Government of India, New Delhi. Government of India, 2009.
- Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi Indian Journal of Social Work.
- Special Issue on Psychosocial Aspects of Disasters, Volume 63, Issue 2, April.

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- http://www.ifrc.org/en/what-we-do/disaster-management
- http://www.wcpt.org/disaster-management/what-is-disaster-management
- en.wikipedia.org

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ECE – 451: Concrete Technology Lab **L T P 0 0 2**

Lab Objective: The objective of this lab is to perform various tests on concrete by preparing samples of structural concrete to test and analyze its behavior and strength characteristic. This lab also deals with to conduct all quality control tests on cement, aggregates and concrete (Fresh and hardened). Students learn the standard procedure to test the quality of building materials in line with the corresponding IS codes.

List of Experiments: **(16 Sessions)**

1. To determine Normal Consistency of fineness of cement.
2. To determine Initial setting time and final setting time of cement.
3. To determine Specific gravity and soundness of cement.
4. To determine Compressive strength of cement.
5. To determine Workability test on concrete by compaction factor, slump and Vee-bee.
6. To determine Young's modulus and compressive strength of concrete.
7. To determine Bulking of sand.
8. To perform Non-Destructive tests on concrete (for demonstration)
9. Mix design

Lab Outcomes:

After completing this lab, students will able to

- Get the practical knowledge of various types of testing on concrete
- Perform various tastings on cement and concrete to check its strength

Suggested readings:

- "Properties of Concrete", A.M.Neville
- "Concrete Technology", M.S.Shetty., S.Chand & Co
- "Concrete Technology", M.L. Gambhir., Tata Mc. Graw Hill Publishers, New Delhi
- "Concrete Technology", Indian Concrete Institute. P Kumar Mehta, Monteiro;

Website Resources:

- https://nptel.ac.in/courses/105/102/105102012/
- https://civilengineeringnotes.com/cement-concrete-specification

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Bachelor of Technology (B.Tech) Civil Engineering
B.Tech – II Year (IV Semester)
Effective from Session 2020-21

ECE – 452: Surveying – II Lab **L T P 0 0 2**

Lab Objective:
The objective of this lab is make familiarize students with some advanced surveying instruments and introduce students out their applications, this lab also deals with direct and indirect measurements of distance, direction and elevations.

List of Experiments: **(16 Sessions)**

1. Study of survey of India Topo sheet
2. Study & Interpretation of Satellite Imagery
3. Interpretation of aerial photograph using pocket stereo scope
4. To determine the reduce level by auto level
5. To carry out temporary adjustment of theodolite.
6. To measure the horizontal angle using theodolite
7. To determine the height of wall using theodolite
8. To study & working of tilting level
9. To carry out the general study of GPS
10. To find the location and tracking of the position or object using the GPS
11. Demonstration & Study of Total Station.

Lab Outcomes:

After completion of this lab students will able to

- Operate various advanced surveying instruments such as total station and GPS.
- Interpret the aerial and terrestrial photographs and make some decision by analysis such photographs.
- Make measurements by instruments such as theodolite, auto level and tilting level.

Suggested Readings:

- "Surveying", Vol.2. S K Duggal, Tata McGraw Hill publications
- "Surveying, Vol. II and III, Dr B C Punmia, Laxmi Publications
- "Advanced Surveying" Satheesh Gopi et al., Pearson Education.

Website Sources:

- https://www.gisresources.com/total-station-and-its-applications-in-surveying/
- https://www.photomodeler.com/uav-photogrammetry-for-surveying/
- https://nptel.ac.in/courses/105/104/105104100/

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ECE-453: Building Planning & Drawing Lab **L T P 0 0 2**

Lab Objective:
- To understand basic principles of planning and drawing of building including its components.
- To gain knowledge of layout of different civil engineering projects.

List of Experiments: **(16 Sessions)**

1. Symbols used in Civil Engineering drawing
2. Masonry Bonds
3. Doors
4. Windows
5. Staircases
6. Plumbing fitting drawing
7. Electrical fitting drawing
8. Preparation of Layout planning of different Civil Engineering Projects

Lab Outcomes:
On the completion of the Lab one should be able to:
- Draw symbols used in civil engineering drawing.
- Draw masonry bonds, doors, windows and staircases.
- Draw plumbing and electrical fittings.
- Draw the plan, section and elevation of buildings (residential and public).
- Prepare layout of different civil engineering projects.

Suggested Readings:
- A course in Civil Engg. Drawing by V. B. Sikka, S. K. Katarian and sons, Fifth Edn.
- Civil Engineering Drawing by Malik and Meo, New Asian Publishers, Fifth Edn.
- IS: 962-1989 (Code of practice for architectural and building drawing)

Website Sources:
- https://www.youtube.com/watch?v=XSczZnEPISY
- https://www.youtube.com/watch?v=rIhfw-ngyZI
- https://www.construction53.com/2011/09/blueprint-the-meaning-of-symbols/
- https://www.designingbuildings.co.uk/wiki/Symbols_on_architectural_drawings

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EMA-451: Computer Based Numerical & Statistical Techniques Lab **L T P 0 0 2**

Objective: - To provide suitable and effective methods by numerical analysis, for obtaining approximate representative numerical results of the problems. To develop good programming skills and to develop numerical problem-solving skills via C-programming language. Applications of computing concepts to problem solving in engineering.

S. No.	List of Experiments	(16 Sessions)

1. Write a Program in 'C' for Newton's forward interpolation formula.

2. Write a Program in 'C' for Newton's backward interpolation formula.

3. Write a Program in 'C' for Newton's divided difference formula.

4. Write a Program in 'C' for Lagrange's interpolation formula.

5. Write a program in 'C' for Trapezoidal rule to evaluate into n equal parts. $\int_{x0}^{xn} (x)$ by dividing the range

6. Write a program in 'C' for Simpson's 1/3 Rule to evaluate $\int_{x0}^{xn} f(x)dx$ by dividing the range into n equal part.

7. Write a program in 'C' for Simpson's 3/8 Rule to evaluate $\int_{x0}^{xn} f(x)dx$ by dividing the range into n equal parts

8. Write a program in 'C' for the Euler's method.

9. Write a program in 'C' for the Runga-kutta method.

10. Write a program to find out a real root of equation f(x) = 0 by Bisection method.

11. Write a program to find out a real root of equation f(x) = 0 by Newton's Raphson method.

12. Write a computer program in 'C' to solve a system of equations Ax = B by Gauss Seidal method.

Course Outcomes:

The student is able to

- Clearly formulate a program's requirements.
- Develop an algorithm for solving a problem.
- Identify functions for solution of a problem, and identify and classify the parameters.
- Build sets of test data in order to evaluate computer programs.
- Write a C program, thoroughly test a program & Debug a program.
- Understand the organization of a computer system.
- Understand the process of compiling, linking, and running a program.

Suggested Readings:

- **Raja Raman V.:** "Computer Oriented Numerical Methods", PHI.
- P.P. **Gupta & G.S.Malik:** "Numerical Analysis", Krishna Prakashan media, Meerut.
- **Grewal B. S.:** "Numerical methods in Engineering and Science", Khanna Publishers, Delhi.
- **Pradip Niyogi:** "Numerical Analysis and Algorithms", TMH
- **Gupta S. C. & Kapoor V.K. :** "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, Delhi.

Website Sources:

- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- onlinecourses.nptel.ac.in
- en.wikipedia.org

SYLLABUS

B.TECH – III YEAR

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STUDY AND EVALUATION SCHEME
Effective from Session 2020-21
YEAR III, SEMESTER-V

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	ECE - 501	Environmental Engineering - I	3	1	0	20	10	30	70	100	4
2.	ECE - 502	Transportation Engineering - I	3	1	0	20	10	30	70	100	4
3.	ECE - 503	Geotechnical Engineering-I	3	1	0	20	10	30	70	100	4
4.	ECE - 504	Structural Analysis - II	3	1	0	20	10	30	70	100	4
5.	ECE - 505	Reinforced Cement Concrete - I	3	1	0	20	10	30	70	100	4
6.	ECE - 506	Open Channel Flow	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
7.	ECE - 551	Environmental Engineering. Lab	0	0	2	20	10	30	70	100	1
8.	ECE - 552	Transportation Engineering. Lab-I	0	0	2	20	10	30	70	100	1
9.	ECE - 553	Soil Mechanics Lab	0	0	2	20	10	30	70	100	1
10.	ECE - 554	Structural Analysis Lab	0	0	2	20	10	30	70	100	1
11.	EGP-501	General Proficiency	-	-	-	-	-	100	-	100	1
		TOTAL	**18**	**06**	**08**	**-**	**-**	**-**	**-**	**1100**	**29**

YEAR III, SEMESTER-VI

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	ECE - 601	Environmental Engineering - II	3	1	0	20	10	30	70	100	4
2.	ECE - 602	Transportation Engineering - II	3	1	0	20	10	30	70	100	4
3.	ECE - 603	Hydrology	3	1	0	20	10	30	70	100	4
4.	EHU-601	Human Value & Professional Ethics	3	1	0	20	10	30	70	100	4
5.	ECE -605	Reinforced Cement Concrete - II	3	1	0	20	10	30	70	100	4
6.	ECE-606	Design of Steel Structure-I	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
7.	ECE - 651	CAD Lab - I	0	0	2	20	10	30	70	100	1
8.	ECE - 652	Transportation Engineering. Lab-II	0	0	2	20	10	30	70	100	1
9.	ECE - 653	Hydraulic Engineering. Lab	0	0	2	20	10	30	70	100	1
10.	ECE - 654	Seminar	0	0	2	20	10	30	70	100	1
11.	EGP-601	General Proficiency	-	-	-	-	-	100	-	100	1
		TOTAL	**18**	**06**	**08**	**-**	**-**	**-**	**-**	**1100**	**29**

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ECE-501: Environmental Engineering-I **L T P 3 1 0**

Course Objective:

The objective of this course is to apply knowledge of mathematics, physics, chemistry, and microbiology to solve and analyze engineering problems related to water and wastewater collection, transport, quality and treatment. It also includes introduce diverse methods of collecting the hydrological information, which is essential, to understand surface and ground water hydrology, provide an awareness of the numerous health hazards, both biological and chemical, that threaten the well-being of humankind throughout the world. To have a working knowledge of the public health engineering principles those have been developed for protection against biological and chemical threats.

Unit I: **(6 Sessions)**
Water demands: Types of demands domestic, commercial, industrial, fire, public use and losses, per capita demand, variations in demand, factors affecting demand. Design period. Forecasting population-different methods and their suitability

Unit II: **(8 Sessions)**
Sources of water: surface sources rivers, streams, lakes and impounded reservoirs, determination of quantity of water in the above sources. Underground sources Springs, wells and infiltration galleries, measurement of yield of open wells, tube wells, artesian wells and infiltration galleries.

Unit III: **(10 Sessions)**
Comparison of surface source and subsurface sources in respect of quality and quantity. Quality of water: Pollution and contamination of water. Sources, classification and prevention of pollution. Water borne diseases, Impurities in water. Collection of water samples. Water analysis Physical chemical and biological tests, standards for potable water.

Unit IV: **(10 Sessions)**
Water Treatment: Aeration, Plain sedimentation, sedimentation with coagulation- coagulant feeding devices, optimum dosage of coagulant. Filters and their different types, disinfection, water softening. The functional design of treatment unit. Removal of iron, manganese, colour, odour and taste, Fluoridation, desalination

Unit V:
Water Distribution: **(6 Sessions)**
(i) **Pipes**: Different types of pipes cast iron, steel, plastic, (PVC, LDPE, HDPE), asbestos cement, concrete, plastic, GI and lead pipes, Details of their sizes, joints and uses.
(ii) **Appurtenances:** Sluice (Gate and spindle), air, reflux, scour and safety valves, fire hydrants, their working and uses.

Course outcomes:
After completion of this students will be able to:

- Understand water quality concepts and their effect on treatment process selection
- Appreciate the importance and methods of operation and maintenance of water supply systems.
- Establish the suitable distribution system for a locality and know the appurtenances used. Determine the need of conservation of water and rural water supply.
- Ascertain the quality of water as per BIS and select the appropriate treatment method required for the water source.

Suggested readings:

- "Environmental Engineering Vol. I & II", S.K. Garg, Khanna Publishers, New Delhi, 1994.
- "Environmental Engineering Vol. I & II", P.N. Modi; Standard Book House, New Delhi, 2001.
- "Environmental Engineering Vol. I & II", B.C. Punmia; Lakshmi Publications (P) Ltd., New Delhi, 2002

Website resources:

- https://www.indiawaterportal.org/articles/indian-standard-drinking-water-bis-specifications-10500-2012-second-revision
- https://www.ngwa.org/what-is-groundwater/About-groundwater/information-on-earths-water.
- https://nptel.ac.in/courses/105/106/105106119/

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ECE-502: Transportation Engineering-I **L T P 3 1 0**

Objective:
- To introduce different transportation systems and their importance and role in development.
- Analyze how signal systems, visual aids and Markings etc. help in safe working of transportation systems.
- To take up the concepts of highway alignment and design various components of highway.
- To design elements like horizontal curves, vertical curves, super elevation etc.
- To impart knowledge of tests on aggregates, gravel, sand, bitumen, cement and concrete.

Unit I **(06 Sessions)**
Highway Development & Planning: Brief history and development; characteristics of road transport; road classification; road patterns; Nagpur plan; Jaykar Committee recommendations; Bombay plan; Road Plan –2020; road layouts

Unit II **(10 Sessions)**
Traffic Engineering: Traffic characteristics, Accidents and their preventive measures, Traffic studies, Traffic control devices, Types and design of traffic signal systems – Approximate method, Trial cycle method, Webster's method. Traffic Islands, Divisional islands, Channelizing islands, Rotaries, Design of intersections, Design of parking facility, Highway lighting

Unit III **(10 Sessions)**
Highway Alignment, Survey and General Considerations: Fundamental principles of alignment. Factors controlling the selection of alignment Highway survey, Width of formation, Right of way, Width of pavement, Camber, Gradient, Super elevation, Extra widening on curves, Design speed, Sight distances, Set back distances, Road Cross-section; Provision of Shoulders, Cycle tracks, Footpaths and Drains; Arboriculture

Unit IV **(08 Sessions)**
Geometric Design of Highways: Simple curves – scope, Degree of curve, characteristics, offset from chord produced, Rankine's method, obstacles in curve setting Compound and Reverse Curves : Different cases Transition Curve- Super elevation: Length of transition curve; Characteristics; equations; shift; tangent length and curved length of combined curve; setting out of combined curve
Vertical curve – scope, assumption of vertical curve, equations, setting out vertical curve Summit and Valley curves

Unit V **(06 Sessions)**
Tests on Road Materials and Proportioning of Mixes: Tests on aggregates, gravel, sand, moorum, bitumen, cement, concrete; concrete mix design; CBR of soil; relevant IS and IRC Codes of Practice

Course Outcomes:
On successful completion of the course, the students shall be able to understand the following
- Basic concepts about Highway Engineering and its development.
- Different types of traffic studies and traffic control devices.
- Concepts and design of highway alignment and components of highway.
- Principles of highway geometrics design as per IRC standards.
- Procedure and application of tests on various materials required for highway construction.

Suggested Readings:
- "Highway Engineering";S.K. Khanna and C.E.G. Justo
- "Highway Engineering";N.K. Vaswani
- "A Course in Highway Engineering";S.P. Bindra
- "Transportation Engineering";L.R. Kadiyali

Website Sources:
- https://theconstructor.org/
- https://www.aboutcivil.org/highway-transportation-engineering-lectures-notes.html
- https://en.wikipedia.org/
- https://nptel.ac.in/

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ECE-503: Geotechnical Engineering-I **L T P 3 1 0**

Course Objective: The objective of this Course is to provide students with basic understanding of physical and mechanical properties of soil, together with knowledge of basic engineering procedures to identify factors controlling soil behavior and methods to determine soil properties.

UNIT I **(6 Sessions)**
Introduction: Introduction of soil mechanics, field of soil mechanics, phase diagram physical and index properties of soil. Formation of soil, weathering of rocks and types of soils classification of soils, general classification based on particles size, textural classification and I.S. soil classification.

UNIT II **(12 Sessions)**
Permeability: Definition, Hydraulic gradient, Darcy's Law, Factors affecting permeability, Permeability of stratified soils, Laboratory and field determination of coefficient of permeability.
Compaction: Definition, Compaction fundamentals, Moisture density relationships, Standard Proctor test, Factors affecting compaction, Compaction equipment, properties and structure of compacted soils, Specifications.

UNIT III **(10 Sessions)**
Shear strength- Mohr stress circle, theoretical relationship between principle stress circles, theoretical relationship between principal stress, Mohr-coulomb failure theory, effective stress principle. Determination of shear parameters by direct shear test, triaxial test, unconfined compression test, vane shear test. Numerical exercise based on various types of tests.

UNIT IV **(6 Sessions)**
Effective stress principal: Effective stress principal, nature of effective stress, effect of water table fluctuations of effective stress, increase in effective stress due to surcharge, seepage pressure, effective stress under steady seepage condition, quick sand conditions. Capillarity effect, confined flow and flow net, exit gradient and failure due to piping

UNIT V **(6 Sessions)**
Stability of slopes: Types of slope failure, Analysis of finite and infinite slopes in cohesion less and cohesive soil, Swedish And friction circle method, earthen slope test.

Course Outcomes:
After completion of this course students will able to

- Understand the theoretical and practical aspects of geotechnical engineering along with the design and management applications.
- Understand basics principles of flow and soil permeability through porous media including Bernoulli's equation, Darcy's Law, and Hydraulic conductivity.
- Gain an experience in the implementation of Geotechnical Engineering on engineering concepts which are applied in field Geotechnical Engineering

Suggested readings:

- "Soil Mechanics and Foundation Engineering", V.N.S. Murthy, CBS Publishers & Distributors.
- "Soil Mechanics and Foundation Engineering", K.R. Arora, Standard Publishers
- "Pile Foundations Design and Construction"; S. Mittal, CBS Publishers New Delhi.
- "Soil Mechanics and Foundation Engineering"; P. Purushothama Raj; Pearson Education.

Website resources:

- http://bis.org.in/other/quake.htm
- https://nptel.ac.in/courses/105/103/105103097/
- https://www.geoengineer.org/education/soil-mechanics
- https://www.classcentral.com/course/swayam-soil-mechanics-geotechnical-engineering-i-10099

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ECE-504: Structure Analysis-II **L T P 3 1 0**

Course Objective:

The objective of this course is to impart concepts of static and kinematic indeterminacy, and to introduce the fundamental concepts of analysis of determinate beams, frames, trusses, cables and three hinge arches, Finding slope and deflection of determinate structures.

UNIT I **(10 Sessions)**
Arches: Introduction. Three hinged arch-analysis and influence line. Two hinged arch--application of unit load method, Castigliano's method, Influence line for arches.

UNIT II **(6 Sessions)**
Portal frame: Solution by- unit load method, Castigliano's method.

UNIT III **(8 Sessions)**
Moment distribution method - solution of continuous beam, effect of settlement and rotation of support, frames with or without side sway.

UNIT IV **(6 Sessions)**
Slope Deflection Method – Method and application in continuous beams and Frames.

UNIT V **(10 Sessions)**
Kani's method: application to indeterminate beams. Cables & Suspension bridges with three hinged stiffening girders. Matrix method of structural analysis

Course Outcomes:

After completion of this course, the students will be able to
- Identify the concept of analysis of indeterminate structures.
- Evaluate and draw the influence lines for reactions, shears, and bending moments in beams
- Analyze and determine slope and deflection of determinate trusses, beams and frames
- Calculate the internal forces in cable and arch type structures
- Assess the results obtained by solving above problems

Suggested readings:

- 'Theory of Structures' by S.Ramamrutham, Dhanpat Rai Publishing, New Delhi.
- "Basic structural analysis", C.S. Reddy, McGraw Hill Education.
- "Structural Analysis-A Matrix Approach" by G.S. Pandit, Tata McGraw Hill, New Delhi
- "Theory of structures": Vazirani and Rathwani Vol. II and Vol. III.
- "Intermediate structural Analysis": C. K. Wang. Tata McGraw hill Edition.
- "Structural Analysis" , R. C. Hibbeler, 8th edition, Pearson Prentice Hall, 2012.
- "Structural Analysis Vol II" by BhaviKatti, Vikash Publishing House Pvt. Ltd.
- 'Theory of Structures' by B.C. Punmia, Laxmi Publication House.

Website Resources:

- https://ocw.mit.edu/courses/find-by-topic/#cat=engineering&subcat=civilengineering&spec=structuralengineering
- https://nptel.ac.in/courses/105/105/105105166/
- https://nptel.ac.in/courses/105/105/105105041/

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ECE-505: Reinforced Cement Concrete- I **L T P 3 1 0**

Objective:
To make Civil Engineering students able to design various RCC members of building using Limit State Design method.

Unit I **(06 Sessions)**
Introduction to working stress method and Limit state method of design, Assumptions in Limit State Design Method

Unit II **(06 Sessions)**
Design of singly & doubly reinforced rectangular beams L- beams and T- beams by using Limit state method

Unit III **(10 Sessions)**
Behavior of RC beam in Shear, Shear Strength of beams with and without shear reinforcement, Minimum and Maximum shear reinforcement, design of beam in shear, Introduction to development length, Anchorage bond, flexural blood, Failure of beam under shear, Concept of Equivalent Shear and Moments.

Unit IV **(08 Sessions)**
Design of one way and two way solid slabs by Limit State Design Method, Serviceability Limit States, Control of deflection, cracking and vibrations.

Unit V **(10 Sessions)**
Design of Columns by Limit State Design Method- Effective height of columns, Assumptions, Minimum eccentricity, Short column under axial compression, requirements for reinforcement, Column with helical reinforcement, Short column under axial load and uni-axial bending, Design of columns under bi-axial loading by Design Charts.

Course Outcomes:
On successful completion of the course, the students shall be able:
- To understand conceptually the difference between Working stress method and Limit state Design method.
- To design the structural elements like RCC beam, slab and column by limit state Design method as per I.S.456-2000.
- To design two way slab & one way continuous slabs.
- To design columns for eccentric loads.

Suggested Readings:
- IS: 456 – 2000.
- "Reinforced Concrete – Limit State Design", A. K. Jain, Nem Chand & Bros., Roorkee. "Reinforced Concrete Design",
- P. Dayaratnam.
- "Plain and Reinforced Concrete Vol. I & II", O. P. Jain & Jai Krishna, Nem Chand & Bros.
- "Reinforced Concrete Structures", R. Park and Pauley.
- "Reinforced Concrete Design", S. Unnikrishna Pillai & D. Menon, Tata Mc-Graw Hill Book Publishing Company Limited, New Delhi.

Website Sources:
- http://www.nptelvideos.in/2012/11/design-of-reinforced-concrete-structures.html
- https://nptel.ac.in/
- https://theconstructor.org/search/RCC/posts/
- https://en.wikipedia.org/
- https://theconstructor.org/structural-engg/

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ECE-506 Open Channel Flow **L T P 3 1 0**

Course Objective:
The objectives of the course are to provide a physical understanding of phenomena and concepts in advanced water flows and to introduce calculation methods to analyze a number of important hydraulic problems. The course deals mainly with free-surface flows with emphasis on open-channel hydraulics and introduce the fundamental concepts relevant to flow in open channels, GVF, RVF, energy dissipation, soil moisture, irrigation requirement, canals and water resources management.

UNIT I: **(6 Sessions)**
Basic fluid flow concepts: Classification of open channel flow, Velocity and pressure distribution. Energy and Momentum Equation applied to open channel flow, Energy and momentum coefficients, Channel Geometry and geometrical elements.

UNIT II: **(10 Sessions)**
Uniform and critical flow: Energy depth relationships, Resistance formulae, Concepts of First and Second hydraulic exponent, Determination of critical and normal depth, hydraulically most efficient channel sections, Analysis of Flow in Channel transitions.

UNIT III: **(8 Sessions)**
Gradually varied flow: Differential equation governing GVF, Classification and analysis of GVF profiles and control sections, Computation of GVF profiles by different methods

UNIT IV: **(10 Sessions)**
Rapid varied flow: Type, Analysis and characteristics of Hydraulic jump in rectangular channels, Location of jump, Introduction to jump in non-rectangular channel and on sloping floor, Use of jump as Energy dissipater. Flow Measurement –Weir, spillways, critical depth flumes.

UNIT V: **(6 Sessions)**
Unsteady Flow: types and examples of unstable flows. Surge, Classification of surges and analysis of Surges

Course Outcomes:

Students completing this course will able to
- Calculate Open channel flow resistance, Manning equation, uniform and non-uniform flow
- Analysis of non-uniform flow and computation of flow profiles
- Formulate advanced models based on the governing equations for free-surface flows and to solve the equations for commonly encountered flow situations.
- Gain knowledge about the basic nature of flow in open channels and the common ways of classifying open channel flow (laminar or turbulent, steady state or unsteady state, uniform or non-uniform, and critical, subcritical or supercritical).

Suggested readings:

- " Open Channel Hydraulics", Ven Te Chow, McGraw-Hill civil engineering series
- " Open Channel Flow" F.M.Henderson.
- " Flow in open channels" K . Subramanya. Tata McGraw-Hill Publications
- " Fundamentals of Open Channel Flow" Glenn E Moglen, CRC press

Website Resources:

- https://nptel.ac.in/courses/105/107/105107059/
- https://civilenggforall.com/gate-material-ies-master-open-channel-flow-study-material-for-gate-psu-ies-govt-exams-free-download-pdf-www-civilenggforall-com/

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ECE-551: Environmental Engineering. Lab **L T P 0 0 2**

Lab Objective: The objective of this lab is to introduce students to experimental design, procedures and analysis through material related to environmental engineering. There is an emphasis on assessing water quality and quantifying water resources. Students learn to correctly use glassware, a pH/conductivity meter, and spectrophotometer for analyses of various water samples. Analytical results will provide information on pH, conductivity, calcium, magnesium, phosphate and hardness.

List of Experiments: **(16 Sessions)**

1. Determination of turbidity, colour, and conductivity.
2. Determination of pH, alkalinity and acidity.
3. Determination of hardness and chlorides.
4. Determination of residual chlorine and chlorine demand.
5. Determination of dissolved oxygen.
6. Determination of most probable number of coli-forms.
7. Measurement of air pollutants with high volume sampler.
8. Measurement of sound level with sound level meter.
9. Determination of COD, BOD.

Lab Outcomes: After completion of this lab, student will able to

- Operate and use of various equipments used for analytical analysis of water.
- Determine various physical parameters of water such as turbidity, alkalinity, conductivity etc.
- Determine various Chemical parameters of water such as hardness, DO, COD, BOD, chlorides etc.

Suggested readings:

- "Environmental Engineering Vol. I & II", S.K. Garg, Khanna Publishers, New Delhi, 1994.
- "Environmental Engineering Vol. I & II", P.N. Modi; Standard Book House, New Delhi, 2001.
- "Environmental Engineering Vol. I & II", B.C. Punmia; Lakshmi Publications (P) Ltd., New Delhi, 2002

Website resources:

- https://www.indiawaterportal.org/articles/indian-standard-drinking-water-bis-specifications-10500-2012-second-revision
- https://www.ngwa.org/what-is-groundwater/About-groundwater/information-on-earths-water

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ECE-552: Transportation Engineering Lab- I **L T P 0 0 2**

Objective:
- To impart knowledge of tests on aggregates used as construction materials in highways including measurement, calculation and sampling.
- To gain experimental knowledge of traffic volume and speed studies.

List of Experiments: **(16 Sessions)**

1. Crushing Value Test of Aggregate
2. Impact Value Test of Aggregate
3. Los Angeles Abrasion Value of Aggregate
4. Shape Test (Flakiness Index, Elongation Index) of Aggregate
5. Classified both directional Traffic Volume Study
6. Traffic Speed Study (Using Radar Speedometer or Enoscope)

Course Outcomes:
On the completion of the course one should be able to:
- Perform crushing value, impact value, Los Angeles abrasion value and shape test on aggregates in evaluating the properties of aggregates to be used as construction material in highways.
- Conduct traffic studies (volume and speed studies) for estimating traffic flow characteristics.

Suggested Readings:
- "Highway Engineering";S.K. Khanna and C.E.G. Justo
- "Highway Engineering";N.K. Vaswani
- Laboratory Manual in Highway Engineering; Ajay K. Duggal and Vijay P. Puri

Website Sources:
- https://en.wikipedia.org/
- https://ts-nitk.vlabs.ac.in/transportation-engineering/
- https://civildigital.com/powerpoint-presentations/transportation-engineering-ppts/

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ECE-553: Soil Mechanics Lab-I **L T P 0 0 2**

Lab Objective:

The objective of this lab is to describe the nature of soil problems encountered in civil engineering and gives an overall preview of the behavior of soil, describes the nature of soil, especially the transmission of stresses between soil particles and studying primarily the dry soil behavior since many aspects of soil behavior can be understood by considering the interaction of soil without the presence of water.

List of Experiments: **(16 Sessions)**

1. Determination of water content of soil
2. Determination of specific gravity of soil
3. Determination of field density of soil by core cutter method
4. Determination of field density by sand replacement method
5. Grain size analysis by sieving (Dry sieve analysis)
6. Determination of permeability by constant head method.

Lab Outcomes:

After completion of this lab, students will able to

- Understand the theoretical and practical aspects of geotechnical engineering along with the design and management applications.
- Determine various parameters such as specific gravity, water content, permeability etc.
- Operate and use of various equipments related to geotechnical field.

Suggested readings:

- "Soil Mechanics and Foundation Engineering", V.N.S. Murthy, CBS Publishers & Distributors.
- "Soil Mechanics and Foundation Engineering", K.R. Arora, Standard Publishers
- "Pile Foundations Design and Construction"; S. Mittal, CBS Publishers New Delhi.
- "Soil Mechanics and Foundation Engineering"; P. Purushothama Raj; Pearson Education.

Website resources:

- http://bis.org.in/other/quake.htm
- https://nptel.ac.in/courses/105/103/105103097/
- https://www.geoengineer.org/education/soil-mechanics
- https://www.classcentral.com/course/swayam-soil-mechanics-geotechnical-engineering-i-10099

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ECE-554: Structural Analysis Lab **L T P 0 0 2**

Lab Objective: The objective of this lab is to familiarize students with various theorems and experimental work related to analysis of any structure, and demonstrates and verifies theorem related to beams.

List of Experiments: **(16 Sessions)**

1. To verify Clark Maxwell's theorem by means of a mild steel beam.
2. Study of a three hinged arch experimentally for a given set of loading and to compare the results with those obtained analytically.
3. To obtain experimentally the influence line diagram for horizontal thrust in a three hinged arch and to compare the same with the theoretical value.
4. To determine the flexural rigidity of a given beam.
5. To study the behavior of different type of struts.
6. To verify moment area theorem for slopes and deflection of a beams.
7. To find the deflection of a pin-connected truss and to verify the results by calculation and graphically.
8. To determine the ratio of fixed end moment at one end to the moment applied at the other end
9. To determine the moment required to produce a given rotation at one end of the beam when far end is (a) Fixed (b) pinned.
10. Determine experimentally the horizontal displacement of the roller end of a two hinged arch for a given set of a loading and to compare the results with those obtained analytically.

Lab Outcomes:

After completion of this Lab, the students will be able to

- Determine and draw the influence lines for reactions, shears, and bending moments in beams.
- Determine and draw the influence lines for horizontal thrust in a three hinged arch.
- Analyze and determine slope and deflection of determinate trusses, beams and frames by experimental work.
- Calculate the internal forces in cable and arch type structures.

Suggested readings:

- "Theory of Structures" by S.Ramamrutham, Dhanpat Rai Publishing, New Delhi.
- "Basic structural analysis", C.S. Reddy, McGraw Hill Education.
- "Structural Analysis-A Matrix Approach" by G.S. Pandit, Tata McGraw Hill, New Delhi
- "Theory of structures": Vazirani and Rathwani Vol. II and Vol. III.
- "Intermediate structural Analysis": C. K. Wang. Tata McGraw hill Edition.
- "Structural Analysis" , R. C. Hibbeler, 8th edition, Pearson Prentice Hall, 2012.
- "Structural Analysis Vol II" by BhaviKatti, Vikash Publishing House Pvt. Ltd.
- 'Theory of Structures' by B.C. Punmia, Laxmi Publication House.

Website Resources:

- https://ocw.mit.edu/courses/find-by-topic/#cat=engineering&subcat=civilengineering&spec=structuralengineering
- https://nptel.ac.in/courses/105/105/105105166/
- https://nptel.ac.in/courses/105/105/105105041/

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ECE-601: Environmental Engineering-II **L T P 3 1 0**

Course Objective:
The objective of this course is to familiarize students with water quality issues, operate and maintain working treatment systems and do troubleshooting of the problems in these systems. This course also deals with various methods of water treatments for polluted water and calculation of various parameters related to contaminated water such as BOD COD etc.

Unit I **(8 Sessions)**
Introduction: Waste**:** Dry, semi-liquid, liquid, Necessity of systematic collection and disposal of waste. Brief description of sewage disposal system. Conservancy and Water carriage system, their advantages and disadvantages. Quantity of Sewage**:** (i) Sewage**:** Domestic, industrial and storm water. (ii) Volume of domestic sewage (DWF), variability of flow, limiting velocities in sewers.

Unit II **(8 Sessions)**

Sewerage System: Collection and Disposal of sewage, Quantity and composition of sanitary sewage, Storm runoff estimation, Wastewater characteristics and significance, Effluent disposal standards, Types of sewers, joints in sewers, planning of sewerage system, layout and construction of sewer lines, Sewage Pumping.

Unit III **(8 Sessions)**
Sewage Treatment & Design Principles: Design principles of primary and secondary treatment units, screen chamber, grit chamber, primary sedimentation tank, activated sludge process, Aeration tank and oxidation ditch Trickling filter, Stabilization ponds, Septic tanks, Biogas recovery.

Unit IV **(6 Sessions)**
Sewer Appurtenances:
Manholes, street inlets, catch basins, building connections, sewer junctions, inverted siphons, flushing tanks, air ejectors, storm regulators, regular and measuring devices

Unit V **(10 Sessions)**
Disposal of Sewage: General composition of sewage, importance & method of determination of O.D., B.O.D. and C.O.D. Disposal methods: Land disposal by dilution and disposal in sea. Merits and demerits. Nuisance due to disposal, self purification of streams, conditions of disposal. Sewage Treatment: Meaning and principle of primary and secondary treatment, constructional details of screening chamber, clarifier, secondary clarifiers. Sludge treatment, sludge digestion, sludge drying. Sludge disposal, Oxidation ponds.

Course Outcomes:
After completion of this course students will able to
- Understand water quality concepts and their effect on treatment process selection
- Understand working principle and functioning of various water treatment processes.
- Communicate effectively in oral and written presentations to technical and non-technical audiences.

Suggested readings:

- "Environmental Engineering Vol. I", Garg, S.K., Khanna Publishers, New Delhi, 1994.
- "Sewage disposal and Air pollution Engineering". Garg, S. K., Khanna Publishers, New Delhi, 2010.
- "Environmental Engineering Vol. I & II", Modi, P.N., Standard Book House, New Delhi , 2001
- "Environmental Engineering Vol. I & II", Punmia B.C., Lakshmi Publications (P) Ltd., New Delhi, 2002.

Website resources:

- https://en.wikipedia.org/wiki/Water_treatment
- https://www.indiawaterportal.org/topics/technology
- https://www.waterworld.com/international/desalination/article/16202105/filtering-through-indias-drinking-water-challenges
- https://nptel.ac.in/courses/105/105/105105201/

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ECE-602: Transportation Engineering-II **L T P 3 1 0**

Objective:

- To understand the principles of construction and maintenance of highways.
- To know various components, geometrics in a railway track and various techniques for the effective movement of trains.
- To acquire design principles of layout and geometrics of airport.
- To introduce students to basic concepts of tunneling.
- To know the planning, construction and maintenance of Docks and Harbours.

Unit I **(08 Sessions)**

Road Construction and Maintenance: Highway Construction: Construction of cement concrete pavements, W B M roads; Soil stabilized roads; Drainage.

Unit II **(10 Sessions)**

Railways: Functions, requirements and components of permanent way - stations and yards - selection and requirements of site, classification - working principle of simple turnout Signals and their classifications. Modern development in railways, Railway track construction and maintenance.

Unit III **(08Sessions)**

Airports: Selection of site for an airport - elements and typical layout of an airport - orientation, length and patterns of runways - identification of runways (runway numbering) - parking of aircraft's - navigational aids.

Unit IV **(08 Sessions)**

Tunnels: Introduction to tunneling: Considerations in tunneling, shape and size of tunnels, tunnel alignment, shaft, pilot tunnels.Tunneling through soils and soft rock : methods of tunneling through soils and soft rock, tunnel lining, shield method of tunneling. Tunneling in hard rock : Methods of attack, grouting and lining. Tunnel ventilation, Dust Removal etc.

Unit V **(06 Sessions)**

Docks and Harbors: Seaport: Selection of site- elements and typical layout - functions, requirements and classifications of docks and harbors - break water and their types dredging.

Course Outcomes:

On the completion of the course one should be able to understand:

- Different types of highway pavements and their construction.
- Knowledge of railway geometrics, signaling & interlocking Points, crossing and turnouts, etc.
- Different terminology related to airport engineering- Layout, runway and parking of aircrafts.
- Fundamentals of tunnel- its excavation methods, support systems, and executional aspects of tunnel.
- Concepts of docks and harbours- Layout, functions and requirements.

Suggested Readings:

- "Highway Engineering", S K Khanna and C E G Justo, Nem Chand and Bros, Roorkee
- "A course in Highway Engineering", S P Bindra, DhanpatRai Publications, New Delhi
- "A text book of Railway Engineering", S Arora and S C Saxena, DhanpatRai& Sons, Delhi
- "Airport Engineering",S CRangwala and P S Rangwala, Charotar Publishing House, Anand,
- "Harbour, Dock and Tunnel Engineering ", Srinivasan R and Rangwala S C, Charotar

Website Sources:

- https://en.wikipedia.org/
- https://www.asce.org/
- https://www.aboutcivil.org/railway-engineering
- https://nptel.ac.in/

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ECE-603: Hydrology **L T P 3 1 0**

Course Objective:

The objective of this course is to comprehend basic concepts of the water cycle and hydrology and basic principles and movement of ground water and properties of ground water flow. This course also deals with diverse methods of collecting the hydrological information, which is essential; to understand surface and ground water hydrology.

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UNIT I **(6 Sessions)**
Introduction: Definitions, Hydrologic Principles- Hydrologic cycles and weather, hydrologic losses, Precipitation measurement and analysis, rainfall-runoff, hydrograph analysis and UNIT hydrograph theory.

UNIT II **(10 Sessions)**
Hydrologic Abstraction: Infiltration, factors affecting infiltration, measurement of infiltration, empirical and analytical models of infiltration, evaporation: its measurement and estimation, evapo-transpiration: its measurement and estimation, interception and depression storage, rain harvesting; Procedure and its design.

UNIT III **(10 Sessions)**
Stream Flow: Measurement of stream flow, factors affecting stream flow, hydrograph analysis, base flow separation, methods of steam flow determination, synthetic UNIT hydrograph, hydrological modeling for steam flow estimation, and methods for peak discharge estimation.

UNIT IV **(8 Sessions)**
Frequency Analysis: Return period, random variable, checks for persistency, frequency distributions, frequency analysis of hydrological data. Dependent and independent variables, simple correlation coefficient, method of least squares, variance analysis, partial correlation coefficient, simple and multiple regression analysis.

UNIT V **(6 Sessions)**
Ground Water and Flood Routing: Aquifers, hydraulic conductivity, transmissivity, well hydraulics. Governing equations, reservoir flood routing, hydrologic routing: Muskingum method.

Course Outcomes:
After completion of this course students will able to

- Understand basic concepts of hydrologic simulation modeling to evaluate potential impacts of management decisions.
- Understand systematic understanding of the nature of hydrological stores and fluxes and a critical awareness of the methods used to measure, analyze and forecast their variability; and the
- Get knowledge in the field of theory of hydrological processes and their measurement.

Suggested readings:

- "Elementary Hydrology", Singh, V.P., Prentice Hall
- "Applied Hydrology", V.T. Chow, D.R. Maidment and W.L.,Mays, "McGraw Hill.
- "Hydrology", M.Wanielista, R. Kersten and R. Eaglin John Wiley
- "Engineering Hydrology" C.S.P. Ojha, R. Berndtsson and P. Bhunya, Oxford University Press.

Website resources:

- https://public.wmo.int/en/resources/bulletin/hydrology-distance-learning-courses-indian-and-international-professionals
- https://civilenggforall.com/hydrology-civil-engineering-gate-2020-study-material-free-download-pdf-civilenggforall/
- https://nptel.ac.in/courses/105/104/105104029/

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ECE-605: Reinforced Cement Concrete- II **L T P 3 1 0**

Objective:
To make Civil Engineering students able to design flat slab, footing, retaining wall, water tank and to introduce students to the concept of pre-stressed concrete.

Unit I **(08 Sessions)**
Nature of Stresses in flat slabs with and without drops, coefficient for design of flat slabs, reinforcement in flat slabs. (IS Code Method).

Unit II **(08 Sessions)**

Analysis and design of beam curved in plan. Structural behaviour of footings, design of footing for a wall and a single column, combined rectangular and trapezoidal footings, Design of strap footing.

Unit III **(08 Sessions)**

Structural behavior of retaining wall, stability of retaining wall against overturning and sliding, Design of T-shaped retaining wall, Concept of Counter fort retaining wall. Loads, forces and I.R.C. bridge loadings, Design of R.C. slab culvert.

Unit IV **(08 Sessions)**
Design criteria, material specifications and permissible stresses for tanks, design concept of circular tank situated on the ground / underground , overhead Tanks.

Unit V **(08 Sessions)**
Advantages of prestressing, methods of prestressing, losses in prestress, analysis of simple prestressed rectangular and T-section.

Course Outcomes:
On successful completion of the course, the students shall be able:
- To understand stresses in flat slab and design them as per I.S.456-2000
- To design footings and retaining wall by limit state design method as per I.S.456-2000.
- To design ground, underground and overhead tanks.
- To understand the concepts of pre-stressed concrete and analyze simple pre-stressed rectangular and T-section.

Suggested Readings:
- IS: 456 – 2000.
- "Reinforced Concrete – Limit State Design", A. K. Jain, Nem Chand & Bros., Roorkee.
- "Plain and Reinforced Concrete Vol. I & II", O. P. Jain & Jai Krishna, Nem Chand & Bros.
- "Reinforced Concrete Structures", R. Park and Pauley.
- "Reinforced Concrete Design", P. Dayaratnam.

Website Sources:
- http://www.nptelvideos.in/2012/11/design-of-reinforced-concrete-structures.html
- https://nptel.ac.in/
- https://theconstructor.org/search/RCC/posts/
- https://en.wikipedia.org/
- https://theconstructor.org/structural-engg/

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ECE-606: Design of Steel Structures- I **L T P 3 1 0**

Course Objective:
The objective of this course is to introduce the students to the general design of tension, compression, beam members and roof truss including connections, study of IS codes with latest design methods.

UNIT I INTRODUCTION **(08 Sessions)**
Properties of steel – Structural steel sections – Limit State Design Concepts – Loads on Structures – Metal joining methods using rivets, welding, bolting – Design of bolted, riveted and welded joints – Eccentric connections - Efficiency of joints – High Tension bolts

UNIT II TENSION MEMBERS **(08 Sessions)**
Types of sections – Net area – Net effective sections for angles and Tee in tension – Design of connections in tension members – Use of lug angles – Design of tension splice – Concept of shear lag

UNIT III COMPRESSION MEMBERS **(08 Sessions)**
Types of compression members – Theory of columns – Basis of current codal provision for compression member design – Slenderness ratio – Design of single section and compound section compression members – Design of lacing and battening type
columns – Design of column bases – Gusseted base

UNIT IV BEAMS **(08 Sessions)**
Design of laterally supported and unsupported beams – Built up beams – Beams subjected to biaxial bending – Design of plate girders riveted and welded – Intermediate and bearing stiffeners – Web splices – Design of beam columns

UNIT V ROOF TRUSSES AND INDUSTRIAL STRUCTURES **(08 Sessions)**
Roof trusses – Roof and side coverings – Design loads, design of purlin and elements of truss; end bearing – Design of gantry girder

Course Outcomes:
On successful completion of the course, the students shall be:
- Capable of using all loading and limit state design methods for steel structures.
- Capable of elementary design of tension /compression members used in steel structures.
- Able to provide the design of beams and roof truss.
- Capable of understanding the types of structural fasteners with their behavior and connections. .

Suggested Readings:
- "Teaching Resources for Structural Steel Design – Vol. I & II", INSDAG, Kolkatta.
- "Design of Steel Structures", E.H., Gaylord, N.C. Gaylord and J.E., Stallmeyer, 3rd edition, McGraw-Hill Publications, 1992.
- Design of Steel Structures, L.S.Negi,Tata McGraw Hill Publishing Pvt Ltd, New Delhi,2007.
- IS 800-2007 Indian Standard General Construction in Steel – code of practice (3rd Revision).

Website Sources:
- https://theconstructor.org/structural-engg/steel/
- http://www.nptelvideos.in/2012/11/design-of-steel-structures.html
- https://en.wikipedia.org/
- https://www.aboutcivil.org/structural-engineering.html
- https://nptel.ac.in/

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EHU 601: Human Values & Professional Ethics **L T P 3 1 0**

Course Objective:

- To create an awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life.

UNIT I **(06 Sessions)**

HUMAN VALUES: Morals, Values and Ethics – Integrity – Work Ethic – Service – Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing - Honesty – Courage –Valuing Time – Co-operation – Commitment - Empathy – Self-Confidence – Character - Spirituality.

UNIT II **(07 Sessions)**

ENGINEERING ETHICS: Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - Moral dilemmas - Moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - custom and religion - uses of ethical theories.Valuing Time – Co-operation – Commitment

UNIT III **(05 Sessions)**

ENGINEERING AS SOCIAL EXPERIMENTATION: Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

UNIT IV **(11 Sessions)**

SAFETY, RESPONSIBILITIES AND RIGHTS: Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies.
Collegiality and loyalty – Respect for authority – Collective bargaining – Confidentiality – Conflicts of interest – Occupational crime – Professional rights – Employee rights – Intellectual Property rights (IPR) – Discrimination.

UNIT V **(11 Sessions)**

GLOBAL ISSUES: Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers and engineers as expert witness and advisors -moral leadership – Sample code of Ethics like ASME, ASCE, IEEE, IETE etc.

Course Outcome:

- It ensures students sustained happiness through identifying the essentials of human values and skills.
- It facilitates a correct understanding between profession and happiness
- It helps students understand practically the importance of trust, mutually satisfying human behavior and enriching interaction with nature.
- Ability to develop appropriate technologies and management patterns to create harmony in professional and personal life.

Suggested Readings:

- Mike Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw-Hill, New York 1996.
- Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.
- 3.Jayshree Suresh and B.S.Raghavan, “Human values and Professional Ethics”, S.Chand& Company Ltd., New Delhi.

Website Sources:

- https://examupdates.in/professional-ethics-and-human-values
- https://www.uptunotes.com/universal-human-values-and-professional-ethics
- https://lecturenotes.in/

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ECE-651: CAD Lab- I **L T P 0 0 2**

Lab Objective:
- To introduce students with the AUTOCAD software.
- To gain knowledge of drawing various structural components of building using AUTOCAD software.

List of Experiments: **(16 Sessions)**

1. Draw Plan, Elevation and section of small residential building

2. Recall 2D editing tools of AutoCAD
   Prepare two views showing reinforcement details of the following using AutoCAD
   a) Singly Reinforced beam
   b) Doubly Reinforced beam
   c) Simply supported one way slab
   d) Column and column footing

3. Practice on 3D commands and draw different 3D models of the following
   a) 3D view of steps
   b) 3D view a small residential building
   c) 3D view of column footing

Lab Outcomes:
On the completion of the Lab one should be able to:
- Understand 2D and 3D commands used in AUTOCAD software.
- Draw Plan, Elevation and section of small residential building using AutoCAD.
- Draw 2D views of singly and doubly reinforced beam using AutoCAD.
- Draw 2D views one way slab, column and column footing using AutoCAD.
- Draw 3D model of steps, small residential building and column footing.

Suggested Readings:
- A general guide to computer aided design and drafting by Vijay duggal
- Introduction to AutoCAD 2019 for Civil Engineering Applications by Nighat Yasmin; SDC Publications
- Principles and Practice An Integrated Approach to Engineering Graphics and AutoCAD 2020 by Randy H. Shih; SDC Publications

Website Sources:
- https://www.autodesk.in/products/autocad-web-app/overview
- https://www.youtube.com/watch?v=Nu7doXaDbUk
- https://en.wikipedia.org/

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ECE-652: Transportation Engineering Lab- II **L T P 0 0 2**

Objective:
To learn the procedure of testing bituminous sample and sub-grade soil for suitability of usage in pavements.

List of Experiments: **(16 Sessions)**

1. Penetration Test of Bituminous Sample
2. Softening Point Test of Bituminous Sample
3. Stripping Test of Bituminous Sample
4. Ductility Test of Bituminous Sample
5. Flash & Fire Point Test of Bituminous Sample
6. California Bearing Ratio (CBR) test (Soaked and Unsoaked)

Course Outcomes:
On the completion of the course one should be able to:
- Perform penetration test, softening point test, stripping test, ductility test and flash & fire point test on bituminous sample for evaluating its properties to be used in pavements.
- Perform CBR test for evaluating the bearing capacity of sub-grade soil for design of flexible pavement.

Suggested Readings:
- "Highway Engineering";S.K. Khanna and C.E.G. Justo
- "Highway Engineering";N.K. Vaswani
- Laboratory Manual in Highway Engineering; Ajay K. Duggal and Vijay P. Puri

Website Sources:
- https://en.wikipedia.org/
- https://ts-nitk.vlabs.ac.in/transportation-engineering/
- https://civildigital.com/powerpoint-presentations/transportation-engineering-ppts/
- https://www.aboutcivil.org/california-bearing-ratio-test.html

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ECE-653: Hydraulic Engineering Lab **L T P 0 0 2**

Lab Objective: The Objective of this lab is to explore the fundamental principles of fluid mechanics and hydraulics and to impart knowledge about various parameters related to fluid, this lab also deals with study of behavior of fluid in kinetic conditions and demonstrate and analyze key hydraulic phenomenon using equipments.

List of Experiments: **(16 Sessions)**

1. Determination of co-efficient of discharge for orifice
2. Determination of co-efficient of discharge for notches
3. Determination of co-efficient of discharge for venturimeter
4. Determination of co-efficient of discharge for orifice meter
5. Study of impact of jet on flat plate (normal / inclined)
6. Study of friction losses in pipes
7. Study of minor losses in pipes
8. Study on performance characteristics of Pelton turbine
9. Study on performance characteristics of Francis turbine
10. Study on performance characteristics of Kaplan turbine

Lab Outcomes:

- Students completing this lab, will be able to
- Determine the quantities like co-efficient of discharge for venturimeter, notches and orifice meter.
- Calculated and demonstrate the various types of losses in pipes.
- Know about functioning and knowledge of various types of turbines.

Suggested readings:

- "Elementary Hydrology", Singh, V.P., Prentice Hall
- "Applied Hydrology", V.T. Chow, D.R. Maidment and W.L.,Mays, "McGraw Hill.
- "Hydrology", M.Wanielista, R. Kersten and R. Eaglin John Wiley & Sons.
- "Engineering Hydrology" C.S.P. Ojha, R. Berndtsson and P. Bhunya, Oxford University Press.

Website resources:

- https://public.wmo.int/en/resources/bulletin/hydrology-distance-learning-courses-indian-and-international-professionals
- https://civilenggforall.com/hydrology-civil-engineering-gate-2020-study-material-free-download-pdf-civilenggforall/
- https://nptel.ac.in/courses/105/104/105104029/

SYLLABUS

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SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING
IFTM UNIVERSITY, MORADABAD

Bachelor of Technology (B.Tech) Civil Engineering

STUDY AND EVALUATION SCHEME
Effective from Session 2020-21

Note: Industrial Training of 4 – 6 weeks after VI semester which will be evaluated in VII semester.

YEAR IV, SEMESTER-VII

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	ECE - 701	Geotechnical Engineering-II	3	1	0	20	10	30	70	100	4
2.	ECE - 702	Irrigation Engineering	3	1	0	20	10	30	70	100	4
3.	ECE - 703	Design of Steel Structure-II	3	1	0	20	10	30	70	100	4
4.	ECE - 704	Construction Planning & Management	3	1	0	20	10	30	70	100	4
5.	ECE- 705	Rural Water Supply and Sanitation (Departmental Elective)	3	1	0	20	10	30	70	100	4
6.	ECE-706	Earthquake Resistant Design	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
7.	ECE - 751	CAD Lab - II	0	0	2	20	10	30	70	100	1
8.	ECE - 752	Geotechnical Engineering Lab-II	0	0	2	20	10	30	70	100	1
9.	ECE - 755	Structural Design and Detailing Lab	0	0	2	20	10	30	70	100	1
10.	ECE - 754	Industrial Training (Evaluation & Viva)	0	0	2	-	100	100	-	100	1
11.	EGP-701	General Proficiency	-	-	-	-	-	100	-	100	1
		TOTAL	**18**	**06**	**08**	**-**	**-**	**-**	**-**	**1100**	**29**

YEAR IV, SEMESTER-VIII

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	ECE-801	Water Resources Engineering.	3	1	0	20	10	30	70	100	4
2.	ECE-802	Bridge Engineering	3	1	0	20	10	30	70	100	4
2.	EHU-801	Industrial Management	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
2.	ECE – 851	Project	0	0	20	-	300	300	400	700	12
3.	EGP-801	General Proficiency	-	-	-	-	-	100	-	100	1
		TOTAL	**02**	**00**	**20**	**-**	**-**	**-**	**-**	**1100**	**25**

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B.Tech – IV Year (VII Semester)
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ECE-701: Geotechnical Engineering-II **L T P 3 1 0**

Course Objective: The objective of this course is to learn about types and purposes of soil exploration methods and different foundation systems and structures. This course also deals with systematic methods for designing and evaluates the feasibility of foundation solutions to different types of soil conditions considering the time effect on soil behavior, build the necessary theoretical background for design and construction of foundation system and study the nature of the soil behavior for different foundation.

UNIT I **(10 Sessions)**
Introduction: Role of civil engineer in the selection, design and construction of foundation of civil engineering structures. Different types of loads on foundations.
Soil Exploration: Methods of soil exploration; boring, sampling, penetration tests, correlations between penetration resistance and soil design parameters.

UNIT II **(6 Sessions)**
Earth Pressure and Retaining Walls : Earth pressure at rest, active and passive earth pressure, Rankine and Coulomb's earth pressure theories, earth pressure due to surcharge, Rebhamn's and Culmann's Methods.

UNIT III **(8 Sessions)**
Foundations : Types of foundations, mechanism of load transfer in shallow and deep foundations, shallow foundations, Terzaghi's bearing capacity theory, computation of bearing capacity in soils, effect of various factors, use of field test data in design of shallow foundations, stresses below the foundations, settlement of footings and rafts, proportioning of footings and
rafts,

UNIT IV **(8 Sessions)**
Pile Foundation: Types and method of construction, estimation of pile capacity, capacity and settlement of group of piles, proportioning of piles.
Well Foundations: Methods of construction tilt and shift, remedial measures, bearing capacity, settlement and lateral stability of well foundation.

UNIT V **(8 Sessions)**
Machine Foundations: Types of machine foundations, mathematical models, response of foundation – soil system to machine excitation, cyclic plate load test, block resonance test, criteria for design.
Retaining Wall: Proportions of retaining walls, stability checks, coffer dam structures types and suitability.

Course Outcomes;
After completion of this course, students will able to:
- Understand about various soil exploration methods and active and passive system of Earth pressure.
- Understand various types, analysis and design of foundation. of foundation.
- Understand reason behind the structure and foundation failure.
- Understand about behavior/nature of the soil.

Suggested readings:
- "Soil Mechanics and Foundation Engineering", V.N.S. Murthy, CBS Publishers & Distributors.
- "Soil Mechanics and Foundation Engineering", K.R. Arora, Standard Publishers
- "Pile Foundations Design and Construction"; S. Mittal, CBS Publishers New Delhi.
- "Soil Mechanics and Foundation Engineering"; P. Purushothama Raj; Pearson Education.

Website resources:
- http://bis.org.in/other/quake.htm
- https://nptel.ac.in/courses/105/103/105103097/
- https://nptel.ac.in/courses/105/101/105101001/
- https://nptel.ac.in/courses/105/105/105105176/
- https://onlinecourses.nptel.ac.in/noc20_ce52/preview
- https://www.geoengineer.org/education/soil-mechanics
- https://www.classcentral.com/course/swayam-soil-mechanics-geotechnical-engineering-i-10099

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ECE-702: Irrigation Engineering **L T P 3 1 0**

Course Objective:
- To take up the basic concepts of irrigation and construction of various hydraulic structures.
- To introduce students to basic concepts of water, plants, their interactions, as well as irrigation and drainage systems design, planning and management.
- The structures involved the elementary hydraulic design of different structures and the concepts of maintenance shall also form part.
- To develop analytical skills relevant to the areas mentioned above, particularly the design of irrigation and drainage projects.

UNIT I **(10 Sessions)**
Irrigation technique and Water requirements of Crop: Definition, necessity of Irrigation in India, Advantages/Disadvantages of irrigation, Types of irrigation, Techniques of water distribution in the farms, Quality of irrigation water. Crop period or Base period, Duty and Delta of a crop, Crop seasons and Indian Agriculture, Optimum Utilization of irrigation water, Irrigation efficiencies, Consumptive use or Evapotranspiration, Effective rainfall, Consumptive irrigation requirement, Net irrigation requirement, Factors affecting consumptive use, Estimation of consumptive use, soil-moisture-Irrigation relation, estimation depth and frequency of Irrigation on the basis of soil moisture region concept problem.

UNIT II **(10 Sessions)**
Canal Irrigation Systems: General, alluvial and non- alluvial canals, alignment of canal, distribution systems for canal irrigation, curves in canals, certain importance in definitions: gross command area, cultural command area, intensity of irrigation, losses of water in canals, Warabandi system of distribution of irrigation water, design of stable cannels in India, regime channels, Kennedy's theory, lacey's theory, cross-section of an irrigation canal, balancing depth for excavation canals, fixing the L-section of the canal and other design considerations, maintenance of irrigation canals

UNIT III **(06 Sessions)**
Lining of Irrigation canals and Economics of Lining: Advantages of lining, Justification for lining the existing canals, Permissible velocities in lined channels, Under drainage of lined canals, Lining of canals in Expansive soils, Definitions of salinity and water logging, Causes of water logging, water logging control, Reclamation of saline and alkaline lands, Surface drainage or open drainage, Sub-surface drainage or tile drainage

UNIT IV **(08 Sessions)**
Regulation works Canal falls-necessity and location, Development of Falls, design of cistern element, roughening devices, design of Sarda type fall, and design of straight Glacis fall. Off-take alignment, cross-regulator and distributory, head regulators, devices to control silt entry into the off-taking channel and silt ejector, canal escapes, types of escapes, fish ladders, Methods of pricing irrigation water, Economic water rates Vs Prevailing revenue rates in India

UNIT V **(06 Sessions)**
Rivers, Their Behaviour, Control and Training: Importance of rivers and Necessity of Controlling them, Types of rivers and their Characteristics, River Training works-Classification Types-Guidebanks, Groynes, Deflectors, Embankments, Cut-offs, Bank Protection.

Course Outcomes:
On the completion of the course one should be able to understand:
- Concepts of irrigation and different hydraulic structures.
- How to estimate the quantity of water required by crops.
- Be able to plan and design irrigation projects.
- Design channels and other irrigation structures required for irrigation, drainage, soil conservation, flood control and other water-management projects.

Suggested Readings:

- "Irrigation, Water Resources and Water Power Engineering", P.N.Modi.
- "Fundamentals on Irrigation Engineering", Bharat Singh.
- "Irrigation Engineering and Hydraulic Structures", S.K.Garg.
- "Theory and Design of Irrigation Structures Vol.I& II", R.S.Varshney, Gupta & Gupta.

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Website Sources:
- https://www.engineeringcivil.com/page/2?s=irrigation
- https://nptel.ac.in/
- https://www.aboutcivil.org/irrigation-engineering-water-resources-lectures.html
- https://en.wikipedia.org/

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ECE-703: Design of Steel Structures- II **L T P 3 1 0**

Course Objective:
The objective of this course is to introduce the students to the design of roof trusses, gantry girder, plate girder, railway bridges, truss bridges and water tanks with latest design methods with reference to IS codes.

UNIT I **(08 Sessions)**
Design of gantry girder, Design of roof trusses.

UNIT II **(08 Sessions)**
Design of plate girder: Design of section, connections for flange plate to flange angles & flange angles to web, web and flange splicing. Vertical, Horizontal, Intermediate and Bearing stiffeners. Curtailment of plates.

UNIT III **(08 Sessions)**
Bridges: Standard loading for railway bridges, design of Deck type plate-girder bridges, design of bracings and frames. Application of ILD to the design of bridges,

UNIT IV **(08 Sessions)**
Design of through type truss bridges, design of members and joints, design of stringers, cross girder, lateral, sway and portal bracings.
.
UNIT V **(08 Sessions)**
Design of steel chimneys: Introduction, Use, Dimension of steel stacks, chimney lining, design consideration, Design of base plate.

Course Outcomes:
On successful completion of the course, the students shall be:
- Able to design gantry girder, plate girder and roof trusses.
- Capable of detailed design of railway bridges including bracings and frames.
- Able to provide the design of truss bridges including members, joints and stringers.
- Capable of detailed design of various types of water tanks.
- Competent enough to design of steel structures and able to provide the good quality control during the steel construction.

Suggested Readings:
- "Teaching Resources for Structural Steel Design – Vol. I & II", INSDAG, Kolkatta.
- "Design of Steel Structures", E.H., Gaylord, N.C. Gaylord and J.E., Stallmeyer, 3rd edition, McGraw-Hill Publications, 1992
- Design of Steel Structures, L.S.Negi,Tata McGraw Hill Publishing Pvt Ltd, New Delhi,2007.
- IS 800-2007 Indian Standard General Construction in Steel – code of practice (3rd Revision).

Website Sources:
- https://theconstructor.org/structural-engg/steel/
- http://www.nptelvideos.in/2012/11/design-of-steel-structures.html
- https://en.wikipedia.org/
- https://www.aboutcivil.org/structural-engineering.html
- https://nptel.ac.in/

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ECE-704: Construction Planning & Management **L T P 3 1 0**

Course Objective:
The objective of this course is to describe project management and related activities and describe the project life cycle Diagram networks of project activities , estimate the completion time of a project and to impart knowledge about types, merit, and demerits of construction contracts, The objectives in CPM and PERT are to schedule the sequence of work activities in the project and to determine the total time the project will take and to introduce the fundamental concepts relevant to CPM and PERT, and to enable students to understand organizational structures in the construction industry.

Unit I **(6 Sessions)**
Planning: General consideration, Definition of aspect, prospect, roominess, grouping, circulation privacy, occlusion
Regulation and Bye laws: Bye Laws in respect of side space, Back and front space, Covered areas, height of building etc., Lavatory blocks, ventilation, Requirements for stairs, lifts in public assembly building, offices

Unit II **(10 Sessions)**
Fire Protection: Fire fighting arrangements in public assembly buildings, planning, offices, Auditorium
Construction plants & Equipment: Plants & equipment for earth moving, road constructions, excavators, dozers, scrapers, spreaders, rollers, their uses. Plants &Equipment for concrete construction: Batching plants, Ready Mix Concrete, concrete mixers, Vibrators etc., quality control.

Unit III **(12 Sessions)**
Planning & scheduling of constructions Projects:
Planning by CPM & PERT, Preparation of network, Determination of slacks or floats. Critical activities. Critical path, project duration .expected mean time, probability of completion of project, Estimation of critical path; problems.

Unit IV **(6 Sessions)**
Management: Professional practice, Definition, Rights and responsibilities of owner, engineer, Contractors, types of contract.

Unit V **(6 Sessions)**
Departmental Procedures: Administration, Technical and financial sanction, operation of PWD, Tenders and its notification, EMD and SD, Acceptance of tenders, Arbitration.

Course Outcomes:
After completion of this course students will able to:
- Understand purpose, types, merit, and demerits of construction contracts,
- Develop organizational structures in the construction industry,
- Develop critical path method based network and estimate various times and floats, and
- Develop PERT network and find probability of completion of a project in specified duration.

Reference Books:

- "Construction Project Management, planning, scheduling & controlling" by K.K. Chitkara.
- "PERT & CPM -Principles & Applications" by L.S.Srinath.
- "Project Planning & Control with PERT & CPM" by B.C.Punmia & K.K.Khandelwal,
- "Construction Management & Planning" by B.Sengupta & H.Guha,

Website resources:
- https://www.mindtools.com/pages/article/critical-path-analysis.htm
- https://www.simplilearn.com/pert-and-cpm-important-tools-of-project-management-rar225-article
- https://nptel.ac.in/courses/105/103/105103093/

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ECE-705: Rural Water Supply and Sanitation **L T P 3 1 0**

Course Objective:

- To introduce about various rural water supply and sanitation programs in India.
- To introduce improved water supply and low cost sanitation methods in rural areas.
- To introduce feasible treatment and disposal techniques of sewage in rural areas.

UNIT I **(06 Sessions)**

Concept of environment and scope of sanitation in rural areas. Magnitude of problems of rural water supply and sanitation. Population to be covered, difficulties, National policy.

UNIT II **(08 Sessions)**

Water supply: Design population and demand loads. Various approaches of planning of water supply schemes in rural areas. Development of proffered sources of water springs. Wells, infiltration wells, radial wells and infiltration galleries, collection of raw water from surface source. Specific practices and problems encountered in rural water supply.

UNIT III **(08 Sessions)**

Improved methods and compact systems of treatment of surface and ground waters for rural water supply. Brief Details of multi-bottom settlers (MBS), diatomaceous earth filter, cloth filter, slow sand filter, chlorine diffusion cartridges. Pumps, pipe materials, appurtenances and improved devices for use in rural water supply. Planning of distribution system in rural areas.

UNIT IV **(10 Sessions)**

Community and sanitary latrines. Various methods of collection and disposal of night soil. Planning of waste water collection system in rural areas. Treatment and Disposal of waste water.
Compact and simple waste water treatment Units and systems in rural areas such as stabilization ponds, septic tanks, Imhoff tank, soak pit etc. Disposal of waste water soakage pits and trenches.

UNIT V **(08 Sessions)**

Disposal of Solid Wastes. Composting, land filling, incineration, Biogas plants, Rural health. Other specific issues and problems encountered in rural sanitation.

Course Outcomes:

On the completion of the course one should be able to understand:

- Various rural water supply and sanitation programs in India.
- Various water supply techniques and design of rural water supply system.
- Knowledge about the methods of low cost sanitation.
- Various methods of treatment and disposal of sewage in rural areas.

Suggested Readings:

- "Water Treatment and Sanitation – Simple Method for Rural Area" by Mann H.T. and Williamson D.
- "Water Supply for Rural Areas & Small Communities" by E.G. Wanger and J.N. Lanoix., WHO
- "Water Supply and Sewerage", by E.W.Steel& T.J.M, McGraw Hill.
- "Manual on Water Supply and Treatment", CPHEEO, Mini. Of Urban Development, Govt. of India.

Website Sources:

- https://www.who.int/water_sanitation_health/dwq/monograph42.pdf?ua=1
- https://en.wikipedia.org/wiki/Water_supply_and_sanitation_in_India
- https://www.oecd.org/dac/evaluation/Evaluation%20insights%20WASH%20final%20draft.pdf
- https://jalshakti-ddws.gov.in/sites/default/files/Sustainability%20Manual%20Final%2029032012_0.pdf

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ECE-706: Earthquake Resistant Design **L T P 3 1 0**

Course Objective:
The objective of this course is to impart knowledge on the seismology and behavior of buildings during earthquakes and introduce students about Various IS codes related to building design and seismology and involve the application of scientific and technological principles of planning, analysis, and design of buildings according to earthquake design philosophy.

UNIT I **(6 Sessions)**
Introductory Seismology: Various terminologies related with earthquake, Causes of earthquake, plate tectonics, Tsunami. Seismic wave propagation. Magnitude, intensity & energy of earthquake, magnitude & intensity scales, classifications of earthquakes, Seismic zoning case histories of earthquakes. Seismic hazards, induced hazards.

UNIT II **(10 Sessions)**
Earthquake recording, Seismic instruments, Seismographs & Seismograms. Basic concept of liquefaction and isolation, Introduction to various IS related codes. Structural systems, Effects of earthquake on buildings in general, structural and nonstructural failures Dynamic characteristics of buildings, natural period of vibration, damping, stiffness etc Seismic performance of traditionally built masonry constructions, typical failure mechanism of masonry buildings under earthquakes

UNIT III **(6 Sessions)**
IS 4326: 1993: Planning consideration & architectural concept, provisions for earthquake resistant construction/ seismic strengthening of masonry constructions

UNIT IV **(10 Sessions)**
Seismic performance of reinforced concrete buildings. Plan, elevation & stiffness irregularities & their effects. Typical earthquake damages of RC constructions, short column effect, soft storey effect, strong column-weak beam analogy. IS 13920: 1993: Ductile detailing of reinforced concrete buildings and shear wall concept

UNIT V **(8 Sessions)**
Seismic design philosophy, IS 1893 (part I): 2002 code provisions : Load combinations, Design lateral loads, response reduction factors, structural modeling of building frames, equivalent load method for earthquake analysis of multistory frames.

Course Outcomes:
After completion of this course, students will
- Gain an experience in the implementation of Earthquake Engineering on engineering concepts which are applied in field Structural Engineering.
- Get a diverse knowledge of earthquake engineering practices applied to real life problems
- Learn to understand the theoretical and practical aspects of earthquake engineering along with the planning and design aspects

Suggested reading:

- "Elements of Earthquake Engineering" Jai, Krishna , A.R. Chandrasekran,. and B.Chandra, , 2nd Edition, South Asia Publisher, New Delhi
- IS : 1893 Indian Standard – "Criteria for Earthquake Resistant Design of Structures General Provisions and Buildings", Bureau of Indian Standard, Manak Bhawan, New Delhi.
- "Earthquake –Resistant Design of Masonry Building", Miha Tomazevic, Imperial College Press.
- "Earthquake Resistant Design of structures", S. K. Duggal, Oxford University Press.
- "Earthquake Resistant Design of structures" , Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.
- IS: 4326 Indian Standard – "Earthquake Resistant Design and construction of buildings", Bureau of Indian Standard, Manak Bhawan, New Delhi.
- IS: 13920 Indian Standard – " Ductile design and detailing of reinforced concrete structure subjected to seismic force", Bureau of Indian Standard, Manak Bhawan, New Delhi.

Website sources:
- https://www.bigrentz.com/blog/earthquake-proof-buildings
- https://en.wikipedia.org/wiki/Earthquake-resistant_structures
- https://nptel.ac.in/courses/105/101/105101004/
- https://onlinecourses.nptel.ac.in/noc20_ce52/preview
- https://law.resource.org/pub/in/bis/S03/is.1893.1.2002.pdf

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ECE-751: CAD Lab- II **L T P 0 0 2**

Lab Objective:
To introduce students with the latest software tools for Modeling, Analysis and Design to be used in the field of Civil Engineering

1. Recall 3D editing tools of AutoCAD **(16 Sessions)**
   Prepare plan, elevation and sectional view (including hatching wherever required) of any one of the following using AutoCAD and Auto LISP: (Computer Practice)
   a) Small Residential building
   b) Simple Irrigation structure like canal fall
   c) Septic tank, Manhole, Drop Manhole
   d) Section of a road pavement

2. Working on environmental engineering Software for analysis and Design of water & waste water treatment and distribution systems (water CAD / sewer CAD / water GEM / sewer GEM / Loop).
3. Working transportation engineering software / surveying Software's.
4. Working on GIS software (Arc GIS / ENVI / GEPSY).
5. Working on project management software (Primaveera / ms project).
6. Working on geotechnical Software like geo-5 / Plaxis.

Lab Outcomes:
On the completion of the lab course one should be able to understand:
- Draw 3D views of irrigation structure, septic tank, manhole, small residential building and road pavement using AutoCAD and AutoLISP.
- Working of environmental engineering Software for analysis and Design of water & waste water treatment and distribution systems using water CAD / sewer CAD.
- Working of transportation engineering software/GIS software for pavement design and surveying.
- Working of project management software (Primavera / MS project).
- Working of geotechnical Software like geo-5 / Plaxis for soil analysis and design of foundation.

Suggested Readings:
- Reference manual of AutoCAD Autodesk Inc
- The ABC's of Autolisp GeorgeOmmura BPB
- Mastering in AutoCAD George Ommura BPB

Website Sources:
- https://www.autodesk.in/products/autocad-web-app/overview
- https://www.youtube.com/watch?v=Nu7doXaDbUk
- https://en.wikipedia.org/

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ECE-752: Geotechnical Engineering Lab **L T P 0 0 2**

Lab Objective: The objective of this lab is to understand the laboratory tests used for determination of physical, index and Engineering properties of soil such as determination of permeability water content shear parameters etc.

List of Experiments **(16 Sessions)**

1. Determination of Atterberg Limits.
2. Determination of permeability by constant head method
3. Determination of compaction properties by standard proctor test
4. Determination of shear parameters by Direct shear test
5. Determination of shear parameters by Unconfined Compression Strength Test
6. Determination of shear parameters by Triaxial Test

Lab Outcomes;

After completion of this lab, students will able to:

- Measure of the critical water contents of a fine-grained soil by Atterberg limits
- Understand and determine shear parameters by various test such as direct shear test, Unconfined Compression Strength test and triaxial test.

Suggested Readings:

- "Soil Mechanics and Foundation Engineering", V.N.S. Murthy, CBS Publishers & Distributors.
- "Soil Mechanics and Foundation Engineering", K.R. Arora, Standard Publishers
- "Pile Foundations Design and Construction"; S. Mittal, CBS Publishers New Delhi.
- "Soil Mechanics and Foundation Engineering"; P. Purushothama Raj; Pearson Education.

Website Resources:

- http://bis.org.in/other/quake.htm
- https://nptel.ac.in/courses/105/103/105103097/
- https://nptel.ac.in/courses/105/101/105101001/
- https://nptel.ac.in/courses/105/105/105105176/
- https://onlinecourses.nptel.ac.in/noc20_ce52/preview
- https://www.geoengineer.org/education/soil-mechanics

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ECE-755: Structural Design and Detailing Lab **L T P 3 1 0**

Objective:

To learn about design and detailing of various components of RCC structures.

List of Experiments: **(16 Sessions)**

1. General considerations: Design principle of R.C.C. sections. Limit state method of design Loads and stresses to be considered in the design as per I.S. code provisions.

2. Design & detailing of a i) simply supported R.C.C Beam ii) Continuous T- Beam.

3. Design & detailing of RCC columns- Tied columns and Spirally reinforced columns.

4. Design & detailing of Isolated and combined footings for RC Columns.

5. Design & detailing of a i) simply supported one way slab ii) One way Continuous slab.

6. Study of full set of structural drawing of a building as made available by Institute.

Course Outcomes:
On the completion of the course one should be able to understand:

- Design principles of R.C.C. sections as per I.S. code provisions.
- Design and detailing of various components of RCC structures.
- Concepts of structural drawing of a building.

Suggested Readings:

- Krishna Raju N., "Structural Design and Drawing" University Press (India), Pvt.Ltd., Hyderabad.
- "Reinforced Concrete Design", S. Unnikrishna Pillai & D. Menon, Tata Mc-Graw Hill Book Publishing Company Limited, New Delhi.
- "Reinforced Concrete – Limit State Design", A. K. Jain, Nem Chand & Bros., Roorkee.

Website Resources:

- https://nptel.ac.in/courses/105/105/105105104/
- https://nptel.ac.in/courses/105/105/105105105/
- https://theconstructor.org/structural-engg/structural-detailing/
- https://www.engineeringcivil.com/presentation-on-reinforcing-detailing-of-r-c-c-members.html
- https://fossee.in/ (Free and Open Source Software for Education), National mission on education through ICT, MHRD, Govt. of India)

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ECE-801: Water Resources Engineering **L T P 3 1 0**

Course Objective:
- To study water resources of India, their importance and planning of water resources projects.
- To understand the structure of the gravity dams, earth dam, spillways, cross drainage works and diversion head works.
- To introduce students to the concept of pumps, turbines and their applications in water resources engineering.
- To learn about watershed development, rain water harvesting and strategies for flood damage.

UNIT I **(06 Sessions)**
Introduction: Water Resources of India, need of Irrigation and Power of India, need of harnessing water, importance and impact of irrigation projects and hydropower on environment, planning of water resources projects.

UNIT II **(10 Sessions)**
Cross drainage works: Classification and their selection, hydraulic design aspects of aqueducts, siphon aqueducts, super passage, canal syphon and level crossing, design of transitions.
Diversion canal headwork's: Various components and their functions, layout plan, selection of site for diversion headworks, Bligh's creep theory, Khosla's method of independent variables, use of Khosla's curves, various corrections, silt excluders.

UNIT III **(10 Sessions)**
Design of storage structures: Types of dams, selection of a site, gravity dam-two dimensional design, forces acting, stability criterion, elementary profile of a dam, cutoffs and drainage galleries, arch dams constant angle and constant radius arch dam, simple design and sketchs, most economical angle, Earth dam, design principles, seepage through earth dams, seepage line, control of seepage, design of filters.Types of spillways and energy dissipators. Tail water rating. Salient features like joints, water-seals, galleries and adits. Types of gates

UNIT IV **(08 Sessions)**
Pumps and Turbines: Rotodynamic pumps, basic equations, axial and mixed flow pumps, cavitations in pumps, characteristics curves. Hydraulic Turbines: Introduction, Rotodynamic Machines, Including elementary concept of bulb and tubular turbines pelton Turbine, equations for jet and rotor size, efficiency, spear valve, reaction turbines, Francis and Kaplan type, Head on reaction turbine, basic equation for type, Head on reaction turbine, basic equation for rotodynamic machines, similarity law and specific speed, cavitations characteristic curves.

UNIT V **(06 Sessions)**
Managing our water resources: Erosion control and watershed development: their benefit towards conservation of national water wealth. Rain water harvesting and recharge of ground water: role of society and people's participation for sustainable water resource development. Mitigation strategies for flood damage: structural and non-structural measures.

Course Outcomes:
On the completion of the course one should be able to understand:
- Different terminology related to water resources engineering.
- Identify various types of dams and their design aspects
- Application of pumps and turbines in water resources engineering.
- Establish the understanding of cross drainage works, diversion headworks and their design.
- Concepts of watershed development, rain water harvesting and strategies for flood damage.

Suggested Readings:

- "Fundamentals of Irrigation Engineering", B Singh, 9th Ed., Nem Chand & Bros.
- "Irrigation and water Resources Engineering", G.L.Asawa, New Age International.
- "Flow through open Channels", K.G., Ranga Raju, 2nd Ed., Tata McGraw-Hill.
- "Irrigation Engineering and Hydraulic Structures", S.K.Garg.

Website Sources:
- https://nptel.ac.in/
- https://en.wikipedia.org/
- https://www.aboutcivil.org/irrigation-engineering-water-resources-lectures.html
- https://www.asce.org/

SCHOOL OF ENGINEERING & TECHNOLOGY
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Bachelor of Technology (B.Tech) Civil Engineering
B.Tech – IV Year (VIII Semester)
Effective from Session 2020-21

ECE–802: Bridge Engineering **L T P 3 1 0**

Course Objective:
The objective of this course is to familiarize students with the types, suitability, selection, design criteria of various types of bridges and impart knowledge for analysis and equip the students with a thorough understanding of the behavior and design of bridges

UNIT I: **(6 Sessions)**
Introduction: Types of Bridges, selection of suitable type of bridge, aesthetics, economic span.

UNIT II: **(10 Sessions)**
Design loads and their distribution: IRC loads, analysis of deck slab and IRC loads, load distribution among longitudinal beams of a bridge, railway loading.

UNIT III: **(10 Sessions)**
Design of superstructure: Design of balanced cantilever concrete bridge, design of prestressed concrete bridge, design of lattice girder Railway Bridge, introduction to design of RC Arch bridges and box girder bridges.

UNIT IV: **(8 Sessions)**
Design of substructure: Different types of foundations, their choice and methods of construction, design of well foundation, design of piers and abutments, various types of bearings and their suitability

UNIT V: **(6 Sessions)**
Construction Methods: Erection of bridge superstructure, cantilever construction

Course Outcomes:
At the completion of this course, students will be able to:
- Plan and design the superstructure of RCC bridges.
- Design the substructure, superstructure and bearing of the bridge.
- Understand the load-carrying capacity of various types of bridges, upon learning the structural responses to different kinds of loads.
- Design short and medium span bridges, with confidence using existing codes of practice

Suggested Readings:
- "Design of Bridges": N.K.Raju., Oxford & IDH
- "Bridge Engineering": S. Ponnuswamy, Tata McGraw Hill.
- "Concrete Bridge Practice": V.K. Raina, Tata McGraw Hill.
- "Essentials of Bridge Engineering": D.J. Victor, Oxford & IDH
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Website Resources:
- https://onlinecourses.nptel.ac.in/noc17_ce24/preview
- https://nptel.ac.in/courses/105/105/105105165/
- https://onlinecourses.nptel.ac.in/noc19_ce23/preview
- http://engineering.buffalo.edu/home/academics/beyond/online/bridge-engineering.html

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EHU-801: INDUSTRIAL MANAGEMENT **L T P 3 1 0**

Course Objective: The objective of this course is to familiarize the students to gain insight about managerial techniques through various assessment tools/models to control and enhance the productivity of the work environment.

Unit-I **(10 Sessions)**
Introduction: Concept, Development, application and scope of Industrial Management.
Productivity: Definition, measurement, productivity index, types of production system, Industrial Ownership.

Unit-II **(08 Sessions)**
Management Function: Principles of Management- Management Tools – time and motion study, work simplification- process charts and flow diagrams, Production Planning, Specification of Production requirements.

Unit-III **(08 Sessions)**
Inventory control: Inventory, cost, Deterministic models, Introduction to supply chain management.

Unit-IV **(07 Sessions)**
Quality control: Meaning, process control, SQC control charts, single, double and sequential sampling, Introduction to TQM.

Unit-V **(07 Sessions)**
Environmental Issues: Environmental Pollution – various management techniques to control Environmental pollution – Various control acts for Air, Water, Solid waste and Noise pollution.

Course Outcome: Students completing this course will be able to:
- Understand the scope of Industrial Management.
- To apply various management tools in systems of different industrial configurations.
- To use various control charts to determine the product acceptability as per designed criteria .
- To control environmental pollution by various management techniques.

Suggested Readings:

- Khanna O.P.: Industrial Engineering
- T.R. Banga: Industrial Engineering and Management
- Sharma B.R.: Environmental and Pollution Awareness.
- R.K.Singal: Industrial Management, Vayu Education of India Pub.
- Onkar N. Pandey: Industrial Management, S.K.Kataria& Sons (Katson) Pub.
- Dewan J. M. and Sudarshan K. N.: Industrial Management, Discovery Publishing Pvt. Ltd

Website sources:
- nptel.ac.in/course.html
- www.nsf.gov
- en.wikipedia.org
- www.sciencedirect.com
- www.slideshare.net
- www.researchgate.net
- www.sanfoundry.com